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ABU Technical Bureau Mid-Year Meeting 2023

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Asia-Pacific Broadcasting Union

from the Editor

As I'm trying to compile my first words, as the editor of "Technical Review", I'm filled with a mix of excitement and responsibility. Working under the most diverse and respected umbrella of ABU, I'm committed to delivering insightful content that stands up to the legacy of this esteemed magazine.

In this edition, we have some compelling topics:
First up, we explore China's advancements in Immersive Video. The National Radio and Television Administration (NRTA) is pioneering this concept, offering viewers a truly immersive experience. Imagine feeling as if you're inside a movie or a game - that's the potential of immersive video. This technology could redefine how we consume content, especially in areas like tourism, entertainment, and even museums.

Next, we delve into Text-To-Speech (TTS) Systems with our colleagues from IRIB R&D. If you've ever wondered how machines turn text into human-like speech, this article will be helpful. With the rapid growth in technology, especially deep learning, these systems are becoming more advanced and versatile.

We then turn our attention to the recent Cloud Technology Session hosted by ABU at Broadcast Asia 2023 in Singapore. Cloud technology is reshaping the way we store and access information. We share the highlights and takeaways from this session, including real-world examples of how broadcasters are benefiting from moving to the Cloud.

From there, move on to Mediacorp Singapore. This meeting was a blend of in-person and virtual interactions, reflecting how technology is blending with our traditional ways of doing things.

Lastly, we take you to Sri Lanka, focusing on Rupavahini TV's modernization journey. They've embraced new technologies while respecting their rich history, striking a balance that many institutions aim for.

The regular parts like *News from the ABU Region* and *Equipment Trends* are all inside as well. I invite you to dive into these stories and join us in exploring the ever-evolving world of broadcast technology. Your feedback and insights are always welcome, helping us shape the future together.

Warm regards,

Dr Veysel Binbay
veysel@abu.org.my

The Asia-Pacific Broadcasting Union (ABU) is a professional union of broadcasting organisations in the Asia-Pacific area which aims to co-ordinate and promote the development of radio, television and allied services in the region. It is non-governmental, non-political and non-commercial.

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IMMERSIVE VIDEO IN CHINA

ABSTRACT
National Radio and Television Administration (NRTA) of China proposed the concept of 5G high-tech video, including four whole new aspects: interactive video, immersive video, VR video and cloud games. Immersive video is an audio and video system, which is viewed with the naked eyes, and the presentation screen covers a field of view of 120° horizontal and 70° vertical, and has 3D sound effects. It has the characteristics of ultra-high image quality, large viewing angle, and a strong sense of immersion, which can bring the audience an immersive experience. As an important part of the high-tech video format, immersive video has enabled a series of new technologies, new products, new applications and new consumption scenarios, and will continue to contribute to the digital development of emerging fields such as tourism, museums and art exhibitions, cultural entertainment. In the future, immersive video technology will be used to build a virtual world that complements the real world, creating a Metaverse entrance that integrates virtual and reality.

1. INTRODUCTION

In 2019, National Radio and Television Administration (NRTA) of China proposed the concept of 5G high-tech video, including four whole new aspects: interactive video, immersive video, VR video and cloud games. These new technologies aim to serve the public with videos of "higher technical formats, updated application scenarios, and better audio-visual experience".

Immersive video is an audio and video system, which is viewed with the naked eyes, and the presentation screen covers a field of view of 120° horizontal and 70° vertical, and has 3D sound effects. It has the characteristics of ultra-high image quality, large viewing angle, and a strong sense of immersion, which can bring the audience an immersive experience that cannot be achieved by traditional video and audio technology. Immersive Video focuses on content with clearer and more delicate images, more coherent and smooth pictures, wider and more shocking field of vision, saturated and vivid colors, immersive sounds, and presentation terminals with a strong sense of enveloping.

It is an important development direction of audio-visual technology for the future. To promote the integration of the traditional media with the new information technologies and increase the supply of high-quality cultural contents, the "promotion of immersive video and other applications" is clearly specified in the 14th Five-Year Plan of China.

After three years of development, immersive video has been widely used in China's variety shows, large-scale events, science exhibitions, virtual videography, tourism experience, commercial entertainment, education and training, home terminals and other scenarios, meeting the ever growing need of the Chinese people for better audio-visual experience. The application of immersive video has driven the rise of a huge immersive industry market, and at the same time has raised new requirements for content collection and production, audio/video encoding and decoding, transmission and distribution, as well as diversified presentation terminals.

2. CORE ELEMENTS OF IMMERSIVE VIDEO

2.1 ENVELOPMENT FEELING OF THE IMAGE

According to the visual characteristics of human eyes, when image can cover larger area of people's vision, with the horizontal angle of view is greater than 120° and the vertical angle of view is greater than 70°, then people can feel an immersive effect. In order to achieve the above picture envelopment feeling, immersive video can be presented in the form of spherical screen, annular screen, immersive room CAVE and other irregular presentation forms. The display mode can be projection & reflective screen or LED and other self-display screens.

2.2 PICTURE QUALITY

Immersive video stands for high-quality pictures. Resolution, contrast, color gamut, frame rate, color depth and other aspects are important indicators of image quality, the index requirements and recommended value are shown in the following table.

2.3 IMMERSIVE SOUND

The sound system for the immersive video recommends the use of object based or scenes based 3D sound technology. It is required to achieve a sound system no less than 5.1.4 channels, that is, four top channels are added to the traditional 5.1 surround sound.

The core elements for immersive video production are shown in ***Table 1***.

Table 1 : *Table of Core Elements of Immersive Video*

Order	Parameter	Recommended value
1	Horizontal field of view	≥120°
2	Vertical field of view	≥70°
3	Presentation	Spherical screen, annular screen, immersive room CAVE and other irregular presentation forms
4	Resolution	4K/8K
5	Dynamic Range	HDR (not applicable to the projection of the inner arc spherical screen terminal)
6	Color Gamut	A minimal of DCI-P3, ITU-R BT.2020 is recommended
7	Frame Rate	A minimal of 50/60, 100/120 is recommended
8	Color Depth	A minimal of 10,12 is recommended
9	Sound System	A minimal of 5.1.4 channels

3. KEY TECHNOLOGIES

Immersive video involves nine key technologies, which are panoramic video capturing, video image stitching, 3D image mapping, computer image generation, 3D sound, coding and transmission, multimedia control, projection display, LED Screen Display Technology. None of these technologies are entirely new, but for the first time, they are being strung together.

To transmit immersive video, which has bigger picture size and higher picture quality request, the coding and transmission will be a little different. The code stream requirements of immersive video can be divided into three levels that consist of 4K and below, 8K, and above 8K based on the image resolution. The average bit rate of 4K video is 60~100Mbps, and the transmission rate requirement is 80~125Mbps. The average bit rate of 8K video is 150~200Mbps, and the transmission rate required is 180~250Mbps. The average bit rate of video above 8K is 300~500Mbps, and the transmission rate required is 350~600Mbps.

Video coding and decoding technology is the basis for the development of digital TV. Video coding technologies applied to immersive video mainly include H.264, H.265, and H.266 (proposed by ITU-T), as well as the video coding standards AVS/AVS+, AVS2, and AVS3 with independent intellectual property rights developed by the domestic AVS working group. These standards correspond to international standards.

Immersive video can be transmitted by cable TV, 5G wireless network, and Internet according to different application scenarios and actual conditions. These three transmission schemes are suitable to various application requirements of immersive video.

4. IMMERSIVE VIDEO END-TO-END SOLUTION

Immersive video service can be mainly divided into live broadcast and on-demand scenarios. The two scenarios correspond to different production processes. The overall framework of its shooting, production, transcoding, transmission, distribution and presentation system is shown in ***Figure 1***.

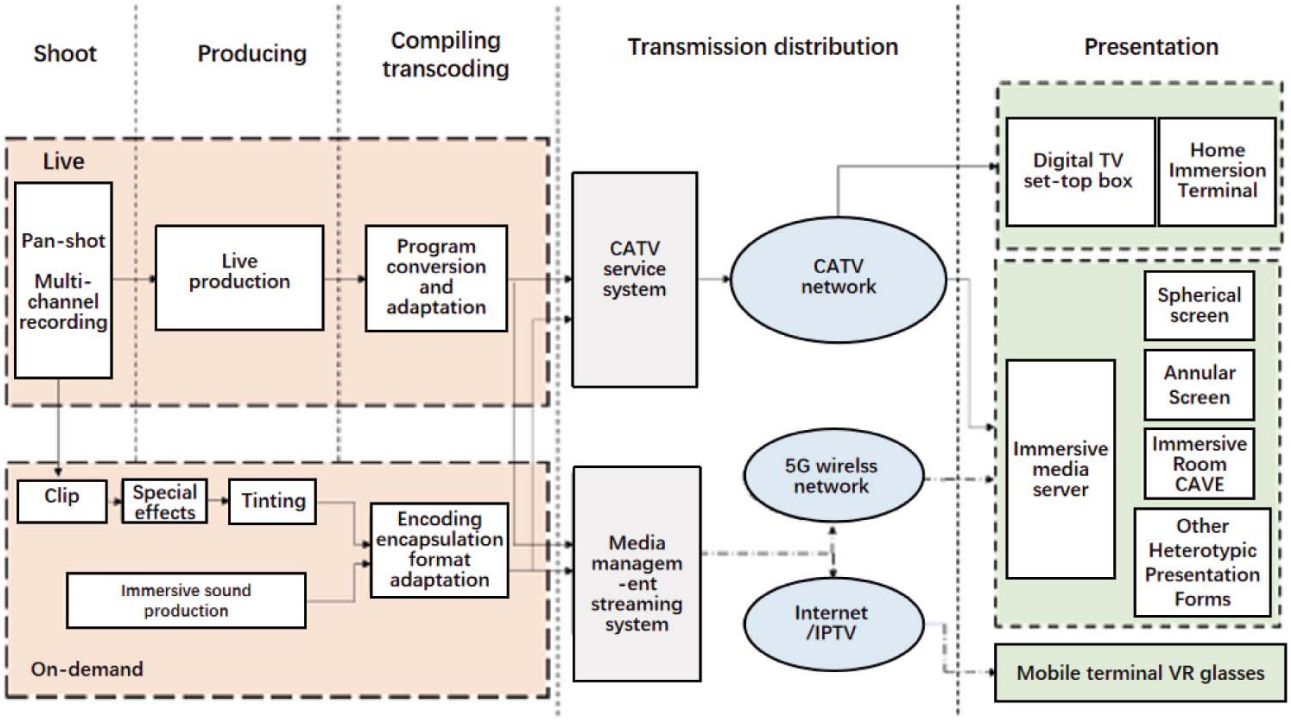

Figure 1 : *Overall Framework of Immersive Video End-to-end System*

For the live broadcast immersive video service, panoramic camera is used to capture and shoot on location, and real time seaming is performed to synthesize the panoramic image. At the same time, multi-channel audio recording is completed, and then the video and audio signals are synchronously encoded, compressed, and packaged for adaptive network transmission, and high bit rate panoramic video and audio stream signals are transmitted to the media server at the presentation end through cable TV network, 5G wireless network, and the Internet. Finally, it is rendered on terminal display device after audio and video decoding and rendering.

For on-demand immersive video service, post production links such as editing, special effect, and color grading are required for stitched panorama shot on site or CG produced pictures. The sound need to be mixed to a 3D sound format, and then the produced video and audio are encoded, packaged and output for subsequent playback or on-demand use. The transmission, distribution and presentation links are similar to the live broadcast process.

5. APPLICATION SCENARIOS

Immersive video is widely used in sports events, science and technology venues, exhibition venues, amusement venues, commercial venues, home terminals, education and training, and virtual production fields due to its unique visual presentation.

Scenarios	Applications
Live Sports Events / Live Major Events	The content can be presented on a spherical screen terminal by employing panorama camera technology for broadcast television content acquisition and recording, video content creation, video content splicing, coding and decoding, distribution, and transmission. Viewers can experience interaction with the content scene.
Science Museum	The application is a spherical screen theater, and projection-based display technology is used to achieve it. Immersive video typically includes nature scenes such as the sky, ocean, and forest, along with 3D sound and other sensory effects to create an immersive atmosphere.
Exhibition Venue	The majority of the applications consist of L-shaped folding screens, tri-folding screens, immersion room CAVE spaces, and spherical screens. The display technology is based on projection and has been widely used in exhibitions for the Communist Party of China.
Amusement Parks	By deploying flying theater, spherical screen theater, and other equipment configurations, the application achieves entertainment and science teaching purposes. The display system is based on projection or LED and other self-display screens.
Commercial Venues	Typically, the applications take the form of a unique dome structure combined with digital 3D projection technology to create a super stunning immersive experience space or interactive projection art installation. It has been widely used in new product launches, business meetings, promotional activities, shows, parties, concerts, and other commercial activities.
Education and Training	The application method is generally a spherical virtual simulation system in the form of an arc screen or a tri-fold screen. The system is based on multi-channel projection technology and three-dimensional synchronous imaging design and is suited for virtual simulation teaching training, and visual simulation exercises.
Home Terminal	Application form can be a small spherical screen of 1.5-3 meters in diameter, with a single projection or multiple projectors stitching to presente of the image and surround sound system to produce a sense of sound envelopment. Combined with motion effect seat equipment, blowing wind, water mist, and different smells and vibrations, it provides the audience with an immersive audio-visual and physical experience.
Virtual Production	The shooting background is displayed in real-time on a projection bowl screen or LED tri-fold screen, providing an immersive space where actors perform in front of a giant screen with a potent visual effect and immersion. It can be utilized in virtual studios, films, and television programs. It facilitates production and provides the audience with the effect of naked-eye 3D.

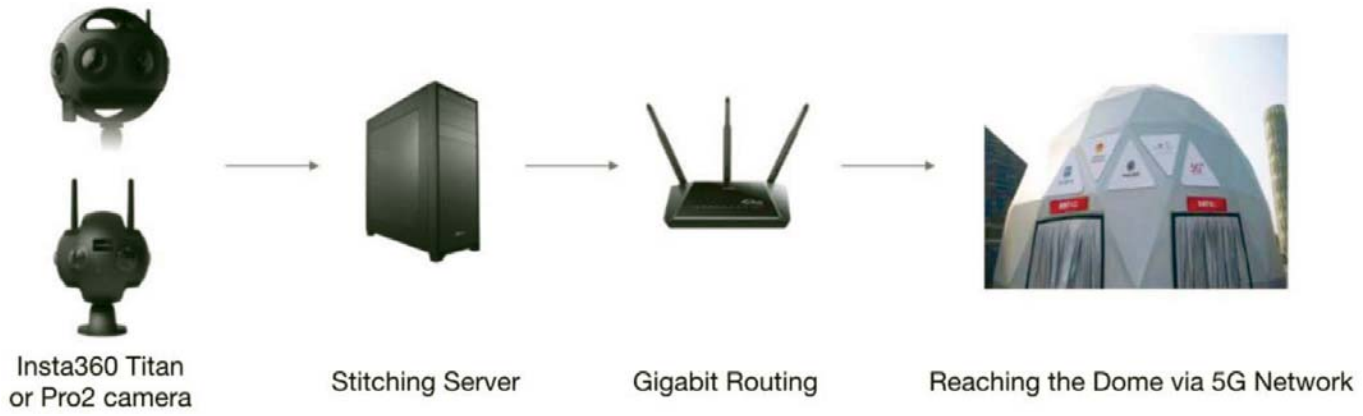

Figure 2 *: Spherical live system diagram for the 70th National Day*

6. TYPICAL CASES

6.1 MAJOR EVENT APPLICATIONS

During the parade for the 70th anniversary of the founding of the People's Republic of China, Xinhua News Agency built a VR live broadcast matrix, relying on VR + 5G + 8K. 12 cameras are used on site to instantly transmit this unprecedented feast in VR, providing the director to switch perspectives and the freedom to select different camera positions in order to create an immersive sense of realism for the tens of millions of online viewers.

6.2 VIRTUAL PRODUCTION APPLICATION

Extended reality (XR) technology is the frontier of the application of immersive video for virtual production. XR technology synchronizes the shooting background on a projection bowl or LED tri-fold screen, so what you see is what you get. A media server with integrated rendering capabilities, a pan-tilt camera for filming, a bowl projection or LED tri-fold screen for presentation, and a switcher constitute the virtual filming system.

2022 Dragon TV's "Bright Moonlight Oriental Moonlight Camping Club" breaks the tradition based on the previous Mid-Autumn Festival brand "Moonlight Oriental", innovatively applies the hecoos xR virtual shooting technology, and conducts the reunion core of "Water Melody Song Head" with a new interpretation. In the program "Hope for a Long Life", the actors used the form of twin dance to present the brotherhood of Su Shi and Su Zhe in the realm of national style and fantasy expanded by xR technology, bringing the audience the best wishes of "a thousand miles together".

7. PRODUCTS

Since 2020, the Radio, Film & TV Design and Research Institute (DRFT) has taken the lead in undertaking the task, assigned by NRTA, of compiling the Immersive Video White Paper and Standard System. DRFT built an immersive video laboratory to continuously carry out technical research, system testing, standard formulation and application demonstration of immersive video. With an open gesture,

Figure 3 *: Immersive LED screen for virtual shooting scenes*

Figure 4 *: Virtual production site effect*

DRFT has cooperated with around one hundred partners in production, academic, research and application fields to advance the industrial promotion of immersive video. A batch of good technologies and products with independent intellectual property rights have been hatched, reaching international leading level in panoramic shooting, video playback control, LED screen presentation, and 3D audio.

China has continuously innovated and created the best immersive video shooting tools, using self-developed software and hardware imaging technology. Its cinematic 360° camera product has been successfully used for immersive video shooting that requires high image quality. As one of the world's leading LED manufacturing country, China has successfully created classic immersive projects such as "Riyadh Season" in Saudi Arabia, and assisted in the virtual videography of famous films and TV series such as "The Mandalorian" and "Westworld". The sound-transmitting LED spherical screen, develops by China, has been successfully applied in planetariums in Nagoya and Yokohama, Japan. The system has solved the problems of sound focusing in spherical presentation space and limited speaker's installation.

China's enterprises continue to carry out technology research, development and innovation, and have developed 3D audio recorders and supporting softwares, content creation tools and material libraries, 3D audio decoders, processors, etc. These products have formed a closed loop from 3D audio collection, production to playback, and have been applied in the fields of film, TV, music, VR, Metaverse, automotive and consumer electronics.

8. FUTURE

As an important part of the high-tech video format, immersive video has enabled a series of new technologies, new products, new applications and new consumption scenarios, and will continue to contribute to the digital development of emerging fields such as tourism, museums and art exhibitions, cultural entertainment. And it will be gradually applied to people's daily consumption such as catering, shopping, and entertainment.

In the future, immersive video technology will be used to build a virtual world that complements the real world, creating a Metaverse entrance that integrates virtual and reality, and real-time interaction, boosting the further development of the Metaverse industry.

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Ouyang Yue participated in writing the White Paper on 5G High tech Video-Immersive Video Technology and the 5G High tech Video-Immersive Video Standard System published by the State Administration of Radio, Film and Television. Hosted or participated in many research projects by ministries and commissions such as the Ministry of Science and Technology, the Propaganda Department of the Central Committee, National Radio and Television Administration, and the Beijing Bureau. Publish 2 monographs and translations. Published over ten papers in domestic core journals such as "Modern Film Technology" and "Modern Television Technology". ■

AN OVERVIEW OF TEXT-TO-SPEECH SYSTEMS AND MEDIA APPLICATIONS

ABSTRACT
Producing synthetic voice, similar to human-like sound, is an emerging novelty of modern interactive media systems. Text-To-Speech (TTS) systems try to generate synthetic and authentic voices via text input. Besides, well known and familiar dubbing, announcing and narrating voices, as valuable possessions of any media organization, can be kept forever by utilising TTS and Voice Conversion (VC) algorithms . The emergence of deep learning approaches has made such TTS systems more accurate and accessible. To understand TTS systems better, this paper investigates the key components of such systems including text analysis, acoustic modelling and vocoding. The paper then provides details of important state-of-the-art TTS systems based on deep learning. Finally, a comparison is made between recently released systems in term of backbone architecture, type of input and conversion, vocoder used and subjective assessment (MOS). Accordingly, Tacotron 2, Transformer TTS, WaveNet and FastSpeech 1 are among the most successful TTS systems ever released. In the discussion section, some suggestions are made to develop a TTS system with regard to the intended application.

1. INTRODUCTION

Text-to-speech (TTS) is an essential component of many speech-enabled applications such as navigation systems, and accessibility for the visually impaired [1]. Typical modern text-to-speech systems are complex to design [2]. These systems usually need a text frontend to extract linguistic features, a model to predict acoustic features and a signal-processing-based vocoder to reconstruct the final waveform [2] as shown on ***Figure 1***. Each of these blocks require expert design and needs to train independently [2]. Neural network based TTS has achieved higher quality compared to conventional concatenative and statistical parametric approaches [3]. Concatenative synthesis mostly relies on concatenation of separated pieces of speech stored in the database [4]. Concatenative synthesis can generate high intelligibility speech close to original voice but it requires huge amount of data to match all possible combination of speech units, but on the other hand, such systems generate voices with lower naturalness quality [4] due to the less flexibility of concatenation of emotional and prosody features. To address such drawbacks of concatenative systems, statistical parametric synthesis speech (SPSS) is proposed. In fact, instead of directly producing an output waveform, acoustic features are firstly extracted, and then final waveform is reconstructed through such predicted parameters [4]. The advantages of SPSS are the output naturalness together with the flexibility to modify the parameters and therefore, creae audio with different prosody. However, the generated speech still suffers from low intelligibility and robotic-like artifacts [4]. Some early neural network modeling follow the same architecture as SPSS but replacing each block with its corresponding neural network like Deep Voice 1/2 [1, 5]. Later, one type of end-to-end (E2E) models like Tacotron 1/2 [2, 6], Deep Voice 3 [7], FastSpeech 1/2 [3, 8], which take character/phoneme sequences directly as input and produce Mel-spectrograms as acoustic features and finally utilise well-known vocoders to generate final waveform. Other types are fully E2E models developed to directly generate waveform from input character/phoneme sequences like FastSpeech 2s [8], ClariNet [9] and EATS [10].

2. TTS AND MEDIA

TTS can be also used in different media applications and can help develop media products cheaper, faster and more easily. Automatic news generation by the voice of a special announcer at regular times obviates the need for human voice costs. Moreover, a high-quality TTS can play a narrator's role in filmmaking and eases the reproduction of documentaries and middle programme clips. China Central Television [11], Japan Broadcasting Corporation (NHK) [12] and British Broadcasting Corporation (BBC) R&D [13] have recently investigated the TTS following an AI anchor (announcer).

3. KEY COMPONENTS OF A TEXT-TO-SPEECH SYSTEM

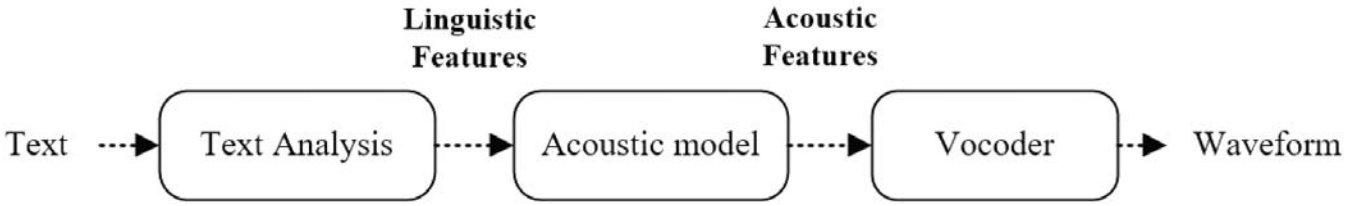

***Figure 1**: General Structure of TTS systems [4]*

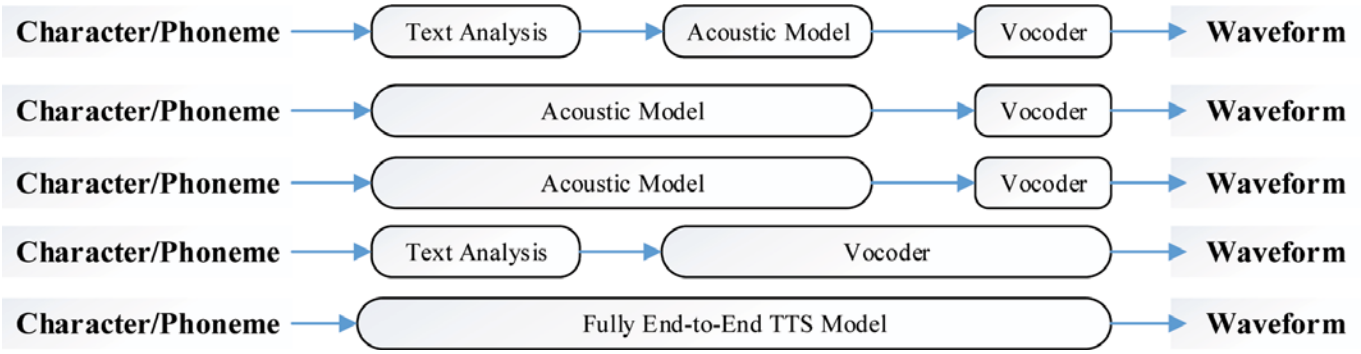

***Figure 2**: Different types of TTS model [4]*

TEXT ANALYSIS

Text analysis, also called frontend in TTS systems, transforms input text into linguistic features containing rich information about pronunciation and prosody [4]. Char2Wav and DeepVoice1/2 incorporate the character-to-linguistic feature conversion purely based on neural networks [4]. The prosody information, such as rhythm, stress, and intonation of speech corresponds to the variations in syllable duration, loudness and pitch [4]. A manually collected grapheme-to-phoneme lexicon is usually leveraged for G2P conversion.

ACOUSTIC MODELS

Acoustic features are generated from linguistic features or directly from phonemes and characters. Some important acoustic features are Mel-Cepstral Coefficients (MCC), Mel-generalised coefficients (MGC) [355], band aperiodicity (BAP), fundamental frequency (F0), Voiced/Unvoiced (V/UV), Bark-Frequency Cepstral Coefficients (BFCC), and the most widely used Mel-spectrograms. In contrast to traditional acoustic models, neural based TTS systems mostly take character or phoneme sequence as input and generate high-level Mel-spectrograms as output [4]. An important advantage of neural end-to-end acoustic models over conventional ones is how alignment is done. In fact, conventional acoustic models require alignment between linguistic and acoustic features, while sequence-to-sequence based neural models implicitly learn the alignment through attention, or predict the duration jointly [4].

VOCODER

Generally speaking, vocoders are classified into traditional SPSS and neural-based ones. STRAIGHT [14] and WORLD [15] are popular SPSS. Traditional vocoders generally take acoustic features as input while neural-based vocoders can take both acoustic and linguistic features. For example, WaveNet [16], WaveRNN [17] and char2wave take linguistic features and LPCNet [18], WaveGlow [19]and MelGAN [20] take acoustic features.

4. WHY END-TO-END TTS SYSTEMS?

An end-to-end TTS means to train the model merely by <text, audio> pairs. Such systems make the entire structure easier by removing the need to design each block independently. Another advantage of such systems is the flexibility to condition different types of input. For example, you can replace <text, audio> with <specific feature, audio> such as <MFCC, audio>, <Mel-spectrogram, audio> etc. Moreover, such systems are more robust compared with multi-stage ones. Therefore, these advantages imply that an end-to-end system could allow us to utilise more of huge real-world data [2].

It is worth noting the slight difference between an integrated end-to-end and vanilla end-to-end; the vanilla end-to-end structure is a compound of separated blocks trained independently and connected together to form the end-to-end system, like Deep Voice [1], while in integrated synthesisers, there is just one structure trained from scratch with random initialisation like Tacotron [2].

5. CHALLENGES TO END-TO-END TTS SYSTEM

In TTS systems, a given text input can lead to different pronunciation or speaking style output. This makes end-to-end TTS more difficult than other simple end-to-end tasks. Moreover, unlike automatic speech recognition (ASR) and Neural Machine Translation (NMT), TTS outputs are continuous and usually have much longer sequences. Each of these properties can cause errors which accumulate quickly [2].

Figure 2 shows different types of TTS system. Type 1 is based on traditional structure including text analysis, acoustic model and vocoder (SPSS). Type 2 and type 4 combines text analysis and acoustic model and directly predicts general acoustic features or Mel-Spectrogram respectively using input characters. Tacotron 2, DeepVoice 3 and FastSpeech 1/2 are such examples. Type 3 TTS combines acoustic models and final vocoder, which directly transforms linguistic features into waveform (WaveNet). Finally, fully E2E models combine all three blocks into one and directly converts characters into waveform (Wave-Tacotron, Char2Wav, ClariNet).

6. DETAIL OF SOME IMPORTANT STATE-OF-THE-ART TTS

3.1 WAVENET

Inspired by generative autoregressive models in image [21, WaveNet {Oord, 2016 #78] addresses the same issue for generating wideband raw audio waveforms with at least 16,000 samples per second. WaveNet adopts dilated causal convolutions to deal with long-range temporal dependencies [16]. This architecture, when conditioned on a specific speaker, could apply to applications such as voice conversion, text-to-speech etc. The main ingredient of WaveNet is causal convolution [16]. In dilated convolutions, a fixed-sized filter covers larger area by skipping input values by certain steps. Dilated convolution allows the network to sweep more time-steps and therefore, modelling more temporal resolution. A stack of dilated casual convolutional layers is illustrated in the ***Figure 3***.

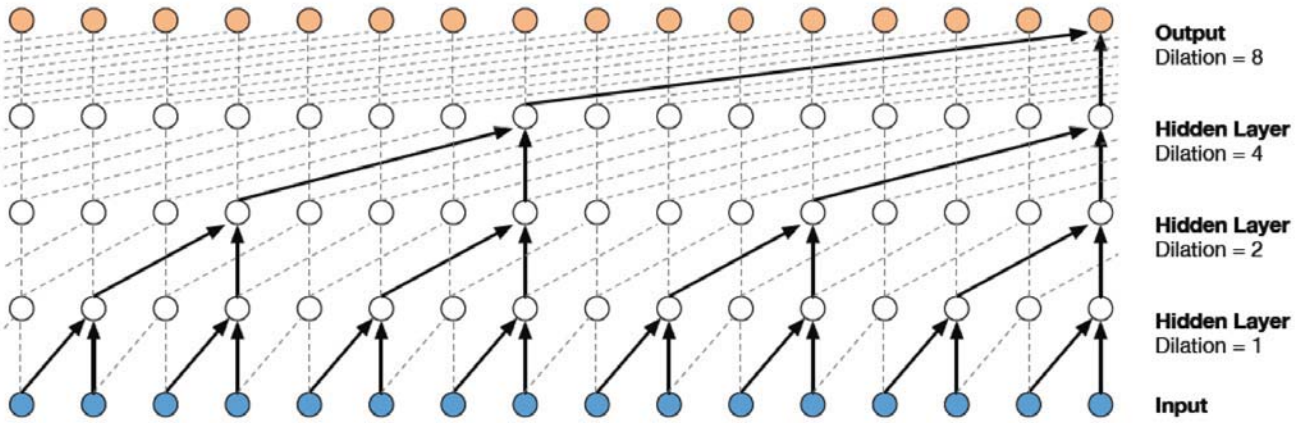

***Figure 3**: structure of dilated convolution layer [16]*

Table 1: subjective results of WaveNet [16]

Speech samples	Subjective 5-scale MOS in naturalness	
	North American English	Mandarin Chinese
LSTM-RNN parametric	3.67 ± 0.098	3.79 ± 0.084
HMM-driven concatenative	3.86 ± 0.137	3.47 ± 0.108
WaveNet (L+F)	$\mathbf{4.21} \pm 0.081$	$\mathbf{4.08} \pm 0.085$
Natural (8-bit μ-law)	4.46 ± 0.067	4.25 ± 0.082
Natural (16-bit linear PCM)	4.55 ± 0.075	4.21 ± 0.071

One can condition the WaveNet on global and local parameters. The global conditioning occurs as a latent representation embedded. Local conditioning happens when the input time series in typically lower than output, thus, the first step is to up-sample the input (using transposed convolution network) to map it to the same resolution as the output and feed it fed into the process. However, the inputs to WaveNet such as linguistic features, predicted log fundamental frequency (F0), and phoneme durations require elaborate text-analysis [6] and exact prior processing. Due to its flexibility to generate audio, it can tackle a wide range of speech applications such as music, speech enhancement, voice conversion, source separation etc. [16].

3.2 DEEP VOICE 1

Deep voice is based on traditional text-to-speech pipelines and adopts the same structure but replaces each component with its corresponding neural network [1, 2]. According to Deep Voice, TTS systems consist of five major building blocks [1] :

- *The grapheme-to-phoneme model*
  Grapheme-to-phoneme (G2P) conversion is the process of generating pronunciation for words based on their written form. It has a highly essential role for natural language processing, text-to-speech synthesis and automatic speech recognition systems [22]. Deep Voice G2P model is based on an encoder-decoder architecture [1]. ***Figure 4*** illustrates the bi-directional LSTM[23].

- *The segmentation model*
  Given an audio file and phoneme-by-phoneme transcription of the audio, the segmentation module finds the start and time point of each phoneme. Adopting a state-of-the art speech recognition system could help to segment and label the given phoneme sequence and corresponding audio utterance [1]. This block adopts a CTC-based RNN.

- *The phoneme duration model*
  Predicting the temporal duration of each phoneme in an utterance. The model architecture used here is shared with fundamental frequency model and explained in the following part.

- *The fundamental frequency model*
  Having predicted voiced phonemes, this component predicts the fundamental frequency (f0) throughout its duration identified in the past section. Adopting a joint structure to predict phoneme duration and fundamental frequency, Deep Voice suggests an architecture comprising two fully connected layers with 256 units

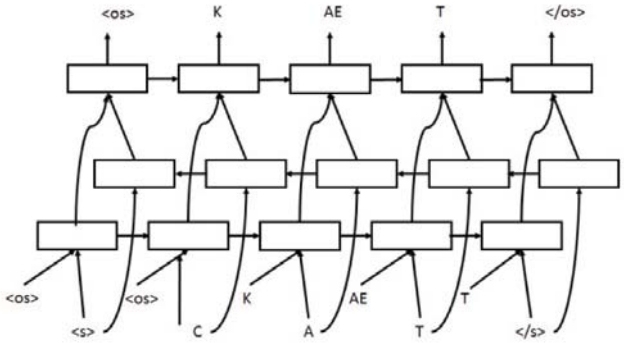

***Figure 4**: The bi-directional LSTM. "CAT" for forward amd "TAC" for backward [1]*

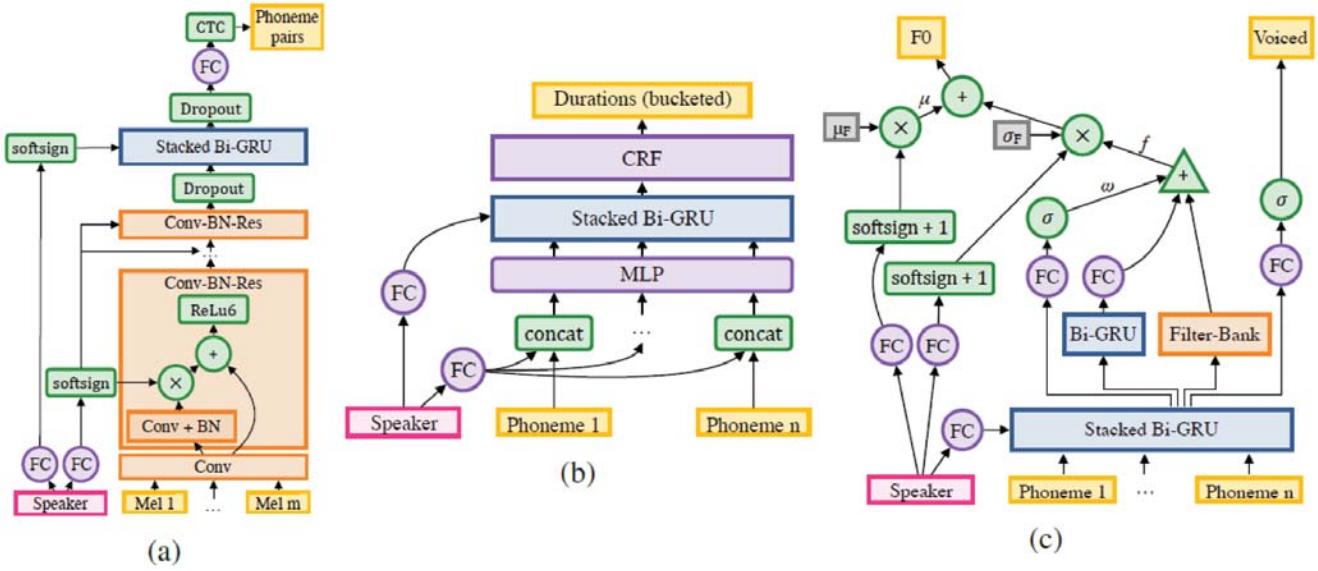

***Figure 5**: Speaker embedding at each block of Deep Voice 2: a) segmentation b) duration c) frequency model [5]*

each followed by two unidirectional recurrent layers with 128 GRU cells each and finally a fully connected output layer [1]. The final layer outputs three estimations for every input phoneme: the phoneme duration, the probability that the phoneme is voiced, and F0 sampled uniformly over the predicted duration [1].

- *The audio synthesis model*
  Combining the outputs of grapheme-to-phoneme, duration, and fundamental frequency prediction models, this module synthesises the output raw waveform. Deep Voice utilises WaveNet [16] as its backbone of audio synthesis.

In fact, Deep Voice has upgraded each block with the corresponding neural network based models. This model has not meaningfully progressed past the state-of-the-art systems in this regard. It concludes that the main barrier to progress towards natural TTS lies with duration and fundamental frequency prediction [1].

3.3 DEEP VOICE 2

This model keeps the general structure of the Deep Voice 1. Major differences with Deep Voice 1 are the separation of the phoneme duration and frequency models. The phoneme durations are predicted first and are then used as inputs to the frequency model. All models are trained separately. Each block is also augmented with low-dimensional speaker embedding. Using speaker-embedding technique in each block turns Deep Voice 2 into a multi-speaker TTS. Deep Voice 2 is a high quality text-to-speech systems and conclusively shows that neural speech synthesis models can learn effectively from small amounts of data spread among hundreds of different speakers [5].

3.4 DEEP VOICE 3

Deep voice 3 is fully convolutional character-to-spectrogram architecture TTS. It generates monotonic attention behaviour, avoiding error modes commonly affecting sequence-to-sequence models [7].

3.5 CHAR2WAV

Char2wave divides modelling text-to-speech models into two parts: a reader (frontend) and a neural vocoder (backend). The reader is an encoder-decoder architecture with attention that takes as input text or phonemes and transforms it into linguistic features. The vocoder accepts linguistic (acoustic) features and produces the corresponding audio [24]. In this definition, WaveNet [16] is considered as a neural backend [16]. Char2wav adopts SampleRNN as hierarchical vocoder. Char2Wav integrates the frontend and backend and learn the entire model end-to-end and simultaneously [24]. The general structure of Char2Wav is illustrated in the ***Figure 6***. However, Char2Wav need to predict vocoder features firstly and, SampleRNN vocoder used here needs to be separately pre-trained whereas Tacotron directly predicts output raw waveform[2].

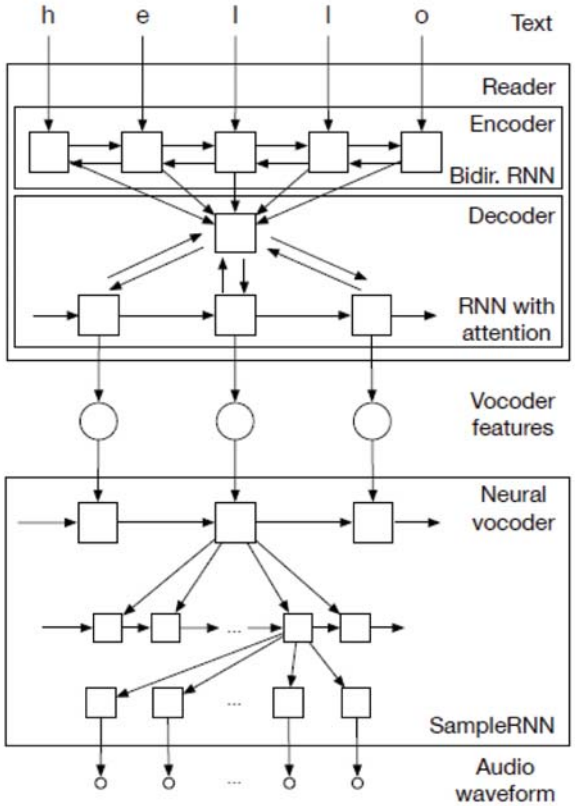

***Figure 6**: Char2Wav: An end-to-end speech synthesis model [24]*

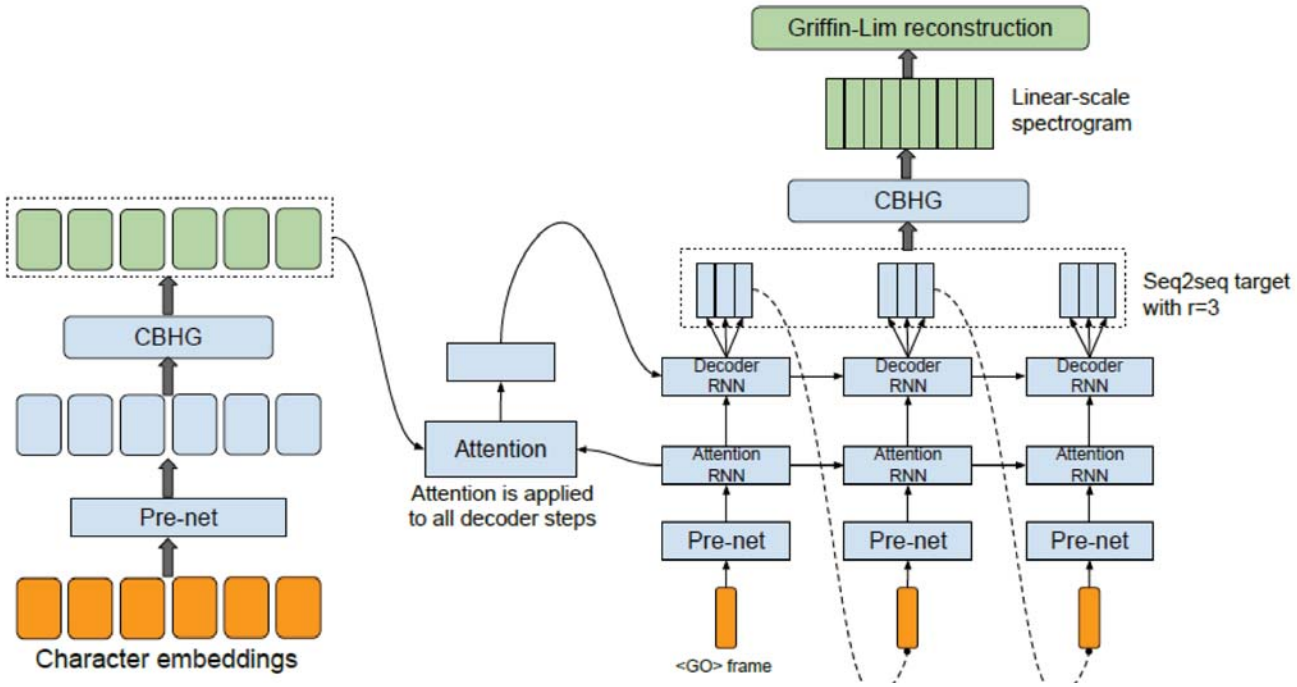

***Figure 7**: Tacotron architecture [2]*

3.6 TACOTRON

Tacotron is an end-to-end generative text-to-speech model that directly synthesises speech from characters [2]. Tacotron is a sequence-to-sequence architecture producing a magnitude spectrogram from a sequence of characters which replaces traditional linguistic and acoustic features pipeline with a single neural network [6]. Tacotron consists of three blocks: an encoder, an attention-based decoder and a post-processing net. Tacotron takes characters as input and produces spectrogram frames, which are then converted to waveforms using Griffin-Lim. CBHG (1-D Convlution bank + Highway network + Bidirectional GRU) module of encoder reduces overfitting [2]. ***Figure 7*** illustrates the structure. **Table 2** shows the Mean Score Opinion (MOS) of Tacotron.

Table 2: MOS evaluation of Tacotron

Tacotron	3.82±0.085
Parametric	3.69±0.109
Concatenative	4.09±0.119

3.7 TACOTRON 2

Unlike Tacotron, which uses Griffin-Lim algorithm to produce final audio waveform, Tacotron 2 utilises WaveNet [16] as vocoder to compensate for the typical artifacts made by Griffin-Lim. As shown in figure 5, Tacotron 2 consists of two general blocks: (1) a recurrent sequence-to-sequence feature prediction network with attention, which predicts frames of mel-spectrograms and (2) a WaveNet vocoder to produce final audio waveform [6]. Tacotron 2 significantly outperforms all other TTS systems, and results in an MOS comparable to that of the ground truth audio [6].

3.8 TRANSFORMER TTS NETWORK

Transformer TTS network [25] is based on Tacotron 2 [6] and Transformer network [26]. Inspired by the success of Transformer networks in Neural Machine Translation (NMT), this approach suggests the use of Transformer combined with Tacotron 2 to predict mel-spectrograms and leveraging WaveNet to reconstruct final waveform. Since WaveNet is used to reconstruct the final raw waveform, this model is autoregressive and still suffers from slow inference [25]. According to the results reported in the paper, this approach outperforms Tacotron 2 with a gap of 0.048 and is very close to human quality (4.39 vs 4.44 MOS) [25]. The structure of Transformer TTS is illustrated in ***Figure 8***.

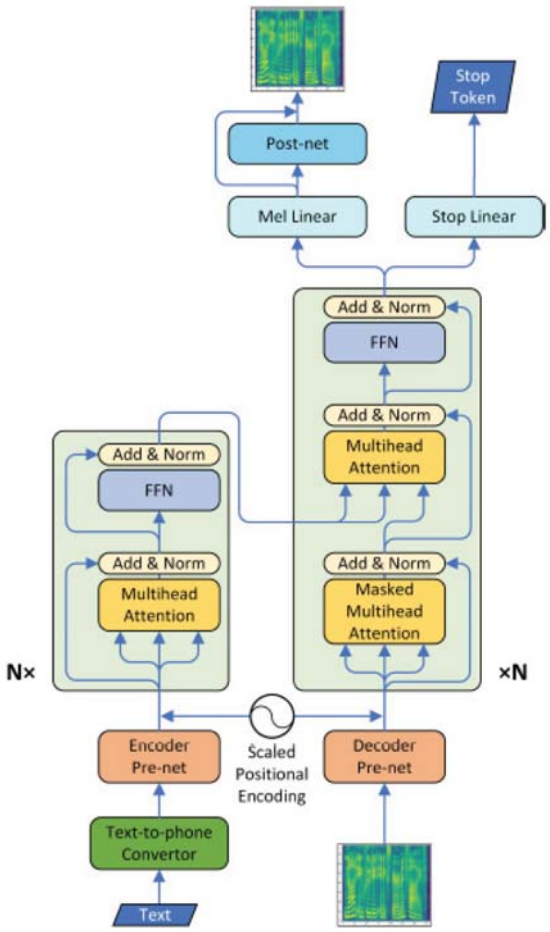

***Figure 8**: Architecture of Transformer-TTS [25]*

7. DISCUSSION & CONCLUSION

Table 3 collates the state-of-the-art TTS systems. Accordingly, Tacotron 2, Transformer TTS, WaveNet, FastSpeech 1 and ClariNet are among the most successful TTS systems ever released. In the discussion section, some suggestions are made to develop a TTS system with regard to the intended application. Some TTS models are end-to-end and convert the input characters to high-level acoustic features such Mel-spectrogram and adopts a neural vocoder such as WaveNet to generate output waveform. Others are fully end-to-end; converting input character/phoneme sequence directly to output waveform. Char2Wav, ClariNet and FastSpeech 2s are such examples. Therefore, enough notice is to be taken to differentiate between E2E and fully E2E. It is worth noting that, typically, the first versions of TTS systems are trained on single-speaker datasets such as LJSpeech, Internal US English and later versions are designed and trained on multi-speaker datasets such as VCTK. Embedding speaker vector to different blocks of a TTS can customizse it to the specific speaker.

Table 3: Comparison of State-Of-The-Art TTS models

NAME	TYPE	BACKBONE ARCHITECTURE	INPUT	OUTPUT	VOCODER	DATASET (HOUR) (S-M*)	REPORTED MOS
WaveNet [16]	Autoregressive	PixelCNN	Linguistic Features	Wav	-	North American English (24.6) (S)	4.21±0.081
						Mandarin Chinese (34.8) (S)	4.08±0.085
Deep Voice 1 [1]	Autoregressive	CNN-based	Character / phoneme	Linguistic Features	WaveNet	Internal English Speech (20) (S) (Synthesized Duration and F0)	2.00±0.23
						Subset of the Blizzard 2013 (20.5)	2.67±0.37
Deep Voice 2[5]	Autoregressive	CNN-based	Character / phoneme	Linguistic Features	WaveNet	VCTK (44) (M)	3.53±0.12
						Audiobooks (238) (M)	2.97±0.17
Deep Voice 3 [7]	autoregressive	Fully CNN-based + attention + Seq2Seq	Character / phoneme	Acoustic Features	Griffin-Lim	VCTK (44) (M)	3.01 ±0.29
					WORLD		3.44±0.32
					WaveNet		-
CHAR2WAV [24]	Autoregressive	Seq2Seq RNN	Character / Phoneme	Wav	SampleRNN	-	-
Tacotron [2]	Autoregressive	RNN + Encoder-Decoder + Attention	Character / phoneme	Acoustic Features	Griffin-Lim	Internal North American English (24.6) (S)	3.82±0.085
Tacotron 2 [6]	Autoregressive	RNN + Encoder-Decoder + Attention	Character / phoneme	Acoustic Features	WaveNet	Internal North American English (24.6) (S)	4.5±0.06
Transformer TTS [25]	Autoregressive	Transformer-based	Character / phoneme	Acoustic Features	WaveNet	Internal US English (25) (S)	4.39
ClariNet [9]	Autoregressive	CNN-based	Character / phoneme	Wav	WaveNet	Internal English speech dataset (20)	4:15 ± 0:25
Fastspeech [3]	Non-autoregressive	Transformer-based	Character / phoneme	Acoustic Features	WaveGlow	LJSpeech (24) (S)	3.84±0.08
Fastspeech 2 [8]	Non-autoregressive	Transformer-based	Character / phoneme	Acoustic Features	Parallel WaveGAN	LJSpeech (24) (S)	3.83 ± 0.08
Fastspeech 2s [8]	Non-autoregressive	Transformer-based	Character / phoneme	Wav	Parallel WaveGAN	LJSpeech (24) (S)	3.71 ± 0.09

- **S stands for single speaker and M stand for multi-speaker.*
- *Single architecture to jointly predict phoneme duration and time-dependent fundamental frequency.*

REFERENCES:

1. Arık, S.Ö., et al. *Deep voice: Real-time neural text-to-speech.* in *International Conference on Machine Learning.* 2017. PMLR.
2. Wang, Y., et al., *Tacotron: Towards end-to-end speech synthesis.* arXiv preprint arXiv:1703.10135, 2017.
3. Ren, Y., et al., *Fastspeech: Fast, robust and controllable text to speech.* Advances in Neural Information Processing Systems, 2019. 32.
4. Tan, X., et al., *A survey on neural speech synthesis.* arXiv preprint arXiv:2106.15561, 2021.
5. Gibiansky, A., et al., *Deep voice 2: Multi-speaker neural text-to-speech.* Advances in neural information processing systems, 2017. 30.
6. Shen, J., et al. *Natural tts synthesis by conditioning wavenet on mel spectrogram predictions.* in *2018 IEEE international conference on acoustics, speech and signal processing (ICASSP)*. 2018. IEEE.
7. Ping, W., et al., *Deep voice 3: Scaling text-to-speech with convolutional sequence learning.* arXiv preprint arXiv:1710.07654, 2017.
8. Ren, Y., et al., *Fastspeech 2: Fast and high-quality end-to-end text to speech.* arXiv preprint arXiv:2006.04558, 2020.
9. Ping, W., K. Peng, and J. Chen, *Clarinet: Parallel wave generation in end-to-end text-to-speech.* arXiv preprint arXiv:1807.07281, 2018.
10. Donahue, J., et al., *End-to-end adversarial text-to-speech.* arXiv preprint arXiv:2006.03575, 2020.
11. China Television. Available from: https://www.mediabuzz.com.sg/companies-campaigns-april-2022/meet-chinese-central-television-s-ai-anchor-wang.
12. Available from: https://www.nhk.or.jp/strl/open2019/tenji/17_e.html.
13. Available from: https://www.bbc.co.uk/mediacentre/worldnews/2020/life-project.
14. Kawahara, H., *STRAIGHT, exploitation of the other aspect of VOCODER: Perceptually isomorphic decomposition of speech sounds.* Acoustical science and technology, 2006. 27(6): p. 349-353.
15. Morise, M., F. Yokomori, and K. Ozawa, *World: a vocoder-based high-quality speech synthesis system for real-time applications.* IEICE TRANSACTIONS on Information and Systems, 2016. 99(7): p. 1877-1884.
16. Oord, A.v.d., et al., *Wavenet: A generative model for raw audio.* arXiv preprint arXiv:1609.03499, 2016.
17. Kalchbrenner, N., et al. *Efficient neural audio synthesis. in International Conference on Machine Learning.* 2018. PMLR.
18. Valin, J.-M. and J. Skoglund. *LPCNet: Improving neural speech synthesis through linear prediction.* in *ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).* 2019. IEEE.
19. Prenger, R., R. Valle, and B. Catanzaro. *Waveglow: A flow-based generative network for speech synthesis.* in *ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).* 2019. IEEE.
20. Kumar, K., et al., *Melgan: Generative adversarial networks for conditional waveform synthesis.* arXiv preprint arXiv:1910.06711, 2019.
21. Oord, A.v.d., et al., *Conditional image generation with pixelcnn decoders.* arXiv preprint arXiv:1606.05328, 2016.
22. Yolchuyeva, S., G. Németh, and B. Gyires-Tóth, *Grapheme-to-phoneme conversion with convolutional neural networks.* Applied Sciences, 2019. 9(6): p. 1143.
23. Yao, K. and G. Zweig, *Sequence-to-sequence neural net models for grapheme-to-phoneme conversion.* arXiv preprint arXiv:1506.00196, 2015.
24. Sotelo, J., et al., *Char2wav: End-to-end speech synthesis.* 2017.
25. Li, N., et al. *Neural speech synthesis with transformer network.* in *Proceedings of the AAAI Conference on Artificial Intelligence.* 2019.
26. Vaswani, A., et al., *Attention is all you need.* Advances in neural information processing systems, 2017. 30.

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ABU HOLDS A CLOUD TECHNOLOGY SESSION AT BROADCAST ASIA 2023

8 JUNE 2023

During a session at the Broadcast Asia event in Singapore, representatives from top solutions providers and system integrators namely Elevate Broadcast, Harmonic Inc, Ideal Systems, and Skyline Communications shared their expertise and experiences. The 90-minute session, curated and organized by the Asia-Pacific Broadcasting Union (ABU), was titled 'Cloud-Based Workflows and Migration Challenges' and took place on Thursday, June 8.

The session covered a range of topics, including the benefits of Cloud technologies, opportunities in Cloud and hybrid video workflows, and implementing multiple solutions in the Cloud. Case studies were also discussed, showcasing how these workflows bring scalability, flexibility, and resiliency. Attendees were presented with recent examples of broadcasters and operators who have moved their video infrastructure to the Cloud.

It started with a presentation on Cloud Technologies, Expanding Technical & Creative Flexibility by Dennis Breckenridge, CEO of Elevate Broadcast. He gave an overview of Cloud technologies & broadcast ecosystem. Broadcasters should work on Cloud strategy with required building blocks and focus on tools which enables the underlying technology benefit. Also need to consider the impacts to daily activities & operations. The strategy should architect a signal flow which is effective and cost-efficient incorporating Cloud providers where appropriate.

Alexandre Paugam, Streaming Market Development Director - APAC and EMEA at Harmonic Inc had the next presentation about The Latest Opportunities in Cloud & Hybrid Video Workflows. He shared some insights about how cloud and hybrid video workflows bring scalability, flexibility and resiliency. The audience were shown some recent examples of broadcasters and operators that moved their video infrastructure to the cloud. And also got to learn more about personalization and the latest innovations on the topic.

Another interesting case study on Orchestration of a Multi-Vendor Environment in The Cloud was presented in two parts by Michiel Saelen, Regional office manager at Skyline Communications Singapore. The case study was developed together with Grass Valley and RTS on how multiple hybrid/ cloud-native solutions from different vendors are managed together to make cloud-based productions as easy as they were in the past using on-premises infrastructure. The first part was related to the underlying architecture, which is based on media services blueprints. The 2nd part discussed the entire lifecycle management of a production and how a CI/CD approach is used to automate things as much as possible: enter planning data, deploy/configure resources, present control surfaces, monitor the event and finally decommission resources again.

James Taylor, Head of Cloud at Ideal Systems Singapore, gave a technical intensive presentation on SCTE224, SSAI and the Cloud: A pathway to FAST. Free Add Supported TV has been vital for the M&E industry by offering opportunities that are more commercially viable than subscriber-based platforms. For FAST to be profitable it need to be efficient, and scalable to enable channels to be distributed to as wide an audience as possible. SCTE-224 is the key - a standard for describing how a stream enriched with SCTE 35 markers can be manipulated by downstream actors that allows for the creation of SSAI streams based on the FAST business model.

Lastly, Peh Beng Yeow, Lead of Technology Operations at MediaCorp Singapore gave a brief look on how it is migrating into the

cloud. He outlined four different technical areas that enabled transformation at MediaCorp such as IP infrastructure, 4K end-to-end video workflow, AI- based monitoring and Cloud & Virtualization. The cloud services deployed in the organization leverages major functions related to editing, archiving and playout.

Over 170 delegates from the Asia-Pacific region and beyond representing about a hundred organizations attended the session during Broadcast Asia mega-show. The session was informative and interactive, giving audience members the chance to pose technical questions to speakers and giving them the chance to learn the latest Cloud Technologies & workflows.

The ABU, a supporting organization of Broadcast Asia, also had a booth at the Exhibition, which was run from June 7-9 in Singapore. ■

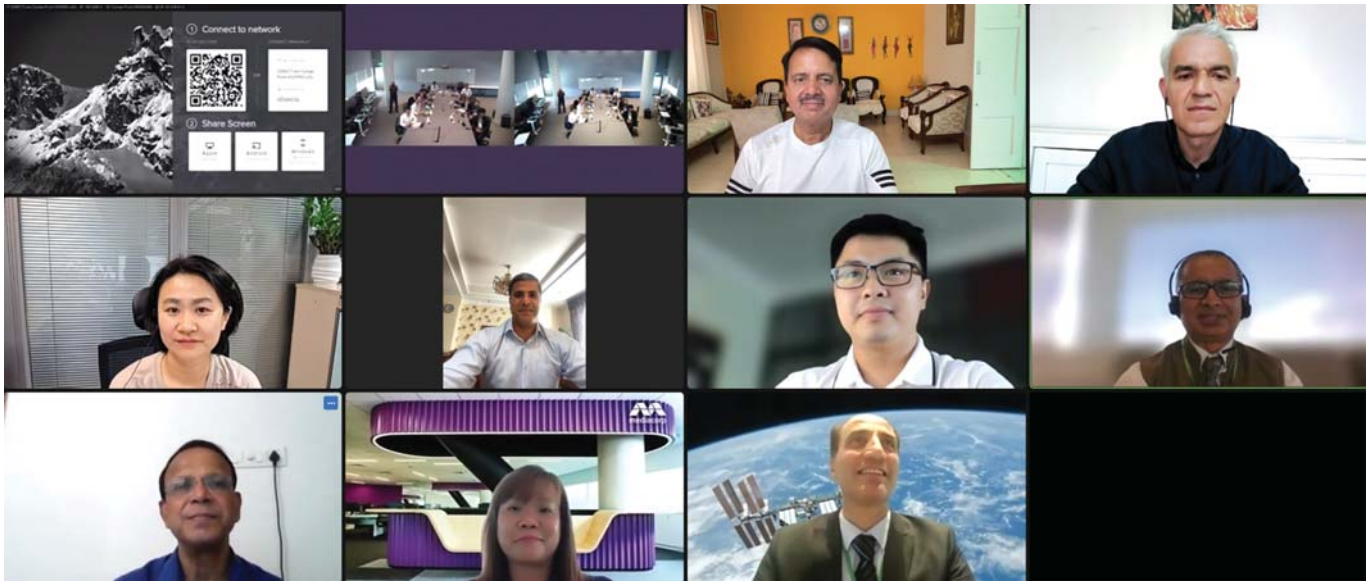
TECHNICAL BUREAU MID-YEAR MEETING

09 & 10 JUNE 2023 | MEDIACORP, SINGAPORE

ABU Technical Department organized the ABU Technical Bureau Mid-Year Meeting on June 9th and 10th in Mediacorp Campus, Singapore. The meeting was hosted by ABU's full member, Mediacorp Pte. Ltd., and was conducted in hybrid mode. Some members were able to make it to the meeting joined physically and others participated virtually via Zoom. The meeting was chaired by ABU Technical Committee Chairman, **Mr Hamid D Nayeri** of IRIB-Iran, and was joined by the Vice-Chairmen, **Mr Sunil** of DD-India, **Mr Masashi Kamei** of NHK Japan and **Mr Kazim Pektas** of TRT-Türkiye. It was attended in-person by members from NHK-Japan, NBT-Thailand, Phoenix-Hong Kong-China, RTM-Malaysia, VTV-Vietnam, Mediacorp-Singapore, and RTPRC-China. While other members from IRIB-Iran, PB-India, TRT-Türkiye, KBS-Korea, NTV-Nepal, and VOV-Vietnam joined remotely.

The Secretary-General, **Ahmed Nadeem**, in his opening remarks emphasised on the importance of collaboration and sustainability. He expressed to maintain the same level of engagement and relationship with the members as he transitioned from Director of Technology to the Secretary-General. The bureau welcomed **Dr Veysel Binbay** who was recently appointed as the new Director of ABU Technology.

The meeting began with the updates from all members on the current situation, measures taken during the pandemic, and organization-wide projects. This information sharing exercise proved beneficial to members, allowing them to learn from experiences by others and appreciate the situation of other members. The bureau was presented with the activity report from the Secretariat since the online TC2022 meeting last November. This included updates on different activities, one of which was the DBS2023. The symposium received an incredible amount of support from



participants, industry partners, and sponsors who were interested in the programme. The event was attended by close to 1000 participants representing 277 organisations from 48 countries. The majority of the report's other activities were online webinar sessions on various topics of technology implementation and applications.

The report also provided an update on other activities that were managed by the Technology department including International Cooperation and Partnership such as A23 Global Conference, Broadcast Asia 2023 & Technical Review Magazine Publications.

The Bureau also approved the ABU Young Engineers' Broadcasting Award Guidelines recently recommended by a task group to review the existing Engineering Awards and its guidelines. The members also heard outcomes and suggestions from the new task group to review the study projects under the four Study Topic Areas, including their terms of reference. The secretariat is now in the process of putting together the revised Terms of Reference and update some Topic Areas at the annual meeting in October after completion of its study cycle.

Among other things, the bureau conducted a thorough review of the tasks and action items assigned since the last meeting. The bureau also reviewed the schedule for this year's annual Technical Bureau and Technical Committee meetings which will be held in Seoul South Korea in October.

The meeting was adjourned with the Chairman's final remarks, in which he wished everyone well and emphasised the importance of staying in touch during this difficult time. The Chairman thanked everyone for their attendance and contributions to the meeting.

Earlier, Mediacorp also provided a specially curated facility tour to the bureau members on 9th June. The tour was also joined by ABU the Secretary-General. They were taken through its world class facility equipped with classical and state of the art radio studio and tv production studios. The members also had the chance to observe the operation of Mediacorp hi-tech newsroom studio. ■

NEWSROOM COMPUTER SYSTEM INSTALLATION IN RUPAVAHINI TV, SRI LANKA

ABOUT SLRC

Sri Lanka Rupavahini Corporation (SLRC) was created by an Act of Parliament on 23rd January 1982, established on 14th February 1982 and commissioned transmission on 15th February 1982. SLRC aims to provide the best possible programmes to satisfy the needs of its viewers for informative, educational and family oriented entertainment.

The Sri Lanka Rupavahini Corporation, the National Television Network expanded its studio and transmission facilities in 1986 and rehabilitated most of the original equipment using digital technology in 1998 under three grant aid projects from the Government of Japan. its studio complex is situated in Colombo the commercial capital of Sri Lanka. The complex comprises of a Master Control Room, four Studios, two Dubbing Studios, Digital Post Production Unit, two Analogue Post Production Units, several editing suites including Non-Linear Editing and four Outside Broadcast vehicles.

THE PROJECT

Since the 1986 upgrade – SLRC has upgraded a number of systems and has been converting from an old tape based manual system to an IT based – digital, automated system.

Keeping in tune with the times – SLRC decided to go for a Newsroom Computer System. The person heading this project was **Mr Kapila Dasanayake**, Deputy Director Engineering, SLRC.

They came up with a tender. Many companies participated in the tender. After a rigorous and detailed selection process involving numerous departments with SLRC – they selected an SI to do the project for them – Whiteways Systems Pte Ltd of Singapore.

WHAT IS A NEWSROOM COMPUTER SYSTEM (NRCS)?

Creating news every day is a complex job – involving planners, schedulers, journalists, cameramen, Non-linear editors, news readers, news producers and a host of live studio staff in the studio control room. There is a news story – which is written by the journalist. There is a cameraman who shoots the video or photographs (if there is a video to be shot), editor who edits the video in time for it to be shown in the upcoming news bulletin. The news producer makes the run-down of the stories to be shown in the next bulletin. Once the run down is ready – the text stories are loaded onto the teleprompter, the related videos are loaded on the video server to be played out, and the related graphics are loaded onto the graphics system ready to be played out.

All these different systems are synced together and controlled by the Newsroom system. In this case – the newsroom chosen was Octopus Newsroom system. The automation and video server was Vector Box.

HOW DOES A NEWSROOM SYSTEM WORK?

A Newsroom system has many modules. Given below is a summary of the modules:

INCOMING FEEDS

The NRCS can ingest all your incoming source materials, such as news agency wires, RSS feeds, emails with feedback or tips from your audience, SMS messages or even faxes. Such feeds may also contain images, videos or audio files as Octopus 8 can display all media belonging to a feed in one view.

ASSIGNMENT DESK

The assignment desk helps organise and delegate tasks to one or multiple users, based on a modern planning calendar. The assignment desk delivers notifications, allows users to communicate with each other using the built in user-to-user messaging system and share files related to the task.

ADVANCED STORY SCRIPT FEATURES

Apart from the standard scripting features, such as calculation of the duration of spell checker, NRCS also offers additional advanced functionalities to ease the work of each team. Such features include the visual story history and version comparison, possibility to separate the script and the technical part or the instant preview of the CG objects from selected graphics systems.

AUTO ADJUSTED PERSONALISED SPEED SPEECH

The system samples each anchor's reading speed. It then calculates the on-air time accurately.

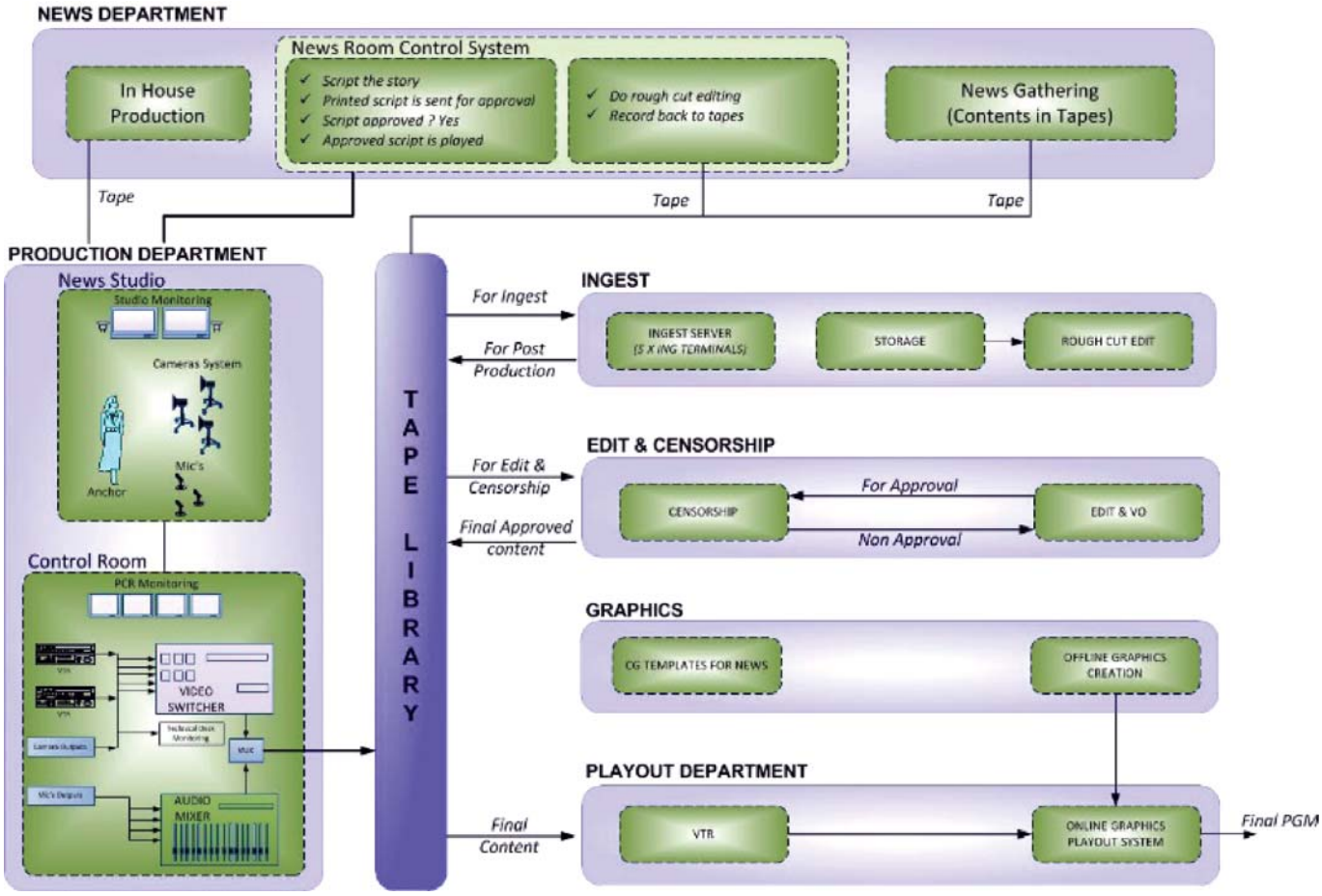


Figure 1 *: Newsroom system modules*

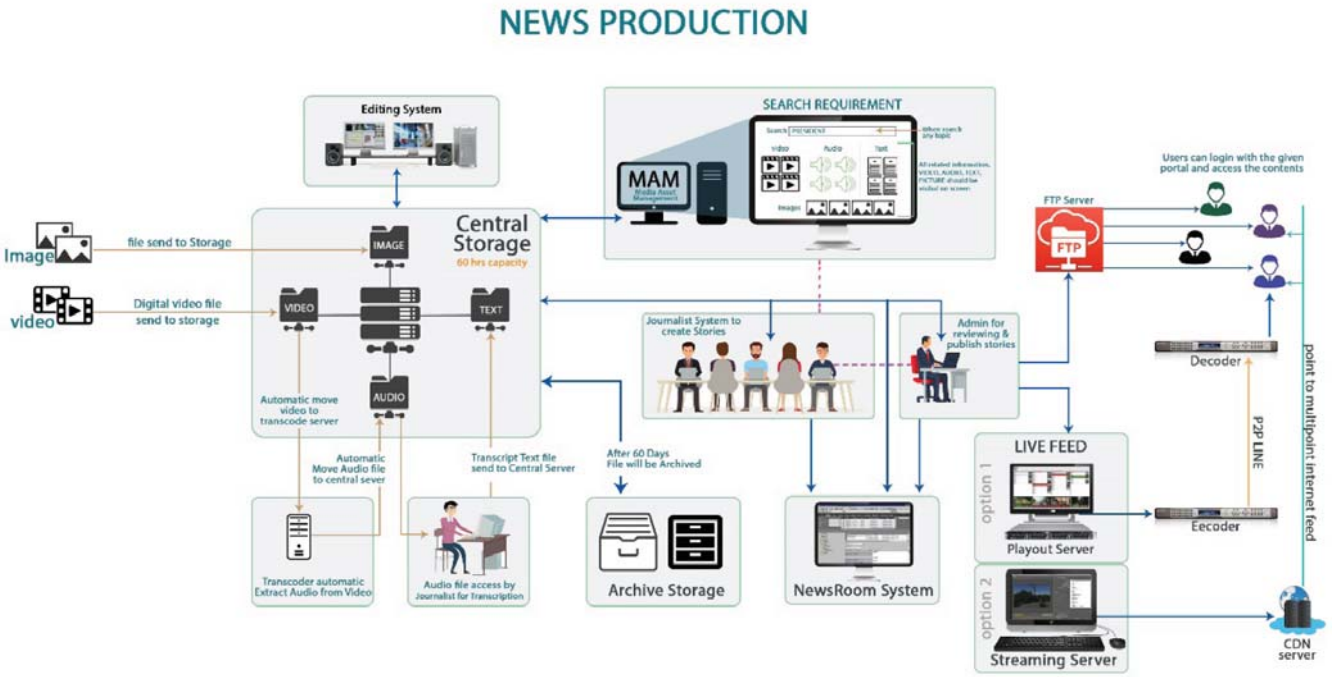


Figure 2 *: News production workflow*

RUNDOWNS

Rundowns can be created automatically based on a schedule plan and rundown templates; they can also be created manually. Multiple slugs or even entire rundowns can be copied/pasted to another show. In the rundown, all required timing information including planned duration, real duration, and countdown time. Customisable slug colours, status colours and forms are available to all users.

CMS CONNECTIVITY

With audiences increasingly using the internet for their news, media organisations are under immense pressure to publish stories online. NRCS directly interconnects with CMS systems such as Joomla, WordPress and CoreMedia, enabling scripts and articles to be uploaded dynamically to web portals. This new web component allows TV news editors to upload pages directly, saving considerable time and reducing pressure on the web team.

CONTACTS AND GUEST MANAGEMENT

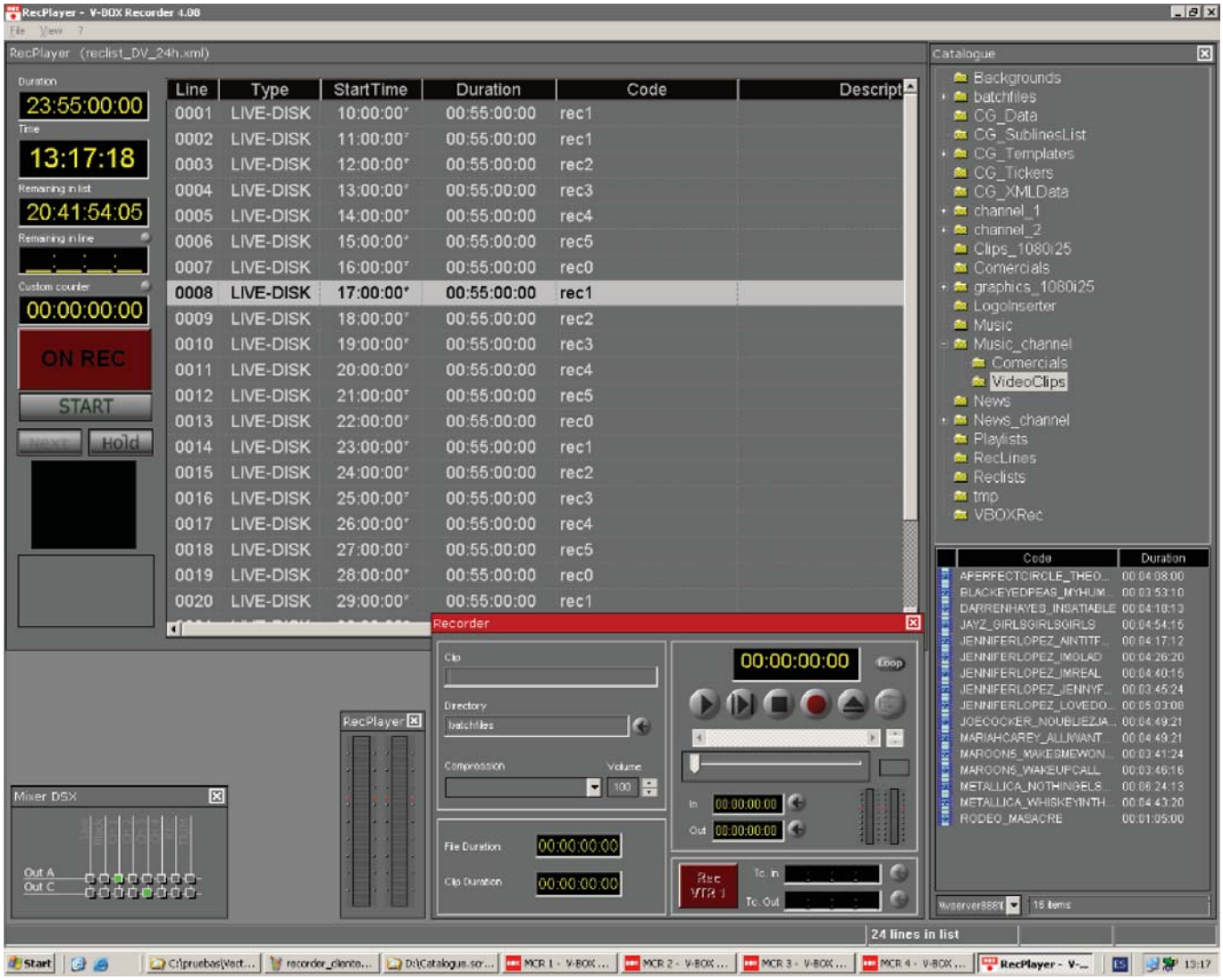
This is an effective contact management solution allowing you to store and manage your contact list in a secure, central location. You can specify the access rights to each individual contact. Contacts can be linked to stories or assignments and used in the inbuilt Guest Management System.

SOCIAL MEDIA INTEGRATION

The NRCS has modules which can easily upload stories and videos to social media platforms like YouTube, Facebook, Twitter and so on. This saves a lot of time and effort for the social media team. On one hand it allows users to search and browse content being posted in accounts such as YouTube and Twitter, follow particular hashtags or channels and have the streamlined view organized in the newsroom.

Apart from the NRCS – the other main components are the automation, video server and the graphics. The automation controls the video server. The tasks of the automation and video server are very important. They are:

- Ingest all the incoming videos into the video server storage.
- Clip information and media files are created, including metadata.
- Ingest sources can be previewed.
- Ingest in segment option is available.



Ingest can be of 2 types :

- **Scheduled ingest** (when we know that a feed will come at a particular date / time via satellite link, IP or some other way. This ingest can be fully automated – so it happens automatically.
- **Manual ingest** (when the camera man comes and ingests his video manually into the video server).

Scheduled ingest of videos can be a LIVE Event, VTR Source, Feed Capture. Automation can control respective devices. Automatic creation of metadata information.

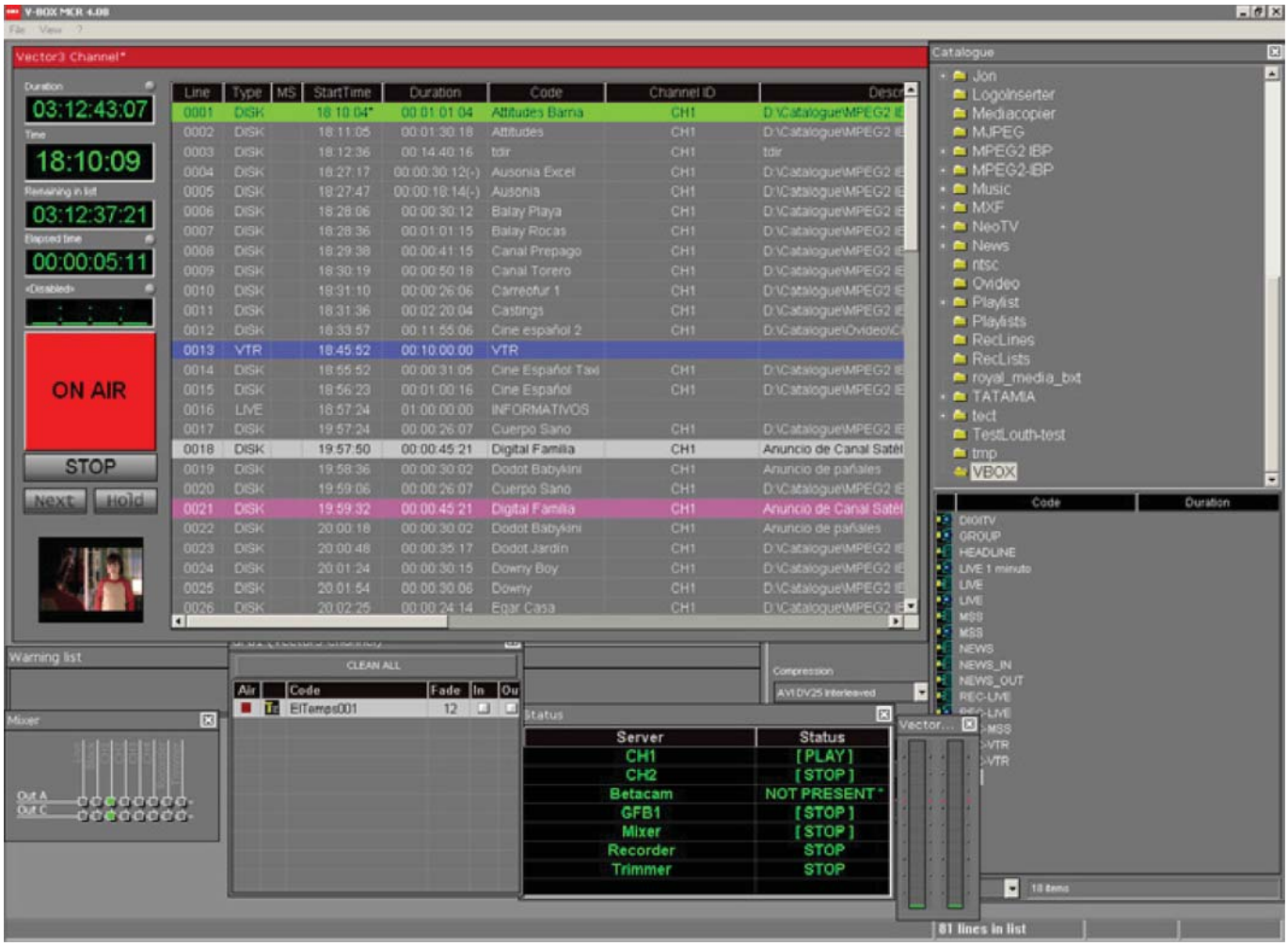
Manual ingest can be done at any time. The automation allows Record, Play, Stop options. You can Choose source and destination. You can also Capture incoming feeds from satellite or IP source.

PLAYOUT

The automation system has a number of useful features for Video Playout:

- User friendly Graphics User Interface.
- Catalogue window along with the playlist.
- Time calculation.
- On air, playlist and Device status indication.
- Thumbnail Preview of the clips.
- Supports all the standard protocols used in broadcast.
- Can control most of the renowned switcher, router etc.

- The automation Looks into Hot Folder and automatically executes all the commands.
- Able to transcode the clip automatically to the house format.
- Cataloguing the clip.
- Creates Metadata automatically.
- Compatible with many of the Archive systems.
- Supports file movement which has to be built into the workflow – so that clips don't have to manually moved from one folder to another.



STORY IS CREATED IN OCTOPUS

The story script is entered in the Octopus Newsroom System. With the content received through wires and local stories received by the reporter. CG content can also be entered on the newsroom system if the CG needs to be triggered automatically during the playout. The stories are at this point waiting for the relevant footage to be available for inclusion into the story for playout at the appropriate time.

Octopus has a very strong Assignment desk – which enables the producer to assign stories to journalists based on calendar, pre-planned events or incoming wire feeds. Once the journalist is assigned to a job, he will get to know once he logs into the system.

The other key component to run this system is the automation and playout system. Vectorbox – the Spanish playout and automation video server was chosen.

INGEST ON VECTOR BOX VIDEO SERVER

Video from the P2cards, backpack-based feeds and the satellite feeds are ingested into the ingest server. It will automatically be transferred to the central storage for editing and finishing. This ingest server can automatically ingest based on schedules and generates a unique ID for the ingested clips which ensures avoidance of clip ID duplication.

VIDEO EDITED ON ADOBE PREMIER NON-LINEAR SYSTEM

The video is retrieved from the central storage and edited using Adobe Non-Linear Editors (NLEs). After editing, it is saved back to the central storage along with a unique ID and a low-resolution file or thumbnail, generated by the Vector Box Automation Server. The reporter can then access the low-resolution files of the clips within the Octopus platform itself. They use the provided ID to attach the clips to their stories at the relevant points in the script using the Octopus Newsroom Software.

Workflow set for SLRC using the Octopus and Vector Box automation system

Once completed, the reporter commits the story to the appropriate rundown within Octopus. The final rundown, including all the story scripts, is sent from Octopus to the Integrated Teleprompter system and the rundown is also sent to the Vector Box.

Once this action is executed automation gets the information from the newsroom and copies the video file from the central storage to the playout server. Once there the video can be played out manually or automatically at the specified time and after playout the video can be archived and deleted from the playout server if desired automatically also.

VECTOR BOX WILL DISPLAY MAIN RUNDOWN IN PCR

The Vector Box automation system client will show the main schedule containing all the stories of the rundown, and the elements of the story (graphical elements, video routing, etc).

After the installation, commissioning and testing a rigorous training schedule began. Dozens of journalists, news producers and operators took part in the training. Once they were trained – the hand holding sessions started. Journalists were told to go through the entire process of producing a story – start to finish.

With this system in place – SLRC can save a lot of time and effort. They can produce more news stories. They can produce news which is new and fresh – happening now. They can quickly introduce breaking news into the run down – thus making it fresh and exciting. They can come up with interesting graphics and insert them into the news. The reporters can spend more time researching the stories and going into the finer details. The planning and assignment desk can make plans months in advance, so they don't miss out on any important event.

"We are very happy with this system. We feel that the NRCS will really help us in our daily news production" said Mr Kapila Dasanayake, Chief Engineer of SLRC. The Chairman of SLRC, Mr Reginald Cooray met the system integration team and toured the new facility. He was satisfied with the installation and commended the SI team for their good work. Mr Cooray has since retired and now Dr Prasad Samarasinghe is the Chairman.

ABOUT AUTHOR

Aale Raza
Founder and Managing Director,
Whiteways Systems Pte Ltd

Mr Raza is a thought leader and visionary. His company - Whiteways is a leading systems integration company focused on providing solutions to broadcast houses. Prior to founding Whiteways, Aale was Head – South Asia and Emerging markets for Kit Digital Inc (NASDAQ – kitd). Kit Digital was the world leader in OTT and video over IP. Under his stewardship, Whiteways has become one of the fastest growing companies in the industry. Whiteways has customers in numerous countries of Asia and the Pacific – from Pakistan to Fiji. In 2016, Whiteways was awarded the TOP 10 Special Achievement award by Singapore Promising SME 500. In 2018, Whiteways was awarded the Singapore Golden Bull Award.

ABOUT WHITEWAYS

Whiteways is an award-winning system integration company. Whiteways is focused on providing products and services to Broadcasters (TV and Radio stations), professional audio / video production / post production houses and anyone who needs a full system. Whiteways is headquartered in Singapore. Whiteways was established in 2011. Whiteways has a long list of implementing large successful projects. Whiteways has over the years become one of the leading system integration companies in the South and South East Asian region. Whiteways has won several awards in Singapore. Whiteways is a member of various national and international bodies. ■

How to contribute to the Technical Review

Would you like to contribute an article to the ABU Technical Review? Anybody is welcome to do so.

It's an excellent way to highlight the work your organisation is doing and bring it to wide attention.

We will be happy to consider publishing any article you contribute. This could be a paper on research your organisation is conducting, details of any new technical developments, or any other article you feel will be of general interest to TR readers.

As you may be aware, the Technical Review is a quarterly publication distributed to all ABU members and industry partners.

It is available to the technical staff in each member organisation and in international organisations such as the ITU and other broadcasting associations, as well as in universities.

The Technical Review is aimed at engineers but also carries general interest news stories. It contains articles on new technologies, developments in broadcasting, innovations by members and other material of interest to engineers.

An article can be any length and written in any style you like. if you have photos to accompany it, they should be high resolution (at least 2 megapixels).

Although we cannot offer payment, we will offer a free half-page advertisement for some articles, particularly those covering technical research. This will be placed after your article, bringing publicity for your organisation.

In addition, articles written by ABU members on Case Studies, Research and Practical Implementation will be considered for the annual ABU Technical Review Prizes which consist of a cash prize and certificate.

Previous issues of the Technical Review can be viewed at the ABU website main page and at: https://www.abu.org.my/technical-review/

If you need more information, please contact veysel@abu.org.my ■

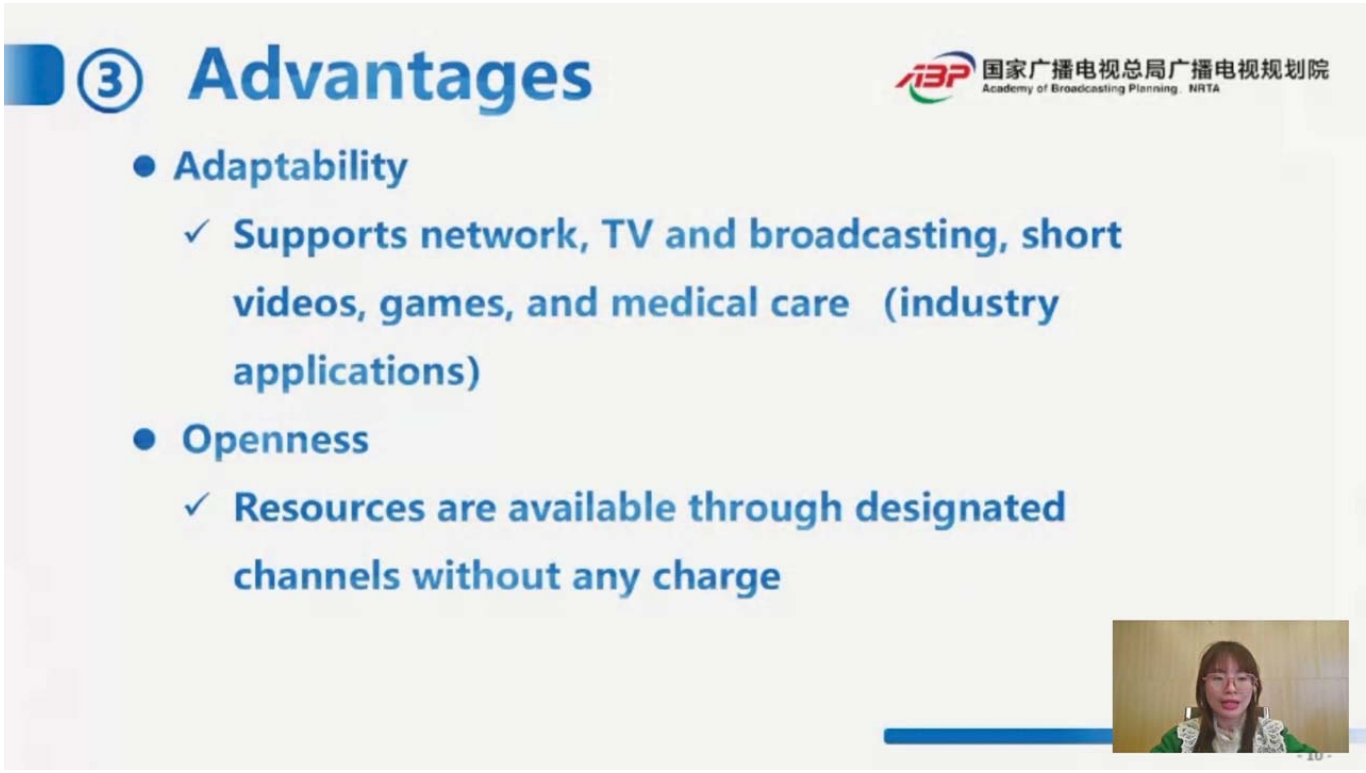
WEBINAR ON HDR VIVID AND AUDIO VIVID STANDARDS AND APPLICATION

27 APRIL 2023

Close to one hundred ninety (190) participants, representing sixty-seven (67) ABU member & non-member organisations from 31 countries, attended the webinar session on 27 April 2023. The presentation on HDR Vivid and Audio Vivid Standards and Application was presented by **Mr Ning JinHui**, **Ms Zhang JianDong** and **Ms Wang Rui** from National Radio and Television Administration, China. It was run as a part of the member innovations series. The series provided a platform to share RTPRC's stories, case studies and advancement in broadcasting. RTPRC, also known as NRTA, is an ABU full member in China.

During the webinar organised by ABU Technology, the speakers discussed different technical areas: introduction & characteristics of the HDR Vivid standard; applications of the HDR Vivid standard; introduction & characteristics of the HDR Audio standard and applications of the HDR Audio standard. With the rollout of 5G technologies and the improvement of terminal display capabilities, HDR has been one of the key technologies of the UHD audio and video industry. It can provide wider colour volume and higher dynamic range and has been gaining more and more attention in recent years. Compared with dual-channel stereo and multi-channel surround sound, 3D audio provides a richer spatial sound field and a sense of immersion. It is one of the six core experiences of UHD technology and a key component of spatial audio and virtual reality experiences. It includes not only sound channel information, but also object and scene information. It requires end-to-end coordination of sound collection and production, encoding and transmission, rendering and playback technologies, to provide an optimal auditory experience.

In 2019, the Ministry of Industry and Information Technology (MIIT), National Radio and Television Administration (NRTA), and China Media Group (CMG), jointly issued the 'UHD Video Industry Development Action Plan (2019-2022)', and with the overall technical route of "4K first, both with 8K", the UHD video industry and its application in related fields, developed rapidly in China. After strict evaluation, HDR Vivid was officially released as an industry standard. With the cooperation and efforts of a large variety of industrial enterprises, it has been widely adopted by the entire industrial chain and now constitutes a complete end-to-end HDR ecosystem.



CHARACTERISTICS OF HDR VIVID

HDR Vivid provides rich details of bright and dark regions to improve the image quality in terms of contrast and grayscale, making the content more detailed and realistic. From the perspective of the entire display adaptation pipeline of the terminal, dynamic metadata is generated based on the analysis of source materials first, and then tone mapping and saturation adjustment are performed to match the display capabilities of different screens. HDR Vivid has three core technical principles: Dynamic metadata, Tone mapping, and Saturation adjustment. Dynamic metadata can record the feature information of each frame or scene, which is more adaptable and effective. Tone mapping is based on metadata, which ensures the consistency of visual experience on different devices and maximises the creators' intentions. After tone mapping is performed, HDR Vivid technology also considers colour correction, that is, saturation adjustment, to ensure that the colour perception is consistent within HDR Vivid processing pipeline.

Compared with other HDR technologies, HDR Vivid is said to have five major advantages in terms of: Compatibility, that devices display the content in HDR10 format without any abnormal effects; Consistency - that the display effects of the same content on different terminals are basically the same; Flexibility - that HDR Vivid technology also allows users to manually adjust metadata based on

creative intent to create their own style; Adaptability - that HDR Vivid supports various application requirements; and Openness, that HDR Vivid is a fully open standard.

APPLICATIONS OF HDR VIVID STANDARD

HDR Vivid has been widely applied in content production, colour grading tools, cloud service platforms, coding and transmission system, chips, terminal devices and so on. The HDR Vivid standard is also considered as the principal technical requirement for Display Adaptation Metadata for High Dynamic Range Television Systems, GY/T 358-2022. Internet video content service companies such as iQIYI, Tencent Video, and Youku have applied the HDR technology in their products. 4K/8K smart STBs support HDR Vivid, providing users with a more authentic HD video experience in telecom carriers' IPTV service. HDR Vivid has also been explored and researched in various service scenarios such as webcasting, VR/XR, games and WeChat videos.

CHARACTERISTICS OF AUDIO VIVID STANDARD

Audio Vivid is a new generation audio codec standard released by UWA (The UHD World Association). It is the next generation high-efficiency compression method for immersive audio in a wide variety of scenarios. It can be applied in the home environment, cinema environment, personal, AR/VR, and vehicle-mounted environments. Audio Vivid coding system includes lossy coding, lossless coding, speaker array renderer and binaural renderer. It supports different formats such as channel-based signal, object-based signal, higher-order ambisonics (HOA) based signal, and metadata. It's the first audio coding standard using AI technology, in that not only it improves audio compression efficiency, but also overcomes long-standing patent barriers in some countries. Audio Vivid uses a hybrid AI encoding and decoding architecture. It greatly improves the coding efficiency of HOA signals by providing a HOA spatial encoding algorithm. The HOA spatial coding algorithm assumes that several virtual speakers are distributed around scene.

Flexible metadata system is one of the important features of Audio Vivid system. Audio Vivid's metadata system is designed as a hierarchical structure consisting of a base layer and an extension layer. The basic layer metadata multiplexes the attributes and elements of the audio signal content and format. The innovative extension layer metadata provides enhanced binaural rendering features and supports binaural rendering to better restore a director's artistic intents through metadata such as acoustic environment and rendering sound effect post-processing. Audio Vivid also provides basic rendering technologies, including loudspeaker renderer and binaural renderer.

APPLICATION OF AUDIO VIVID

Audio Vivid is more suitable for end-to-end industry deployment by all parties in the UHD industry ecosystem and serves the entire process of sound from construction to restoration. At present, more than 100 ultra-high definition (UHD) screens have been deployed in 35 cities across China under the "One Hundred Cities and Thousand Screens" programme CMG provides the audio service of ultra-high definition (UHD) video through mobile terminals, on the basis of the original ultra-high definition (UHD) videos without causing sound interference. ■

4K UHD LIVE VIDEO BROADCASTING OVER 5G WIRELESS TRANSMISSION NETWORK

27 APRIL 2023

ABU Technology organised the webinar session as a part of its 'member innovations series' on 27 April 2023. The session was on 4K UHD live video broadcasting over 5G wireless transmission networks, presented by Linda Guo from Sumavision Technologies in China. The speaker discussed different technical areas, such as high-quality live video solutions, 5G-based remote production etc. The webinar was attended by about one hundred and ninety (190) participants representing sixty-seven (67) ABU member & non-member organisations from 31 countries from Asia-Pacific and elsewhere.

Sumavision Technologies, in China, is constantly working in the field of live news and dynamic sports coverage, with flawless 5G 4K HEVC live streaming and remote production. Together with its cloud-based management and next-gen IP distribution platforms, Sumavision offers a cost-effective, end-to-end contribution, production and distribution solution. Its solutions and products highlight different technologies and components such as multi-camera, time synchronisation, low-latency, aggregation and channel bonding, remote production system etc. 4K/8K 5G backpacks adopt multi-channel aggregated transmission technology, collect the transmitted data on site, and distribute it to the 5G base stations of several operators' uplinks. In the transmission process, the peak bandwidth pressure of a single transmission channel is reduced, and transmission continuity and stability are improved.

Through the use of a 5G backpack, reporters and cameras constitute the lightest video live connection unit, equipment configuration is simplified and the burden of field operators is reduced with wireless transmission and flexible movement while ensuring real-time picture transmission continuous stability. High quality video content 5G signals are transmitted back to the new media integrated release platform for data distribution in the IP domain. Advantages of sharing and timeliness are evident.

Sumavision's 4K AVS2 encoders, 4K IRDs, UHD equipment and relevant solutions ensure a stable and safe process of video transmission. With its unique narrowband compression technology, the equipment can realise low bitrate, high quality HD and 4K programme output. Frame-Level synchronisation functions to realise smooth and free switching of multiple cameras within a server/encoder. Time Synchronisation, both internally and across devices, realises a stable picture without flicker. Additionally, SUMA TER (Time Epoch Reducer) synchronisation technology works by continuously monitoring the end-to-end transit time, and dynamically adjusting the internal decoder buffers to compensate.

Low latency features enable 5G low-delay interactive backpacks to be deployed in a high-speed railway studio and the guest connection area respectively to upload the captured live feeds. The overall system adopts the Cloud transmission architecture and deploys large resources such as video signal scheduling services and virtual production computing power on the Cloud. In the transmitting process from cameras to CCTV central studio, Sumavision's backpack supports different wireless transmission modes and supports fast handover cellular networks. And with CSF channel bonding technology, the solutions can achieve large bit rate video signal transmission, to ensure stable transmission. On the other hand, combined with 5G technology, it can even stably transmit 4K video signals of a fast-moving scene, which further reflects our excellent network security technology.

In the remote production process, the video signals collected in the front production area are sent back to the main production area of IBC by SRT (Secure and Reliable Transmission Protocol) encoding modes respectively. The SRT high-code signal is used for the production of the event. EFP switching station is used for the production and switching of high-code signals, and the convergence media switching station is used for the fast switching of real-time low-bitrate video streams, audio connection and on-site monitoring. ■

World Broadcasting Unions

WORLD BROADCASTING UNIONS TECHNICAL COMMITTEE (WBU-TC) MEETING NOTES:

The meeting was hosted by ORF at the ORF Center, Vienna, on Tuesday, June 13th and was chaired by **John Lee** of the North American Broadcasters Association, NABA. ABU was represented by **Dr Veysel Binbay**, Director of Technology & Innovation.

Antonio Arcidiacono, from EBU, presented an update on their activities. The meeting also ventured into discussing the transformation from linear broadcasting to online platforms. It has been stressed out the need for engineers, programmers, and businesses to collaborate.

The subject of frequency bands and their allocation dominated a significant part of the meeting, under the light of upcoming WRC-23. **Elena Puigrefagut**, from EBU, and **David Hemingway**, from BBC/EBU highlighted various frequency bands under discussion, including the 3.6 to 3.8 GHz and 6.425 to 7.125 GHz bands, and their implications for broadcasters. **Bob Weller** from NAB/NABA also provided an in-depth analysis of the C-band and its importance in satellite services.

The topic of artificial intelligence also came to the forefront. The potential for AI to improve audience services and the challenges it poses, including misinformation, were discussed. An open and diverse market for technological solutions was advocated.

In closing, **Michael McEwen** from NABA lauded John Lee for his services as chair since 2018 and introduced **Bassil Zoubi**, from ASBU, as the new chairman of WBU-TC. ■

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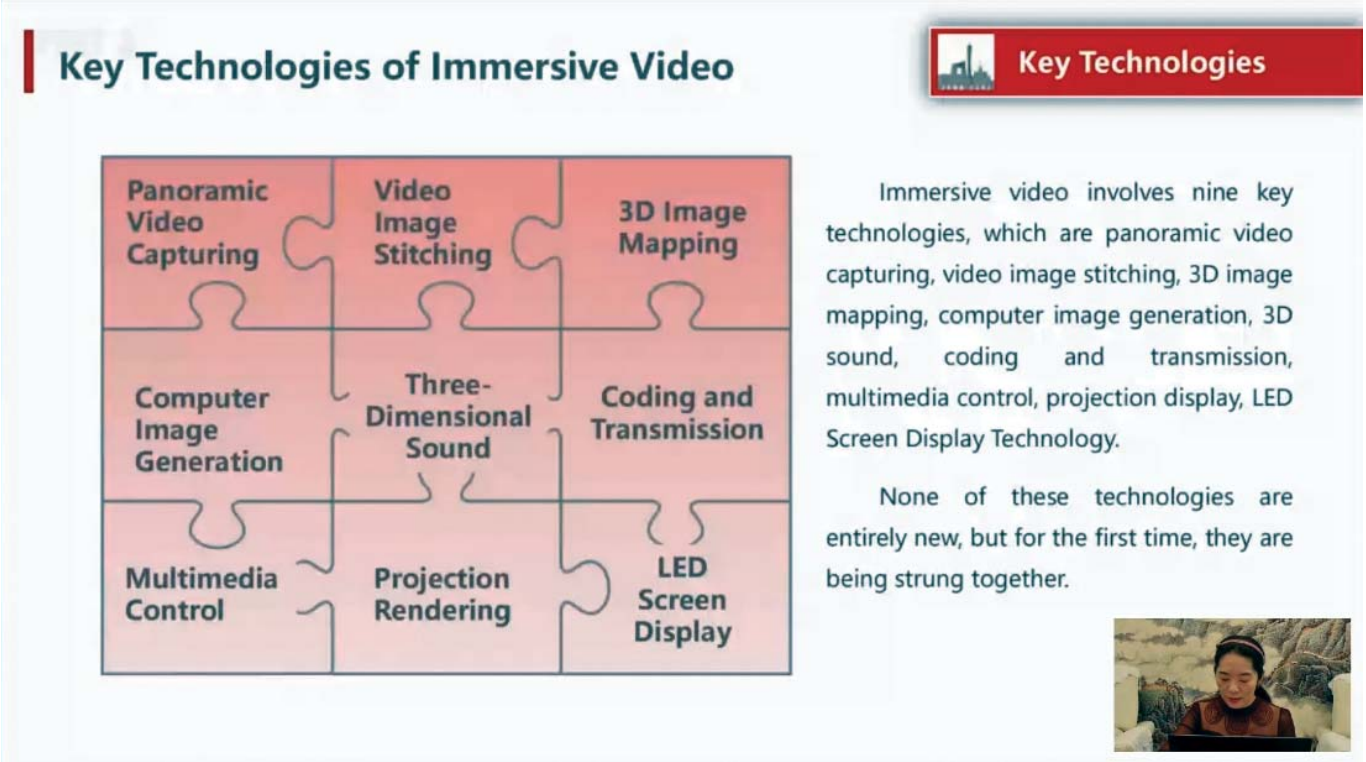
WEBINAR ON IMMERSIVE VIDEO IN CHINA

24 MAY 2023

Ouyang Yue, a Senior Engineer at the Radio, Film & TV Design and Research Institute (DRFT), delivered the webinar session on Immersive Video in China. It was run as a part of the member innovations series that provides platform to share ABU member's stories, case studies and advancement in broadcasting. She discussed different areas of focus such as concept of 5G high-tech video and Immersive Video, core elements and key technologies of Immersive Video, Immersive Video end-to-end Solution, use cases and application scenarios. ABU Technology organised the online session on 24 May 2023. Close to eighty (80) participants attended the webinar. They spanned 28 countries from Asia-Pacific and elsewhere, representing about fifty-three (53) organisations.

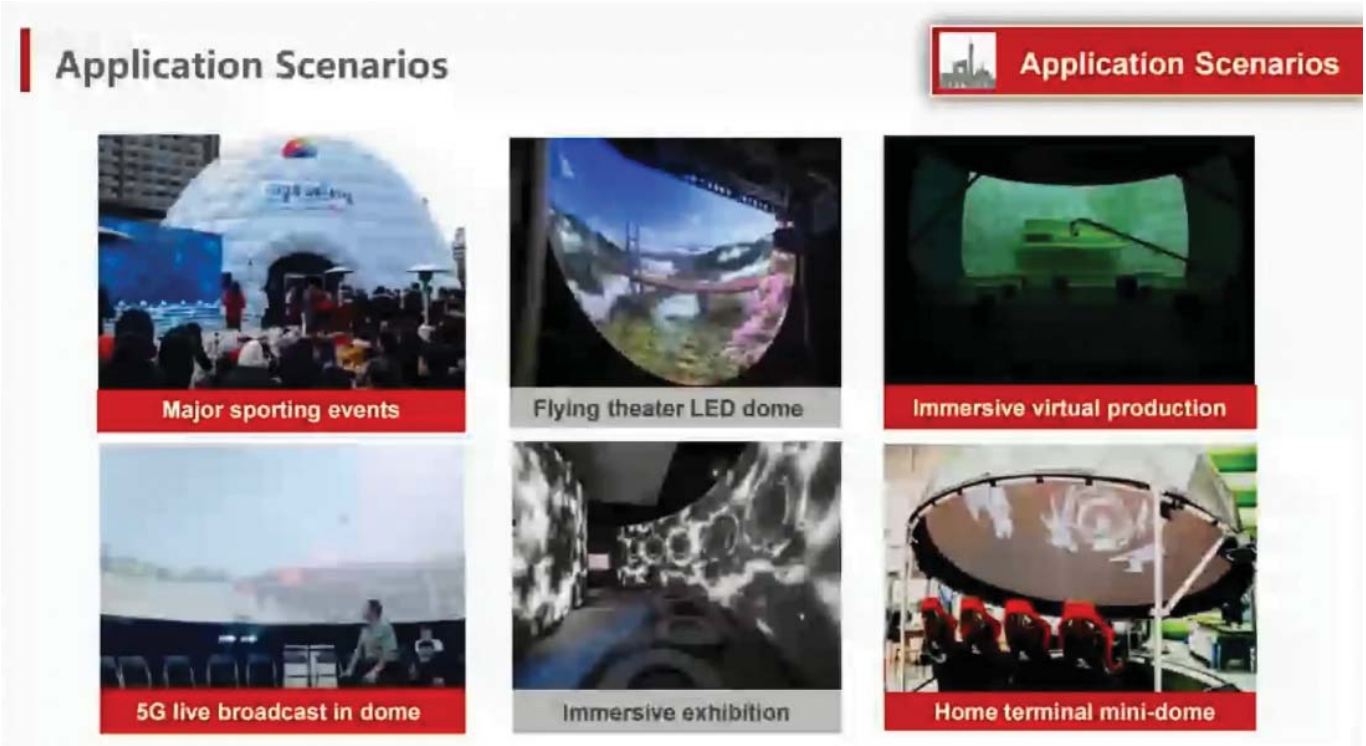
Immersive Video is an audio and video system, which is viewed with the naked eyes, and the presentation screen covers a field of view of 120° horizontal and 70° vertical and has 3D sound effects. It has the characteristics of ultra-high image quality, large viewing angle, and a strong sense of immersion, which can bring the audience an immersive experience that cannot be achieved by traditional video and audio technology. Immersive Video focuses on content with clearer and more delicate images, more coherent and smooth pictures, wider and more shocking field of vision, saturated and vivid colours, immersive sounds, and presentation terminals with a strong sense of envelopment.



Immersive Video has enabled a series of new technologies, new products, new applications and new consumption scenarios, and will continue to contribute to the digital development of emerging fields such as tourism, museums and art exhibitions, cultural entertainment. And it will be gradually applied to people's daily consumption such as catering, shopping, and entertainment. The National Radio and Television Administration (RTPRC/ NRTA) of China proposed the concept of 5G high-tech video, including four whole new aspects: interactive video, immersive video, VR video and cloud games in 2019 and later in August 2021, it published four white papers on these four prominent technologies.

The speaker observed that, in the future, immersive video technology will be used to build a virtual world that complements the real world, creating a Metaverse entrance that integrates virtual and reality, and real time interaction, boosting the further development of the Metaverse industry.

For details, please see the *Feature Article 1* in pages 02-06 contributed by the author in this Issue. ■



News from the ABU Region

USING AN AI TRANSLATION SYSTEM TO GENERATE ENGLISH SUBTITLES FOR LIVE-STREAMED SPECIAL NEWS IN EMERGENCIES

NHK STRL has been researching and developing a Japanese-English AI (artificial intelligence) translation system for news in order to support the production of English news for NHK's global service. This is a specialized system to translate NHK's Japanese news into English. To produce high-quality translations, the AI system has been trained with one million pairs of parallel NHK news sentences in Japanese and English. Because the training data include many news reports about weather-related natural disasters such as heavy rain, the system can correctly translate most news reports about weather-related disasters. It also adjusts the wording in line with English news reports, such as converting wind speeds (from meters per second to kilometers per hour) and expressing dates within one week as days of the week.

NHK launched a new AI English subtitling service in June 2022 using this Japanese-English AI translation system to add English subtitles to special news reports on General TV to be streamed live online. The AI English subtitling service is intended for non-Japanese residents and visitors to Japan. It will be used in the case of an earthquake of seismic intensity of lower 5 or above or when an emergency warning is issued such as a tsunami advisory, tsunami warning, major tsunami warning, or heavy rain warning. When the service is provided, it can be accessed via a banner on the NHK WORLD-JAPAN website and on the app.

Going forward, it will continue with research and development, aiming to achieve a system that can produce higher-quality translations, even for difficult-to-translate Japanese such as live news reports containing colloquial spoken language. [NHK STRL]

SRI LANKAN BROADCASTER GOES DRM FOLLOWING LISTENERS' REQUEST

The international service of the Sri Lanka Broadcasting Corporation (SLBC) recently doubled its Tamil Service airtime to two hours, on 873 kHz AM (medium wave) from Puttalam transmitter. The new schedule is 0130-0330 UTC. This is partly in response to individual efforts of listeners, many in the southern part of India, in Bengaluru. Introducing this change, Colombo International Radio also announced that shortly they are going to use DRM on 1548 kHz. This will be done by using the old transmitter of Deutsche Welle located in the north of Sri Lanka at Trincomalee. The Sri Lankan public broadcaster has started airing the DRM announcement. [Radioinfo]

INDIAN TELEVISION DOORDARSHAN INSTALLS AEQ INTERCOMS

Doordarshan is India's public television company, built on public broadcaster Prasar Bharati. It manages television channels at a national, regional and local level in open signal, cable and satellite platforms, which makes it one of the largest television networks in the world.

In New Delhi it has its two main production centers:

- DD News is the production center of the Doordarshan National News Channel, it is the only 24-hour terrestrial television news channel in India.
- CPC is a production center for General Programs with 4 studios A, B, C and D.

In both centers a new digital intercom system was needed to communicate in each studio the producer and director with the cameras, manager and studio assistant, presenters, lighting technicians, sound technicians, CCU, and general center services such as VCR, graphics, etc.

During 2021, with the travel restrictions imposed by the COVID-19 pandemic, Doordarshan, AEQ and Falcon had to carry out the entire manufacturing, installation, acceptance, commissioning and training process remotely between Madrid (Spain) and the two centers in New Delhi (India).

The AEQ intercom system has great configuration flexibility. Even though the AEQ intercom system usually uses high quality Dante combined AoIP connectivity with G722 / G711 for low bit rate transmissions, due to an express requirement of system design, for reasons of simplicity of configuration and maintenance, DD preferred the digital connection. point-to-point for the wired panels in rack format and point-to-point high-quality analog connection for the rest of the wired and wireless beltpacks and CCUs.

AEQ located in its Madrid offices an Intercom platform equivalent to the one sent, with the CONEXIA matrix, panels, beltpacks, concentrators, etc. In this way, and thanks to the means of remote control of the equipment and video conferences, the AEQ technical staff was able to carry out the necessary tasks for start-up and training from Madrid. AEQ's Crossmapper real-time control and configuration program allowed real-time control and supervision from Madrid of the operations in Delhi. [AEQ News]

INDONESIA'S TVRI TAKES DIGITALISATION TO THE EDGE WITH EATON

Global power management company Eaton has announced

that Televisi Republik Indonesia (TVRI) has adopted Eaton's iCube 2.0 Micro Data Center (MDC) as part of its digital transformation plans. Deployed at TVRI's Jakarta headquarters, the Eaton iCube 2.0 supports the company's long-term goals of digitalising its operations across its 29 regional branches, and delivering consistent, high-quality services to viewers across Indonesia's 18,000 islands.

TVRI's latest digitalisation efforts come off the back of ongoing transformation of its business model. Having launched its digital broadcasting services in 2010 and subsequently rolled out its online streaming and video-on-demand services in 2018, TVRI sought to become a platform that can be accessed anytime, anywhere. However, with branches that spread across Indonesia's dispersed geography, including some located in remote areas that do not yet see widespread power distribution, ensuring uniformed digital transformation across its network was a challenge.

Designed to provide an "all-in-one" data center infrastructure solution with all components integrated and configured before being shipped out, the Eaton iCube 2.0 was quickly set up at TVRI's headquarters. Powered by edge computing technology, it provides computing and storage support in close proximity to the source, minimising data latency and optimising bandwidth at the main branch in Jakarta. This has led to improved efficiency at TVRI's headquarters, enhancing real-time responsiveness and instantaneous communications – key capabilities that are critical for broadcast networks.

Having successfully deployed the Eaton iCube 2.0 MDC at its headquarters, TVRI is looking to modernise the rest of its IT and energy management infrastructure, with plans to deploy micro data centers at their other regional stations in the future. [Content+Technology]

IRDETO, MEDIATECH TO DEPLOY MULTI-DRM FOR RTHK STREAMING PLATFORMS

Irdeto, the world leader in digital platform cybersecurity, and Mediatech, the pre-eminent systems integrator for the video entertainment market in Hong Kong and surrounding regions, announce that Radio Television Hong Kong (RTHK), Hong Kong's biggest free-to-air public broadcaster, has selected Irdeto Control as its multi-DRM solution for all of its video streaming platforms. With Irdeto Control, RTHK will be able to protect its premium video content and confidently scale its streaming services while offering an unmatched user experience.

At a time when consumer appetite for streaming content continues to grow, broadcasters have been exploring how to enhance their streaming platforms to attract a wider audience and grow their customer base. RTHK is investing in premium content from global content providers to strengthen its position against other pay-TV operators and streaming video providers in Hong Kong. Irdeto Control's multi-DRM service and features, such as Geo Blocking and VPN Detection, will protect and prevent its content investments from being pirated. [Irdeto News]

ABC DEMOTES BROADCAST IN "DIGITAL FIRST" TRANSITION

The ABC has announced a range of savings measures and reinvestment initiatives designed to address rising costs and support its transition to a "digital-first" media organisation.

ABC Managing Director David Anderson said the recent content team reorganisation and the release of the new strategy required carefully made decisions on reinvestment and savings to strengthen the ABC into the future. Mr Anderson said the proposed changes announced included the creation of new roles to grow the ABC's digital capability. It is anticipated up to 120 employees will potentially leave the ABC.

The proposed changes include:

- The launch of the Current Affairs Digital Transformation Project to ensure some of the ABC's best investigative programs have the capability to meet audience demand for long-form on-demand video and in-depth digital content.
- Continuing the shift in the News Operations team from linear television programming to on-demand digital content and modernising the ABC's skills base.
- The introduction of ABC News Sunday, a new national bulletin bringing the best stories and journalism from around Australia and the world.
- The return of a digital-first Stateline, unpacking the local stories that matter through long form journalism, in-depth interviews and explainers for on-demand and broadcast audiences.
- The establishment of a dedicated Climate, Environment and Energy reporting team to focus on the issues that are consistently rated as critical for the nation's future, particularly by younger Australians.
- Streamlining of the commissioning editor structure by reducing the number of ABC executives involved in the commissioning and production process with the independent sector, freeing up funds for investment in high-quality distinctive Australian content.
- A digital-first approach to commissioning and choosing content, with a focus on the audience from the earliest development stage.
- Enhancing the ABC iview, ABC News and ABC listen audience experience to drive faster uptake to these platforms.
- Promoting digital output with new roles established in the ABC's digital teams.

[Content+Technology]

THAI PBS CHOOSES ROSS VIDEO HYPERCONVERGED SWITCHERS

Thai PBS had a mandate to make upgrades to its two main studios, including the ability to create content in 4K and major improvements to its existing HD studio. To meet these needs, Thai PBS commissioned a tender to search for two new

production switchers and the successful winner of the tender was Ross Video.

The new Ross Video switchers are used for the primary production of Thai PBS' live content at their broadcast facility headquarters in central Bangkok. The main objective of these upgrades was to enable Thai PBS' studios to create better quality content and ensure that they would be able to increase capacity in the future.

As part of the tender Thai PBS engineers also specified a requirement for production workflow flexibility that would allow for different types of technology such as SDI or IP. They also wanted a well-known and trusted switcher brand that provides high-quality manufacturing and design and is backed by solid service and support.

For their main studio upgrade Thai PBS chose the flagship Acuity production switcher with a 4 M/E row and the Acuity control surface. They also selected Ross' Hyperconverged Production Platform, the 4ME Ultrix Acuity 4K / UHD Switcher, with a 4ME row Acuity panel configuration.

For the installation process, Ross delivered the switchers to Thai PBS in March 2023 and the installation process was completed in April. Commissioning and training were done shortly after installation, with the switchers going live on the air in May in time for the 2023 Thailand General Election. The Acuity and Ultrix Acuity production switchers have provided Thai PBS with a reliable, future-proof solution for news content creation that adds a massive amount of value and confidence to its creative staff.

The switchers have already allowed the Thai PBS production team to greatly improve their creativity and storytelling capabilities. The team was already familiar with Ross Production Switchers and control surfaces thanks to a recent installation for its World News brand and this made it easier for them to install and adapt to the larger, more powerful Acuity series.

With connectivity, the new Ross Video Hyperconverged switchers have also enabled seamless integration with Thai PBS' existing automation system for a smoother and more efficient workflow. [Sports Video Group]

HARMONIC REVOLUTIONIZES ASIA-PACIFIC'S MEDIA LANDSCAPE WITH ADVANCED VIDEO PROCESSING AND DELIVERY SOLUTIONS

Harmonic, the global leader in video processing and delivery infrastructure, is at the forefront of revolutionizing the media industry. The company assists its customers in building their media chain, encompassing everything from production and content preparation to aggregation and delivery across various networks. With the ongoing transformation in the Asia-Pacific region, Harmonic's VP Sales and Services for APAC and ME, Tony Berthaud, shedded light on the current trends and challenges faced by the industry during the BroadcastAsia Show 2023.

Harmonic's expertise lies in enabling customers to deliver content through multiple network channels, including satellite, cable, IPTV, DTT (Digital Terrestrial Television), and OTT (Over-the-Top) platforms. Many customers in the Asia-Pacific region are upgrading their infrastructure to establish a comprehensive content delivery system that combines traditional broadcast networks with OTT capabilities. This transition taps into two significant industry trends: the shift from pure broadcast delivery to hybrid delivery involving broadcast and video streaming, and the expansion of services through video streaming technology.

The integration of video streaming offers numerous advantages for Harmonic's customers. It allows them to launch interactive services such as video-on-demand, catch-up TV, and time-shifting options, enabling viewers to personalize their content consumption. "The capability to deliver curated content to your viewers" is a major advantage that comes with video streaming. Additionally, video streaming opens up opportunities for businesses to extend their reach across the Asia-Pacific region and even globally. With the help of Harmonic's solutions, customers can captivate a larger audience and expand their market presence.

Another crucial development in the Asia-Pacific media landscape is the migration from on-premises infrastructure to cloud-based solutions. Harmonic stands ready to guide its customers through this transformation, offering seamless workflow integration from production and layout to content delivery, both on-premises and in the cloud. Cloud infrastructure provides enhanced agility, flexibility, and faster time-to-market for customers. Moreover, the pay-as-you-use business model offered by cloud-based solutions presents a new opportunity for media companies to optimize their operational costs. [APB News]

ASIASAT BUYS LIGHTNING TO SPEED UP DISTRIBUTION & MEDIA SOLUTIONS

Satellite solutions provider AsiaSat has completed the acquisition of Lightning International, a content distribution and media solutions company. The acquisition, said AsiaSat, is a strategic move to expand the company's services and extend its clients' reach to global audiences through traditional and new distributions platforms including over-the-top (OTT) and free ad-supported streaming TV (FAST).

With over 12 years of distributing TV channels and programme content to worldwide audiences via TV stations, pay-TV operators and streaming platforms, Lightning represents producers, channels and other media businesses from Europe, Asia and around the world, and provides advice on a wide range of content and media solutions.

Combining Lightning's expertise in

content distribution with AsiaSat's all-embracing satellite and IP-based distribution capabilities will enable both companies to deliver customised solutions including content aggregation and playout, channel distribution and affiliate management. [AsiaSat News]

LISTNR AND SBS ANNOUNCE PARTNERSHIP FOR SBS PODCASTS AND RADIO STREAMS

LiSTNR and SBS have announced a multi-year partnership that will see no less than 40 of SBS's premium podcasts, plus six of its digital radio stations, available on LiSTNR. Digital radio brands SBS Radio1, SBS Radio2, SBS PopAsia, SBS PopDesi, SBS Chill, and SBS Arabic24 will be available on LiSTNR.

SBS launched SBS Audio earlier, which houses all SBS's audio products in more than 60 languages in one unified digital experience on app and web. According to the 2021 Census the number of Australians using a language other than English at home grew 16 percent to more than 5.6 million, with SBS serving 92 percent of these users to reach more audiences than ever before.

The LiSTNR network announced it now reaches a new record of more than eight million Australian podcast listeners. On LiSTNR, SBS will have the ability to expand its overall reach as well as access a continually expanding signed-in known audience of more than1.3 million. SBS podcasts and audio streaming already sees more than 5 million streams per month on its existing platforms and this new partnership will further extend that reach. [SBS]

ENENSYS POWERS DAB TRIAL IN UZBEKISTAN

ENENSYS Technologies, the provider of efficient media delivery solutions, has announced that its Twister II high efficiency exciter is being used for DAB trials in Uzbekistan.

CRRT, the national operator of DVB-T/T2 Digital Terrestrial Television in Uzbekistan, is considering the possibility of launching new DAB digital radio services in several regions. Looking for a quick and cost-effective solution, the decision was made to reuse old analogue VHF transmitters. To do so, ENENSYS' Twister II was chosen to upgrade towards the DAB standard. CRRT already upgraded successfully its high-power TV station in Tashkent with Twister II, and thus ensured excellent DAB signal distribution in the capital of Uzbekistan. [Content+Technology]

SINGAPORE LAUNCHES FOUNDATION TO SHAPE AI STANDARDS

At the ATxAI conference, a part of Asia Tech x Singapore (ATxSG), Mrs Josephine Teo, Singapore's Minister for Communications and Information announced the launch of the AI Verify Foundation to harness the collective power and contributions of the global open source community to develop AI testing tools for the responsible use of AI. The Foundation will look to boost AI testing capabilities and assurance to meet the needs of companies and regulators globally.

BUILDING THE FOUNDATION FOR TRUSTWORTHY AI

The launch of AI Verify Foundation will support the development and use of AI Verify to address risks of AI. AI Verify is an AI governance testing framework and software toolkit. first developed by IMDA in consultation with companies from different sectors and different scales. The Foundation will help to foster an open-source community to contribute to AI testing frameworks, code base, standards and best practices and create a neutral platform for open collaboration and idea-sharing on testing and governing AI.

THE NEED FOR COLLECTIVE EFFORT TO ADVANCE AI TESTING GLOBALLY

IMDA built AI Verify to help organisations objectively demonstrate responsible AI through standardised tests. However, AI testing technologies albeit growing, are still nascent. There is a need to crowd in the best expertise from across industry and research community to develop this area.

PATHWAYS FOR POLICYMAKERS FOR GENERATIVE AI

IMDA and Aicadium have published a discussion paper to share Singapore's approach to building an ecosystem for trusted and responsible adoption of Generative AI, in a way that spurs innovation and tap on its opportunities. The paper seeks to enhance discourse and invite like-minded partners from around the world to work with Singapore to ensure that Generative AI can be trusted and used in a safe and responsible manner. [Content+Technology]

TVU NETWORKS CHOSEN BY MEDIACORP FOR 32ND SEA GAMES

One of Singapore's largest content creator and national media network, Mediacorp, has once again chosen various TVU solutions to broadcast the 2023 Southeast Asian Games across its suite of TV channels, radio stations and digital platforms.

Based on the network's experience in prior SEA Games, it turned to TVU Remote Commentator for the remote production required in its workflow. In addition to the remote commentary setup similar to the prior SEA Games, Mediacorp expanded TVU's role to include the collection and feedback of live scenes, using the TVU One cellular mobile transmitter and TVU Anywhere live streaming app.

During the 2023 SEA Games, Mediacorp successfully conducted remote live broadcast production and commentary production of football games, aquatic sports, track and field, martial arts and many other events, and fed back to the International Broadcast Center (IBC) for live broadcast and commentary production. [Pro AVL Asia]

WHITEWAYS UNVEILS INNOVATIVE PLAYOUT SYSTEM AT BROADCASTASIA SHOW 2023

Whiteways, a system integration

company specializing in broadcasting solutions, unveiled its groundbreaking playout system at the BroadcastAsia Show 2023 in Singapore. The system, called Drillarium, offers a multi-channel playout solution that enables a single operator to manage up to 10 channels simultaneously, significantly reducing the need for multiple operators. The company's Operations Manager, Punit Bhanushali, highlighted the key features of the system during an interview with Asia-Pacific Broadcasting+ at the event.

The Drillarium playout system offers broadcasters a compact and remote solution, particularly relevant in light of the COVID-19 pandemic. With travel restrictions and social distancing measures in place, operators can now remotely manage channels from the comfort of their own surroundings. This innovation allows broadcasters to continue their operations seamlessly, even in times of crisis.

With the ability to operate multiple channels remotely, the system provides flexibility, efficiency, and cost-effectiveness, making it an attractive option for broadcasters in the Asia Pacific region and beyond. As the industry continues to evolve, Whiteways remains at the forefront, consistently delivering innovative solutions that meet the changing needs of broadcasters. With their commitment to excellence and customer satisfaction, Whiteways is poised to make a lasting impact in the broadcasting sector, empowering broadcasters to navigate the challenges of the digital age with confidence and efficiency. [APB News]

BENCHMARK UNVEILS CUTTING-EDGE BROADCAST SERVICES AND DIGITAL TRANSFORMATION SOLUTIONS AT BROADCASTASIA SHOW 2023

Benchmark, a leading global provider of broadcast engineering and digital transformation services, took center stage at the BroadcastAsia Show 2023 in Singapore, presenting their latest innovations in the industry. The event showcased Benchmark's expertise in broadcast infrastructure design, studio integration, digital transformation, and more.

With a focus on their core broadcast engineering services, Benchmark highlighted their proficiency in handling various projects, including Greenfield ventures, facilities migration, and expansion projects. They emphasized their capabilities in designing broadcast infrastructure for production, post-production, and delivery, encompassing the associated broadcast network infrastructure, data center NOC (Network Operations Center), and studio design with acoustics and lighting.

Bhaskar Majumdar, Corporate Executive at Benchmark, spoke about the company's commitment to providing comprehensive solutions for the industry. One of the key highlights of the showcase was Benchmark's digital transformation services. The company presented their AI-based, cloud-based media marketplace, which enables content creators and distributors to connect and collaborate efficiently. Additionally, they unveiled an AI-enabled hybrid enterprise media asset management solution, empowering organizations to streamline content workflows and maximize productivity. [APB News]

BBC WINS EBU TECHNOLOGY & INNOVATION AWARD WITH PRIVATE 5G NETWORK FOR CONTRIBUTION

The BBC is the winner of the 2023 EBU Technology & Innovation Award with its 'Private 5G Network for Contribution and Distribution' project, while Jaime Sánchez Roldán University Politechnica de Valencia takes the EBU Young Technology Talent of the Year Award. The EBU recognizes, encourages and supports outstanding technical solutions developed by Member organizations with the Technology & Innovation Award. Now in its 8th year, the Award attracted a record 23 entrees in 2023.

The Young Technology Talent award highlights engineers at student or graduate level who have achieved concrete technical demonstrations, proofs-of-concepts or solutions relevant to broadcasting organizations.

The winner and runners-up are selected on the basis of scores assigned by each of the elected members of the EBU Technical Committee across a range of relevant criteria.

BBC-DEVELOPED 5G LINKS BRING MAJOR ECONOMIES AND QUALITY BENEFITS

5G technology brings the prospect of higher bandwidths via mobile data links. Publicly available 5G mobile networks, however, are subject to unpredictable public demand and thus are currently too unreliable for professional content providers.

The BBC has created and used a private 5G network in the UK that has the quality and reliability needed. The network can be deployed where needed and has been used successfully for news contributions at national events such as The Coronation, which involved multiple crews, a large aggregate number of cameras, and video signals in UHDTV.

EBU YOUNG TECHNOLOGY TALENT OF THE YEAR AWARD

Jaime Sánchez Roldán from the University Politechnica de Valencia won the 2023 EBU Young Technology Talent Award for his development of an 'Open Source LTE-based 5G Broadcast Platform'. Through the development of this platform, Sánchez Roldán has contributed significantly to the advance of 5G-Broadcast technology in Spain and Europe. The platform is also notable for the new algorithms used and features included that improve performance. Sánchez Roldán has also made a major contribution to the 5G-MAG project, which is encouraging the development and use of 5G systems. [EBU News] ■

DIGITAL BROADCASTING Updates

EBU PUBLISHES PAPER ON GENERATIVE AI IMPLICATIONS FOR NEWS AND AUDIENCES

The EBU Task Force on Generative AI has produced a special cross-disciplinary paper called 'Generative AI, News and Audiences: a need-to-know-now briefing for PSM' to help public service media and journalist better understand the potential and impact of this transformative technology.

The paper is intended as a concise briefing for decision-makers at PSM organizations, covering areas such as editorial workflows, journalistic credibility, misinformation, ethical issues, regulatory aspects, cybersecurity risks, the evaluation and benchmarking of available technologies, as well as the impact on audiences and the distribution of news.

Generative AI tools are expected to have a significant impact on the production and distribution of news content, but the fast pace of change has made it difficult to weigh opportunities, challenges and risks. In response, the EBU has created a transversal task force to study the topic. The report is the group's first deliverable and will be followed by other publications and activities on generative AI.

The Task Force on Generative AI contains members of the EBU News, Digital and Technical Committees, as well as experts from the EBU Media, News and Technology & Innovation departments. [EBU News]

MULTIPLEXING METHOD FOR ADVANCED TERRESTRIAL BROADCASTING

NHK STRL is working on research and development of a transmission system and a receiving system for program content using the CMAF/MMT format. Multiplexing is a technology that brings together information composed of programs and services including video, audio, program guides, and applications, and transmits it as a single signal format. Digital terrestrial television broadcasting uses MPEG-2 TS (Transport Stream), whereas the newer 4K/8K satellite broadcasting uses the MMT (MPEG Media Transport) multiplexing method. As part of our advanced terrestrial broadcasting project, we are exploring technologies to provide services in the same way through broadcasting and communication.

The CMAF/MMT multiplexing method that NHK STRL is currently investigating uses CMAF, the media format shared by online video streaming services, multiplexed by MMT and transmitted by broadcast. CMAF, standardized by the MPEG, is adopted in streaming technologies widely used by online video services. It also takes into account important requirements such as content protection functions.

The software transmission system currently under development can transmit content in the common CMAF by both broadcast and unicast communication, so it will allow various services to be provided by combining broadcast and unicast communication. The home gateway, being developed as a receiving system, has functions to receive content transmitted by both broadcasting and unicast communication. Content received via broadcasting can be kept in CMAF and sent to a smartphone without a broadcast tuner, allowing broadcast programs to be viewed in the same way as online video services. Broadcasters will be able to implement viewing services in a more flexible way using apps provided by broadcasters, allowing them to diversify the services that they provide. This should reduce costs for broadcasters by having a single development workflow for broadcast and online services, while viewers will benefit from more personalized services. [NHK STRL]

DVB APPROVES THE SPECIFICATION FOR NEXT-GENERATION VIDEO CODECS TO DELIVER 4K AND 8K BROADCAST AND STREAMING TELEVISION

A new revision of the DVB-AVC specification adding two new video codecs – VVC and AVS3 – has been approved by the DVB Steering Board and is available now as DVB BlueBook A001r21.

The DVB Project maintains a single specification for the use of video and audio coding in broadcast and streaming applications which is constantly updated with the latest codecs . The specification is extensively referenced worldwide and defines DVB audio and video conformance points, to be used for all DVB delivery methods (terrestrial, satellite, cable, IPTV, and DVB-DASH). The new revision will soon be published by ETSI and will add support for next-generation video codecs VVC, from ISO/IEC MPEG and ITU-T VCEG, and AVS3, from the AVS Workgroup.

The specification includes four conformance points for AVS3 and VVC, the minimum requirement being a baseline receiver capable of supporting resolutions up to 4K (3840×2160) with HDR and standard frame rates. The three additional conformance points cover the support of high frame rates (HFR) and resolutions up to 8K (7680×4320). The video coding parameters of the four conformance points for both VVC and AVS3 match, giving consistency in service levels across codecs.

These new video codecs are important enablers of enhanced experiences for broadcast and broadband, like 8K, as well as for accelerating the adoption of 4K UHD. DVB also provides reference streams that implementers can use for verification and validation (V&V), available here. An update to the DVB-DASH specification, including the addition of the VVC and AVS3 video codecs, was also approved by the DVB Steering Board (BlueBook A168r6). [DVB News]

ITU FINALIZES REPORT ON PREPARATORY STUDIES FOR THE 2023 WORLD RADIOCOMMUNICATION CONFERENCE

ITU Member States have approved a major report on the technical, operational, and regulatory materials for the preparation of the World Radiocommunication Conference 2023 (WRC-23).

The report summarizes and analyses the results of extensive technical studies conducted by members of the ITU Radiocommunication Sector, as well as possible solutions to satisfy WRC-23 agenda items. The report was approved at the conclusion of the 2nd session of the Conference Preparatory Meeting (CPM23-2) held from 27 March to 6

April 2023 in Geneva Switzerland. The CPM Report represents a major step in the preparations for WRC-23 which will be held in Dubai, United Arab Emirates from 20 November to 15 December 2023. Among the key issues highlighted during the two-week meeting include:

- • Identification of additional frequency bands for the continued development of International Mobile Telecommunications (IMT), including the use of high-altitude platform stations as IMT base stations for the universal deployment of wireless networks.
- Improvements to the international regulatory framework for geostationary orbit (GSO) and non-geostationary (NGSO) satellites while promoting equitable access for all countries.
- Use of satellite technologies for broadband services to improve connectivity, particularly in remote areas.
- New spectrum to enhance radiocommunications in the aeronautical mobile service, including by satellite, and to facilitate the use of the Space Research and Earth exploration-satellite services for climate monitoring, weather prediction and other scientific missions.
- The modernization of the Global Maritime Distress and Safety System (GMDSS).
- Regulatory framework for the use of earth stations in motion on board aircraft and ships for communication with geostationary orbit (GSO) and non-geostationary (NGSO) satellites.
- The future of the ultra-high frequency (UHF) broadcasting band which has implications for television broadcast, programme-making and special events, as well as public protection and disaster relief.

World radiocommunication conferences, held every three to four years, review and revise the ITU Radio Regulations, the international treaty governing the use of the radio-frequency spectrum, including satellite orbits. [ITU News]

DRM DIGITAL RADIO GENERAL ASSEMBLY – SUCCESSFUL, SMART AND ENGAGING

The Digital Radio Mondiale™ (DRM) Consortium held its first in-person General Assembly in Palma de Mallorca, Spain, post-Covid, between April 27-28, under the banner "Smart, Local and Efficient". The open session on April 27th brought exciting updates from all the continents, with new information from India, South Africa, Pakistan, Brazil, Germany etc.

DRM received fresh information directly from the top representatives of the Indonesian Communication Ministry – Kominfo – present in Palma and from the highest echelons of the Indonesian public broadcaster. It also welcomed the surprise announcement made during the GA about the start of DRM tests in Nepal, as well and welcomed the news from Pakistan and its full plans, commitment to receivers and asking for DRM mandate in cars.

Some of the key members brought their own excellent news about DRM developments (like a recent monitoring test of low-cost DRM receiver in Europe -BBC, the multi-channel capabilities of DRM in the FM band- RFmondial and the exciting link established between the ATSC 3.0 standard and DRM-Fraunhofer IIS).

The receiver session, with participation from CML Microcircuits/Cambridge Consultants, Gospell, Inntot, Fraunhofer IIS, Starwaves, NXP and others confirmed the great and innovative progress made in creating receivers for the automotive industry, recent mobile solutions and standalone receivers. The existing and new receiver solutions are already supporting the full DRM standard (AM and FM bands) and all the DRM features set giving extra benefits like EWF (Emergency Warning Functionality), distance learning, extra content in various languages. The "DRM open day" was a global and interactive event with participants from countries as far apart as Malaysia, Nepal, Singapore, several African countries, Colombia, US, UK, Egypt, Hungary, Denmark, Thailand and so many more. [DRM]

IDEAL SYSTEMS BRING TO LIGHT AI PARTNERSHIP WITH COMCAST TECHNOLOGY SOLUTIONS AT BROADCASTASIA SHOW 2023

Ideal Systems, a leading provider of broadcasting solutions, announced a groundbreaking partnership with Comcast Technology Solutions (CTS) during the pre-show conference at BroadcastAsia Show 2023. The event took place in Singapore and drew significant attention from industry professionals and broadcasters worldwide.

During the conference, Fintan McKiernan, the CEO of Ideal Systems, shed light on the collaboration between Ideal Systems and CTS. McKiernan highlighted the integration of CTS's video artificial intelligence (AI) technology into Ideal Systems' existing sports systems and content censorship processes. The partnership aims to revolutionize the broadcasting industry by leveraging advanced AI capabilities to streamline operations and enhance viewer experiences.

One of the key applications of CTS's video AI technology is in the creation of pre-edits and highlight packages. Sky, a part of the Comcast group, has successfully implemented video AI for these purposes. By extending the technology to non-Comcast companies, CTS allows broadcasters to benefit from their IP and in-house developments.

Content censorship was another area of focus discussed during the conference. McKiernan emphasized the global significance of this topic, particularly in Southeast Asia. The implementation of video AI enables broadcasters to automate the removal of undesirable content from video-on-demand (VOD) assets and live channels. Profanities and inappropriate scenes can now be efficiently filtered out, significantly reducing the need for manual labor-intensive processes.

McKiernan contrasted the past approach of introducing new technologies to the market with the current trend of end-users driving adoption. He emphasized the appeal of NDI technology, which solves problems for broadcasters more effectively and affordably. The breadth of applications covered by NDI, ranging from ingest and play editing to live sports production and audio management, surprised many industry professionals. The once-perceived ancillary technology is now becoming mainstream, as evidenced by major news organizations such as CNN and CNBC adopting NDI for their news studios. [APB News]

MASS ROLLOUT OF SMARTFM TECHNOLOGY USHERS IN NEW ERA OF ENERGY

A large-scale rollout of SmartFM AI technology in Germany is enabling broadcasters operating Ecreso transmitters to reduce their energy consumption by up to 40%. This rollout – across 800 FM transmitters – is an important step toward decarbonizing the country's FM broadcast sector.

As a significant energy consumer, the broadcast industry is increasingly focused on products and technologies that produce the lowest possible footprint. However, a major challenge for sustainable solutions is that many broadcasters work to tight budgets while also trying to manage rapidly growing energy costs.

So, where are the current energy inefficiencies in FM transmission? A typical transmitter has different stages, including one or more power blocks capable of supplying anything from a few watts to 10 kW for standard models. The efficiency of the most recent 10 kW transmitter sitting at about 76% translates into a direct electrical power consumption of about 13.3 kW per hour, 24 hours a day. The result is that in a single year, the electricity consumption for one 10 kW FM transmitter is around 120 MWh; that's about half the annual electricity consumption of a city the size of Berlin.

SmartFM allows broadcasters to reduce their energy costs by up to 40% without impacting either audio quality or coverage.

This cost base of such calculations should also include indirect electricity consumption, such as the forced ventilation of a transmitter's amplifier stages and a portion of the air conditioning of the premises housing the transmitter. In each case, these additional costs are directly proportional to the dissipation of a transmitter, which, in turn, is directly related to its output power.

While purely technological efforts have significantly improved the efficiency of transmitters over the years, there remains little additional scope to move beyond the current state due to the theoretical limits of physical component optimization.

Instead, innovation depends on addressing the structural fundamentals of FM, particularly by combining the tremendous progress made in transmitter and receiver performance with "intelligent" transmission management. [Redtech News]

APAC A NASCENT MARKET OF UNTAPPED POTENTIAL FOR ADDRESSABLE TV

Industry initiatives to boost awareness and understanding of addressable TV – a form of TV advertising where advertisers can target specific video ads to specific households during regularly scheduled TV programmes – can help drive substantial growth in the Asia-Pacific region.

While a new report by Ampere Analysis in partnership with GroupM Nexus's addressable TV solution Finecast and Microsoft Advertising reported that the global addressable TV sector is now a US$56 billion industry, only one-eighth of APAC video advertising budgets are currently being spent on addressable TV.

According to the report, some brands in APAC markets remain unaware of the sheer reach of addressable, while others lack a full understanding of geographic and demographic targeting capabilities. By 2027, the global addressable TV sector is estimated to be worth US$87 billion.

One APAC market leading the way and offering valuable best-practice lessons is Australia, where a common ID system deployed across broadcaster video-on-demand (VoD) services allows brands to more easily plan cross-product campaigns. With addressable TV able to address challenges such as service fragmentation and audience management, the report believes there is "immense potential" for APAC to overcome obstacles and emerge as a thriving and innovative market in the near future. [APB News]

IN-CAR DAB+ "REACHING MATURITY" REFLECTED AT WORLDDAB AUTOMOTIVE 2023

In-vehicle DAB+ is now "reaching maturity", said WorldDAB President Patrick Hannon as he opened WorldDAB Automotive 2023 in Paris. Hannon cited figures showing that 96% of new cars sold within the European Union came with DAB+, meaning 10 million new vehicles on the road in Europe with DAB+ in 2022. He described this level of DAB+ in-car penetration as completely transforming the radio landscape, and added this change is clearly illustrated by listening figures in the UK, where, for the first time, DAB now accounts for more than 50 percent of all radio listening in cars.

Over 500 delegates from 60 countries gathered at Maison de la Radio, home of Radio France in Paris, and online for the annual conference, which brings together the broadcast and automotive sectors. All the major automotive OEMs, along with many key suppliers, attended the event, which was organised by WorldDAB, the global industry forum for DAB+ digital radio.

The event also saw the launch of the "Dashboard Dialogue" research study, commissioned by WorldDAB and undertaken earlier by Edison Research, which includes in-vehicle interviews with new car buyers in the UK, France and Germany. Megan Lazovick, Vice President, Edison Research highlighted the key findings, including that radio remains the most listened-to audio platform in the car. Delegates saw videos of the interviews, which underlined the findings that drivers believe radio is essential in-car, with one driver saying: "a car without a radio is like a shopping trolley without wheels." [WorldDAB News]

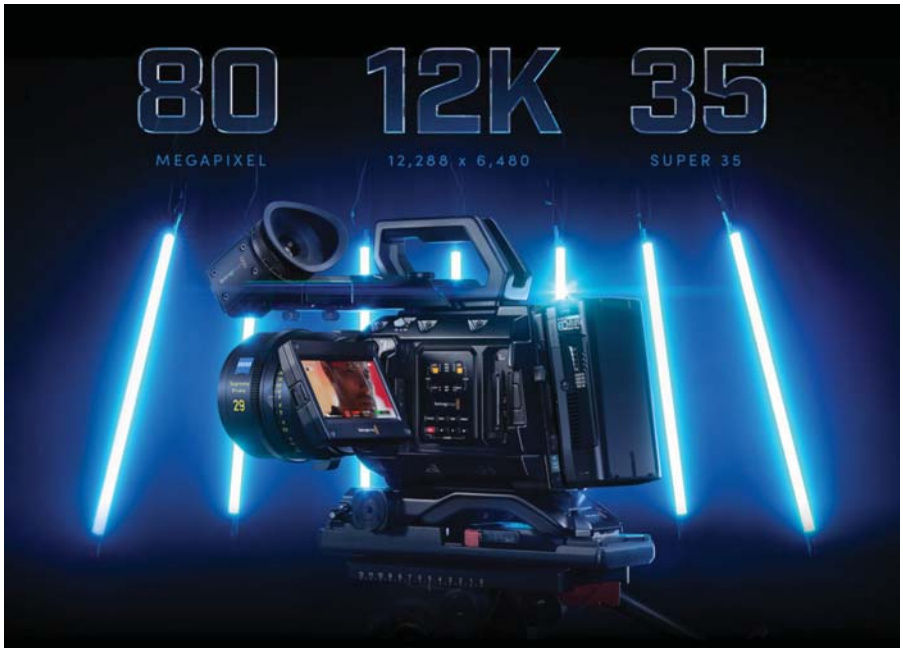
TAG'S MCS INTO SKYLINE'S DATAMINER OFFERS DEEP WORKFLOW HEALTH INSIGHTS

TAG Video Systems has announced an enhanced level of integration with Skyline Communications' DataMiner. This development brings support for TAG's Media Control System (MCS) into DataMiner's media management platform, offering users increased visibility, automation, and control across the entire workflow.

Serving as a monitoring control and data aggregation engine, TAG's MCS can empower media organisations and content owners to track signals and optimise their operations for maximum growth and resource management. By integrating support for TAG's MCS into Skyline's DataMiner platform, users gain access to deep media health insights and management capabilities on DataMiner's Dashboards and Apps, with alarms from both solutions displayed on TAG's advanced multiviewer display.

The integration introduces robust automation, control, and orchestration features to the MCS, delivering data and notifications aggregated by both DataMiner and TAG's MCS in one centralised location. This integration enhances day-to-day workflows, allowing operators to simultaneously monitor the status of their infrastructure using DataMiner and obtain real-time insights into the health of their content and live streams through TAG. [APB News] ■

Equipment Trends



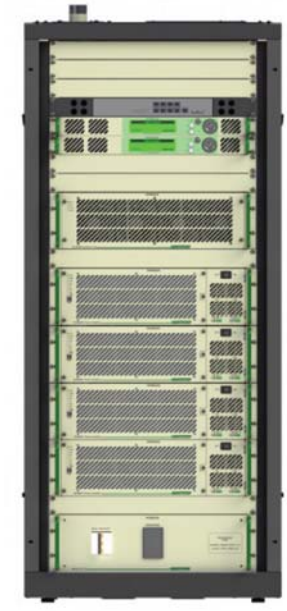
BLACKMAGIC URSA MINI PRO 12K AJA

Blackmagic URSA Mini Pro 12K with a 12,288 x 6480 12K Super 35 sensor and 14 stops of dynamic range, built into the award winning URSA Mini body. The combination of 80 megapixels per frame, new colour science and the flexibility of Blackmagic RAW makes working with 12K a reality. Oversampling from 12K gives you good 8K and 4K images with the subtle skin tones and better detail of high end still cameras. You can shoot at 60 fps in 12K, 120 fps in 8K and up to 240 fps in 4K Super 16. URSA Mini Pro 12K features an interchangeable PL mount, as well as built in ND filters, dual CFast and UHS-II SD card recorders, a SuperSpeed USB-C expansion port and more. DaVinci Resolve Studio is included for creative control through post from editing to colour, VFX and more.

URSA Mini Pro 12K's extreme resolution goes well beyond traditional motion picture film. You get the benefits of shooting with film including incredible detail, wide dynamic range and rich, deep colour. Fits well for feature films, episodic television and immersive, large format IMAX. The incredible definition around objects makes it ideal for working with green screen and VFX including compositing live action and CGI. Super sampling at 12K means you not only get better colour and resolution at 8K, but also a smoothness that comes from making aliasing invisible. This new generation of digital film technology ushers in an analog style purity and subtlety to deliver a better than film experience.

The Blackmagic URSA Mini Pro 12K features a revolutionary new sensor with a native resolution of 12,288 x 6480, which is an incredible 80 megapixels per frame! The Super 35 sensor has a superb 14 stops of dynamic range and a native ISO of 800. The new 12K sensor has equal amounts of red, green and blue pixels and is optimized for images at multiple resolutions. You can shoot 12K at 60 fps or use in-sensor scaling to allow 8K or 4K RAW at up to 120 fps without cropping or changing your field of view. URSA Mini Pro's interchangeable lens mount lets you choose from the widest range of vintage and modern cinema lenses, so you can capture every ounce of character and detail from your favourite optics.

https://www.blackmagicdesign.com/



COMARK, EC600HP-BB3 VHF BAND 3 E-COMPACT SERIES HIGH-EFFICIENCY, AIR-COOLED SOLID-STATE DTV TRANSMITTERS

The EC600HP-BB3 product line is available with up to 4 x PA's in parallel, producing from 1150W to up to 4.6kW respectively. These output power levels are measured after the mask filter. This new VHF band 3 E-Compact delivers the same features as the UHF version including:

- EXACT-V2 digital TV exciter licensed for ATSC 1.0, optional license for ATSC 3.0
- Hot-swappable rectifiers accessible from the front panel of the PA chassis
- Dual commercial off-the-shelf GE AC to DC rectifiers per PA in load share mode
- Single drive exciter & controller or optional dual drive with auto switching
- Newly improved system controller with a simpler Graphical User Interface (GUI)
- Built-in surge protection devices (SPD) to minimize power grid overvoltage
- Optional front panel touch screen for easier user access to the control / monitoring GUI

The EC600HP-BB3 features the latest broadband Doherty LDMOS RF

power amplifiers with efficiency of up to 40%. The air-cooled PA design includes automatic cooling fan speed control that provides lower acoustic noise levels during operation while extending the life span of these fans. Each 3RU PA features a rear-panel plug-in design for easy installation and maintenance. Multiple RF amplifiers are combined with an insulated RF combiner enabling Hot Swap of the PAs.

The transmitters use a built-in Embedded WEB Server that provides control and management of the transmitter through a web-GUI (via PC or mobile phone standard browser) without the need for any external software or drivers. SNMP for transmitter remote control and monitoring is also available.

The E-Compact features the field proven EXACT-V2 IP Optimized DTV exciters with DualCast technology and is easily upgraded from ATSC 1.0 to 3.0. EXACT-V2 delivers an ATSC compliant, on-channel RF output and performs RF precorrection of both linear and non-linear distortion via Digital Adaptive Precorrection (DAP) technology. DAP automatically corrects both the linear and non-linear system distortions inherent to all DTV systems. The use of DAP provides the lowest cost of operation with very high system efficiency and RF SNR performance.

The E-Compact family is compact and rugged, well suited for broadcasters looking to replace their older and less efficient equipment or for future ATSC 3.0 SFN systems.

https://comarktv.com/

MATROX VIDEO, LUMA PRO GRAPHICS CARDS

Matrox Video releases new LUMA Pro graphics cards for demanding video wall applications. Matrox® Video has announced the launch of the LUMA Pro Series, a new line of graphics cards powered by Intel Arc GPUs. Engineered to power digital signage and video wall systems, the low-profile LUMA A310FP and the standard-height LUMA A380P offer the ultimate display flexibility, supporting up to two 8Kp60, two 5Kp120, or four 5Kp60 DisplayPort 2.1 monitors. They can also be combined to drive a high-density-output video wall of up to 16 synchronized 5Kp60 displays. Along with a rich assortment of video wall software and developer tools, the LUMA Pro Series cards enable OEMs, system integrators, and AV installers to deploy high-performance display walls for a broad range of commercial and critical 24/7 applications, including control rooms, enterprises, industrial, government, military, digital signage, broadcast, and more.

OEMs, systems integrators, and AV professionals can easily add – and synchronize – displays by frame-locking up to four LUMA Pro cards via board-to-board frame-lock cables. In addition, LUMA Pro cards support Microsoft DirectX 12, OpenGL 4.6, and OpenCL 3.0, as well as Intel's oneAPI for compute tasks and the Intel Distribution of OpenVINO toolkit for AI development.

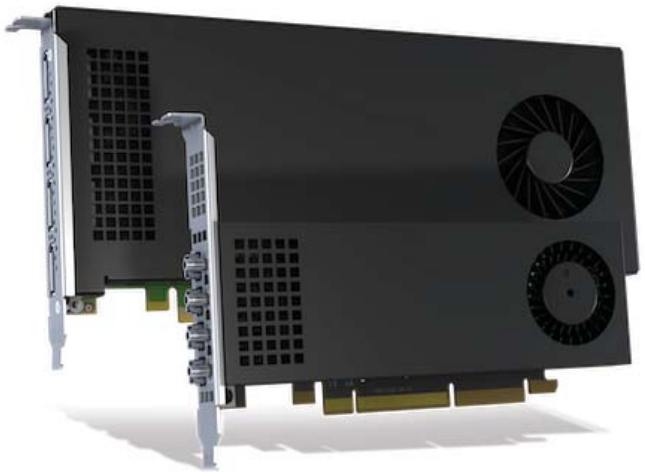
The LUMA Pro cards also feature state-of-the-art GPU-based H.264 and H.265 media codec engines, setting a benchmark in their class. These engines are fully backed by the comprehensive Matrox Mura software libraries, enabling the decoding of over 40 full HD streams per card. As a result, users can now effortlessly create IP-based video walls using only LUMA Pro graphics cards, a possibility that was previously unattainable. This breakthrough not only saves valuable space but also significantly reduces power consumption and hardware costs associated with video wall controllers.

LUMA Pro Series graphics cards work seamlessly with Matrox Video's complete display wall portfolio. OEMs and system integrators can pair LUMA Pro with Matrox Mura IPX capture and IP encode/decode cards for multi-channel 4K and full HD capture with advanced HDCP functionality to capture and display content-protected sources – including set-top boxes, Blu-ray Disc and media players, and video game consoles. LUMA Pro can also be combined with Matrox QuadHead2Go™ multimonitor controllers to create ultra-large-scale configurations of up to 64 1920x1080p60 screens. LUMA Pro's built-in frame-lock capability, coupled with Joined Mode in Matrox PowerDesk™ software, makes it possible to create a single canvas easily using multiple cards that act as one. In this way, the video application can take advantage of a large display space created with multiple GPU cards.

LUMA Pro includes the robust Matrox PowerDesk desktop management software. Users can select from a variety of advanced tools – including Stretched or Independent desktops, Clone Mode, Pivot Mode, Bezel Management, Edge Overlap, Joined Mode, and more – to easily configure and customize multi-display setups. Meanwhile, the feature-rich Matrox MuraControl video wall management software provides an intuitive platform to manage video wall sources and layouts, either locally or remotely and in real time.

Matrox Video's video wall APIs, SDKs, and libraries are also available for developers and AV installers interested in creating custom control functions and applications.

https://video.matrox.com/



STUDER VISTA, EVERTZ UNVEILS NEW TOOLS FOR LIVE PRODUCTION WORKFLOWS

High quality audio is vital when creating engaging live content for any platform because if the sound is poor, audiences quickly move on. Since acquiring Studer in 2021, Evertz has integrated the brand's Vista digital mixing consoles into its own Software Defined Video Networking (SDVN) platform. These acclaimed consoles now support SMPTE ST 2110, making them an important addition to Evertz' live production workflows, which are leading the industry's transition to IP.

Evertz has also brought all the power of Studer Vista to its DreamCatcher™ BRAVO Studio virtual production control suite, which allows users to quickly and easily produce high quality live content at a lower cost. The introduction of Vista BRAVO adds an exciting new dimension to the platform by providing virtual access to a full mixing console featuring all the enhanced audio capabilities for which Studer is so famous. With Vista BRAVO, users all the flexibility they need to enhance live music, entertainment, gaming and sports productions, whether working on-premises or through the cloud.

Another innovation to the Studer Vista range is the expanded Vista control using the Evertz VUE Intelligent User Interface. Now offering over 2000 bidirectional controls, the combination of Vista and VUE has created the ideal tool for multiple small production suites and remote productions.

Shorter adds that introducing Vista BRAVO, together with VUE, pulls Studer's superior audio capabilities into the BRAVO Production suite eco system with MAGNUM-OS at its heart. Video PFL is a direct result of knowledge sharing between video and audio and provides an effective solution for audio production engineers.

New to the Studer Vista console range is the revolutionary Video PFL (Pre-Fade-Listen) feature that maximises the power of Evertz MAGNUM OS orchestration, monitoring and analysis software. With Video PFL, audio operators can select an input to pre-fade while listening to the audio and seeing the accompanying video for that channel on the multiviewer in the audio control room. By allowing the video to follow the audio, Evertz gives engineers a visual representation of the audio on the PFL, thus ensuring that the right source is always selected.

Alongside its Live Media Production solutions for audio, Evertz will also show other developments to BRAVO Studio, which is fast becoming the 'go-to' collaborative, software-based live production platform for content creators and broadcasters. These include the new 'Highlight Factory', where clips and stories are automatically created using AI technology, and published to Ease Live where users can pick their own highlights. The 'Highlight Factory' is an additional co-pilot for BRAVO Studio that uses advanced data-driven features to help automate and simplify production workflows and give small creative teams of all skill levels high-quality and consistency throughout the production.

https://evertz.com/

LAWO, POWER CORE, REV3

Lawo has announced the latest version of Power Core, its high-density I/O, mixing, processing and routing engine. Power Core provides multiple high-density Ravenna/AES67 and MADI interfaces. It also offers modular mic, line, AES3, GPIO and Dante interfaces.

The new Power Core Rev3, alongside the still available Rev2 version, boasts high I/O capacity. Using industry-standard Ravenna/AES67 networking, AoIP facilities built with Power Core can easily scale from simple two- or three-room on-air suites to massive broadcast networks with thousands of channels of analog and digital audio and control, full routing capabilities and facility-wide DSP bus and input audio processing. The internal matrix provides 1,920 x 1,920 crosspoints, up to 96 channels of DSP input processing supply EQ, dynamics, de-essing, limiting and delay. Capable of powering consoles with up to 60 physical and 60 virtual faders, Power Core offers support for up to four independent control surfaces simultaneously.

Power Core Rev3 has four Ravenna/AES67 ports with SFP, double the

previous number. The additional capacity can be used to expand I/O to as many as 512 Ravenna/AES67 channels, or to provide LAN segment separations or LAN-WAN gateway applications in large-scale deployments. Bidirectional Unicast Ravenna/AES67 streams are now supported for wide-area applications. The front panel now has a convenient USB port and an SD memory card slot with security cover for software maintenance operations. A new GPI/O expansion card provides eight GPI + eight GPO and two VCA inputs. This brings control features to the family of Power Core expansion cards. New DSP capabilities include a low-latency Loudness Leveler and other improvements.

https://lawo.com/

WHEATSTONE, STREAMBLADE & WHEATSTREAM

Streamblade addresses the unique challenges of multiple program streams. It is a 1 RU BLADE unit for streaming applications that features key Wheatstone AoIP, audio processing and codec bandwidth optimization technology.

- Selectable AAC, Opus, and MP3 encoders targeting high to low bit rates for reaching a broad range of end user devices and players.
- Accepts eight input streams of native WheatNet-IP audio directly from a soundcard or AoIP driver as well as RTP sources, each capable of four outputs for a total of 32 total output streams.
- Five-band intelligent AGC, dual-band limiter and other audio processing designed to optimize the performance of encoded audio content.
- Cloud-ready and compatible with standard CDN and streaming platforms. Supports HLS, Icecast, RTMP, and RTP streaming protocols.
- Lua transformation filters adapt metadata input from any automation system into any required output format for transmission to the CDN server.
- Local I/O connectivity for other than WheatNet-IP audio network applications.
- Streamblade: WheatNet-IP, Analog, AES3 and AES67 inputs
- Wheatstream: WheatNet-IP and AES67 input (via IP)
- Nielsen encoder optionally available. The PPM watermark is inserted after the dual-band limiter to avoid interference with codec performance
- BS.1770-compliant loudness control manages loudness between -24 and -10 LUFS
- Wheatstone's streaming appliances and Layers cloud streaming software are now available with Triton Digital's streaming protocol.

Unique to Streamblade is its five-band AGC with RMS density driven time constants for establishing tonal balance and level consistency between incoming music sources. Unlike the conventional approach of applying multiband gain control followed by fast compression to build uniform loudness and density from one music source to the next, this AGC is designed specifically for streaming applications and eliminates aggressive RMS attack times that can interfere with codec performance.

Streamblade & Wheatstream Include New Nielsen Audio Software Encoder. Wheatstone worked behind the scenes with Nielsen developers and has gone through the necessary testing to receive the Nielsen certification. The Audio Software Encoder is now integrated in our Streamblade for service to all 32 possible streams. The PPM watermark is inserted after the dual-band limiter for a robust, consistent signal that can be picked up by the PPM without interfering with the performance of the audio codec. Need the power of Streamblade, but not the rest of the marvelous functions of a Blade? Wheatstream is just what you're after. It too is a single rack space device that has the streaming and processing functionality of Streamblade, but without all of the usual Blade functions and I/O, for a lower cost. Wheatstream features WheatNet-IP and AES67 input (via IP).

Also onboard is a stereo width management section that produces a perceived stereo field yet eliminates the big swings in dynamic L-R that can skew the codec algorithm as well as bass boost and monaural bass features for optimizing the quality of the bit stream.

A selectable six-band parametric equalizer with peak and shelf functions, high and low pass filtering for removing noise or hum, and two-stage phase rotator to correct voice asymmetry are also included in StreamBlade.

StreamBlade can be configured and managed from a laptop and web browser using WheatNet-IP NAVIGATOR software. It has two Ethernet ports, one for direct connectivity into the WheatNet-IP audio network on one end and another for connectivity into a WAN for streaming to a CDN or other service provider.

https://wheatstone.com/ ■

REBECCA HANSON APPOINTED NEXT NABA DIRECTOR-GENERAL

Toronto, ON – April 14, 2023 – Borika Vucinic, President of the NABA Board of Directors, is pleased to announce the appointment of **Rebecca Hanson** as the new Director-General of NABA. Ms Hanson begins as Director-General designate on April 15th, where she will work alongside NABA's current Director-General Michael McEwen before taking full responsibility on July 1st. Mr McEwen will be retiring this summer.

"As over-the-air broadcasters move to the multi-platform streaming IP world, they remain committed to serving their listeners and viewers in the communities where they live, work and play," says Ms Vucinic. "Rebecca understands this unique role in a multimedia world and will work with our members as broadcasting adapts to a rapidly changing environment on the national, regional, and international fronts."

An experienced broadcast and media executive, Ms. Hanson has managed numerous policy issues before the U.S. Federal Communications Commission (FCC) and Congress relating to broadcast regulation. While SVP of Policy and Strategy at Sinclair Broadcast Group, she advocated for new video technology, fair compensation for cable carriage, and spectrum protection. She also served as General Counsel for HC2 Broadcasting group overseeing the regulation of 250 full- and low-power television stations.

At the FCC, Ms. Hanson served in a variety of roles, beginning with the first U.S. National Broadband Plan in 2009, the related broadcast spectrum auction planning in 2011, and other broadcast policy issues including the transition to ATSC 3.0. She currently serves on the Maryland Public Broadcasting Commission and is on the board of the U.S. NAB Leadership Foundation.

Ms Hanson will continue to address these issues in her new leadership role at NABA with a solidly forwardlooking strategy that includes resisting all forms of encroachment on broadcast spectrum, a continued commitment to broadcasting core values as a public good, and demonstrating other values that broadcasting offers in evolving communications.

"Broadcasters throughout North America are rightfully proud of their service to local communities, and NABA will continue to support that mission among the challenges and opportunities presented by new streaming technologies," Ms Hanson says. "But when it comes to regional matters (like spectrum and technology coordination, or equipment markets) and international issues (like spectrum usage at the ITU or copyright protection at WIPO) NABA is best situated to represent broadcasters' common interests in Canada, Mexico and the U.S. I am honored to be chosen to lead these efforts and look forward to working with all stakeholders in the months and years ahead."

The announcement was made after a thorough global search conducted by a third-party organization in coordination with a search committee comprised of NABA Board directors and other key members. NABA's Board of Directors and staff are excited to work with Ms Hanson and believe she will be a terrific voice for the organization.

About NABA

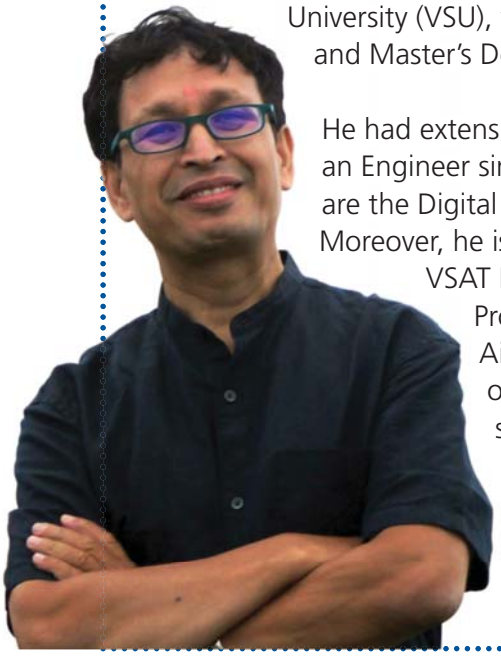
NABA is a non-profit association of the most influential broadcasting organizations in North America committed to advancing the interests of broadcasters at home and internationally, and to identify and take action on technical, operational and regulatory issues affecting North American broadcasters. Both public and private network broadcasters in Canada, Mexico and the United States, work together to provide a common voice for the North American broadcast community. As a member of the World Broadcasting Unions (WBU), NABA creates the opportunity for its members to share information, identify common interests and reach consensus on issues of an international nature.
www.nabanet.com | @NABA_ORG

For more information, contact:
Ashley Spanton
North American Broadcasters Association
ashley@nabanet.com

NEW TECHNICAL LIAISON OFFICER

Mr Udaya Krishna Shrestha has been appointed to the position of ABU Technical Liaison Officer replacing Mr Krishna Chandra Paudel who is now as a Deputy Head for Radio Nepal.

Mr Udaya currently holds the position of Chief Engineering Department (Production & IT). He served in Radio Nepal as a Deputy Director from 2011 until 2022. He attended the Vladimir State University (VSU), where he earned both his Bachelor's and Master's Degrees in Radio Engineering.



He had extensive professional experience serving as an Engineer since 1998 and his main responsibilities are the Digital Archiving System, Studio and IT. Moreover, he is also an expert in OTT, web portal, VSAT Programme Link, DTH, Streaming Program Link, SW/MW/FM On-Air Broadcast Systems, installation of low/medium power FM fill in stations, repair and maintenance of radio equipments and AM/FM transmitters, installation of New Technologies and Digital Broadcasting Switchover. ■

ABU SECRETARIAT WELCOMES **NUR AQILAH MOHD IZAM**

Nur Aqilah Mohd Izam has recently joined the ABU Technology Department as Assistant to Director. She is Malaysian and holds a Bachelor's Degree of Communication (Hons.) majoring in Broadcasting. Prior to joining the ABU, she has worked as Corporate Admin Executive at Kelab Golf Perkhidmatan Awam Malaysia providing corporate communications, legal administration and high-level secretarial support to the general committee members. ■

ABU TECHNOLOGY CALENDAR *of Events* 2023

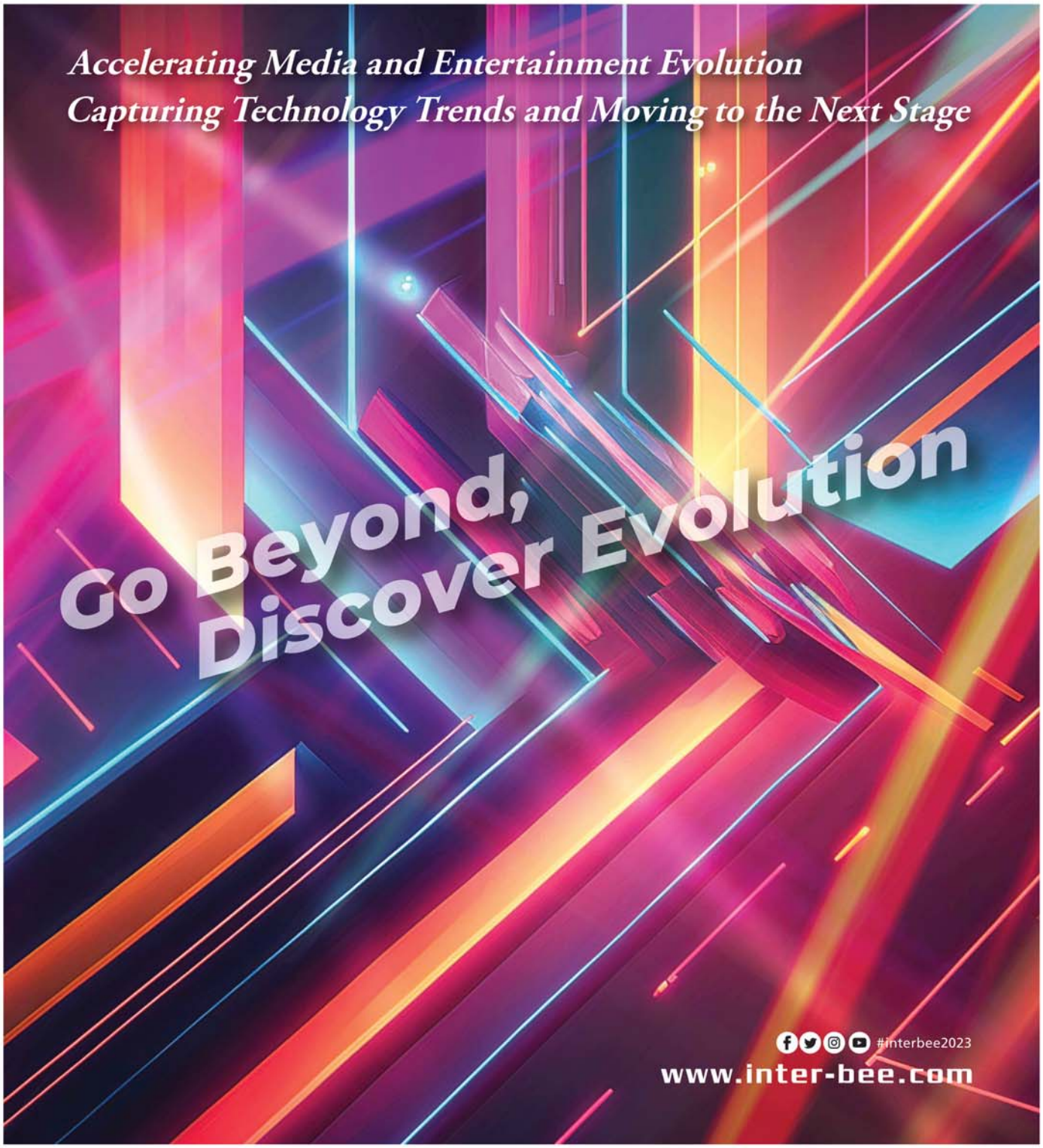
18-20 July	ABU-ASBU Technical Workshop on Digital Radio	Online
1-3 August	Broadcast Archive Systems Workshop	Kuala Lumpur, Malaysia
September	Webinar Series on Member Innovation	Online
15-18 September	International Broadcasting Convention 2023	Amsterdam
9-13 October	ABU-ASBU Satellite Workshop	Tunis, Tunisia
17 October	ABU Technical Bureau Annual Meeting	Online
28-29 October	ABU Technical Committee Meeting	Seoul, Korea
28 October-1 November	ABU General Assembly	Seoul, Korea
December	Engineering Engineering Fundamental Training Course Level 3	Online

Broadmedia & Entertainment

Inter BEE 2023

Makuhari Messe: 11.15 Wed. ⋙ 17 Fri.

Exhibition Guide



CALL FOR NOMINATIONS

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ABU Broadcast Engineering Excellence Award

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ABU Engineering Industry Excellence Award

SUBMIT HERE

ABU Developing Broadcasters' Excellence Award

SUBMIT HERE

ABU Broadcast Engineering Award on SDGs Implementation

SUBMIT HERE

ABU Young Engineers' Broadcasting Award

ABU
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