

DIGITAL BROADCASTING SYMPOSIUM 2023

FULL REPORT INSIDE



ABU DBS 2023
BACK IN BUSINESS

6-9 MARCH 2023

ROYALE CHULAN
KUALA LUMPUR

ALSO INSIDE

MFCC-GAN Codec: A New AI-based Audio Coding

RTM's HD News Digital Archive

HDR Vivid Standard and Application in China

Broadcasting, Risks and Disasters: What Could Possibly Go Wrong?

VX Series

150 W to 6 kW FM Analog Transmitters



11 NEW Nautel Transmitters

- More power choices to fit your needs
- AUI: Secure, HTML5 Tx Control
- Instrumentation, RDS, SNMP, Presets
- PhoneHome for enhanced service
- Modular 3-6 kW for easy service & low weight
- World-class reputation: Design, Build, #1 Support
- Rigorous testing and quality assurance
- Long service-life design
- 4 year warranty



Compact • Efficient • Affordable

nautel.com


nautel

- 02 MFCC-GAN Codec: A New AI-based Audio Coding
- 07 Digital Broadcasting Symposium 2023: Back in Business
- 21 DBS 2023 Workshops
- 27 DBS 2023 Masterclass: Digital Content Strategies
- 28 DBS 2023 Masterclass: The Transition From SDI to IP and IP Workflows & Remote Production
- 29 RTM's HD News Digital Archive
Revolutionary Broadcast Technology Towards Effectiveness - Future Demand Part 2
- 36 HDR Vivid Standard and Application in China
- 39 Broadcasting, Risks and Disasters: What Could Possibly Go Wrong?
- 45 News from the ABU Region
- 49 Digital Broadcasting Updates
- 52 A23 Global Coordination Conference
- 53 Equipment Trends
- 56 DBS 2023 Team
- 57 Personalities & Posts
- Farewell to Mr Hamdhoon Rashad
- 58 Introducing The New Director of ABU Technology | Dr Veysel Binbay
- Calendar of Events
- 59 Thank you and Farewell Dr Javad



Cover: ABU Digital Broadcasting Symposium 2023

from The Editor

The highlight of this edition is the ABU's 19th Digital Broadcasting Symposium (DBS2023) event which took place at the Royale Chulan Kuala Lumpur, marking a return to in-person events after a break of two years. The event spanned four days and featured a comprehensive programme of 12 conference sessions, 9 workshops and 5 masterclasses led by over 90 industry experts and speakers from various corners of the globe. The event also included a 42 booth industry exhibition showcased by leading industry solution providers. The sessions addressed more than 63 topics and discussions which highlighted some of the trending topics such as; Cybersecurity and Media Industry, Sustainable Technologies and Strategies in Broadcasting, AI, Blockchain and Data Applications in Media, IP-centric Solutions for Broadcasters, NextGen Infrastructure and Immersive AV Experiences. We would like to thank all those who graced us with their presence in Kuala Lumpur, as well as our esteemed sponsors, supporters, and partners.

In this edition, we bring you four feature articles. The first one is an insightful research article titled "MFCC-GAN Codec: A New AI-based Audio Coding", contributed by colleagues from IRIB-R&D, which proposes an AI-based audio coding approach with very promising results compared to existing systems. The second on "RTM's HD News Digital Archive", is a continuation of part-1 of the same from the last edition taking a deep dive into the development of the system. The third article, from RTPRC-China titled "HDR Vivid Standard and Application in China", focuses on the new HDR Vivid standard which builds on improving the characteristics of the existing standards including dynamic metadata, tone mapping, saturation etc. The final feature article is based on the webinar presented last February on "Broadcasting, Risks, and Disasters: What Could Possibly Go Wrong?", which focuses on the need to be prepared for the unexpected situations in order to minimise the impact of disasters and maintain continuity of the broadcasting service.

This edition also features highlights from the recent activities organised by ABU Technology. The edition concludes with our regular highlights from industry news, digital updates, and the latest equipment trends.

Finally, let me take this opportunity to introduce the new Director of ABU Technology, Dr Veysel Binbay from TRT- Türkiye, who has taken office recently (you will find more details inside) and will take a lead in continuing the work of ABU's Technology division. This will be my final editorial leading the TR publication and ABU Technology. I would like to extend my appreciation and gratitude to all the contributors and partners in the past and look forward to your continued support to make the TR a successful endeavour that my colleagues can continue to deliver.

Thank you and we hope you will find the information included useful.

Ahmed Nadeem
nadeem@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.

The ABU Technical Review is published in March, June, September and December of each year.

The reproduction of articles published in this Review is not permitted, except with the prior consent of the Editor. News items may be reproduced provided that the source is acknowledged.

Responsibility for contributed articles published rests solely with the authors and the views expressed are not necessarily those of the ABU.

Subscription rates (annual, 4 issues): Asia-Pacific US\$40.00; the rest of the world US\$45.00. Advertising and Editorial offices at Kuala Lumpur.

Published by
Ahmed Nadeem
ABU Technology

The Asia-Pacific Broadcasting Union
2nd Floor, IPPTAR Building, Angkasapuri, 50614 Kuala Lumpur, Malaysia
Telephone: (60-3) 2282 3108 Fax: (60-3) 2282 5292

For advertising inquiries, contact
Nur Aqilah Mohd Izam email: aqilah@abu.org.my
Nur Farisa Nerina Rosli email: nerina@abu.org.my

Design & Layout by: **The Vermillion Trading**
Koi Tropika, Block E-08, Jalan Puchong Batu 13 1/2, 47100 Puchong, Malaysia

MFCC-GAN Codec: A New AI-based Audio Coding

ABSTRACT

In this paper, we proposed AI-based audio coding using MFCC features in an adversarial setting. We combined a conventional encoder with an adversarial learning decoder to better reconstruct the original waveform. Since GAN gives implicit density estimation, therefore, such models are less prone to overfitting. We compared our work with five well-known codecs namely AAC, AC3, Opus, Vorbis, and Speex, performing on bitrates from 2kbps to 128kbps.

MFCCGAN_36k achieved the state-of-art result in terms of SNR despite a lower bitrate in comparison to AC3_128k, AAC_112k, Vorbis_48k, Opus_48k, and Speex_48K. On the other hand, MFCCGAN_13k also achieved high SNR=27 which is equal to that of AC3_128k, and AAC_112k while having a significantly lower bitrate (13 kbps). MFCCGAN_36k achieved higher NISQA-MOS results compared to AAC_48k while having a 20% lower bitrate. Furthermore, MFCCGAN_13k obtained NISQA-MOS=3.9 which is much higher than AAC_24k, AAC_32k, AC3_32k, and AAC_48k. For future work, we finally suggest adopting loss functions optimising intelligibility and perceptual metrics in the MFCCGAN structure to improve quality and intelligibility simultaneously.

INTRODUCTION

Speech coding is an integral part of any communication system. Coding helps such systems utilise the bandwidth optimally and create more capacity to deliver information. Whereas conventional coding approaches lie more on algorithmic processes, deep learning approaches are data-driven

methods. Kuyk et al. compute the true information rate of speech to be less than 100 bps [2]. High-quality speech codecs typically operate at bit rates over 16 kbps [3]. Opus [4] can handle a wide range of audio applications, including Voice over IP, videoconferencing, in-game chat, and even remote live music performances. Advanced Audio Coding (AAC) [5] is an audio coding standard for lossy digital audio compression. Designed to be the successor of the MP3 format, AAC generally achieves higher sound quality than MP3 encoders at the same bit rate. It can scale from low-bitrate narrowband speech to very high-quality stereo music. Dolby AC-3 [6] is the name for what has now become a family of audio compression technologies developed by Dolby Laboratories. AC-3 supports audio sample rates up to 48 kHz. It is worth noting that AAC and AC3 are well-known broadcasting audio codecs currently standardised and utilised in different broadcasting unions.

Vorbis is a general-purpose compressed audio format for mid to high-quality audio and music at fixed and variable bitrates from 16 to 128 kbps/channel [7]. Speex [8] is based on the Code Excited Linear Prediction (CELP) [9] algorithm and, unlike the previously existing Vorbis codec, is optimised for transmitting speech for low latency communication over an unreliable packet network. Deep Neural Networks (DNN) [10], Convolutional Neural Networks (CNN) Variational AutoEncoder (AE) [11] along with Generative Adversarial Networks (GAN) [12] are among the important AI networks to apply to audio coding. AE networks by using an encoder-decoder framework with an information bottleneck

in-between creates the possibility of designing low-bit-rate speech. WaveNet [13] is among the pioneer audio generative models based on PixelCNN architecture [14]. Rather than coding, WaveNet can provide a generic and flexible framework for tackling many other applications that rely on audio generation such as Text-To-Speech (TTS) [15], speech enhancement, [16], and voice conversion [17].

Since deep learning approaches could condition on certain features, the combination of conventional algorithmic approaches with new deep learning could result in low-bit rate codecs. Kleijn et al. [18] used a learned WaveNet decoder to produce audio from the bit stream generated by the encoder in Codec2 (a parametric codec designed for low bit rates) operating at 2.4 kbps. This demonstrates how a learned decoder can better reconstruct the original signal over conventional hand-engineered algorithmic decoders even by using a low-bit rate encoder [3]. Moreover, VQVAE [19] is a frame that can encode speech into a compact discrete latent representation and then reconstruct the original audio by a decoder conditioned on certain features. In fact, can be used as an end-to-end speech codec mapping the input audio to the discrete latent space learned by VQ-VAE and then reconstructing the signal using the decoder network conditioned on the latent representation [3].

A combination of VQVAE and WaveNet to create an architecture suited to the task of speech coding has been introduced in [3]. This architecture reduces 16-bit pulse-code modulation (PCM) encoded speech at 16 kHz sample rate (256 kbps) to a stream of discrete latent

codes at 4 kbps. An important point about utilizing VQVAE in speech coding is to maintain input prosody at the output reconstructed signal. Gârbacea et al. suggests using a loss term to preserve pitch (f0) and timing information. Recently released, SoundStream [20] is an end-to-end neural audio codec that can efficiently compress speech, music, and general audio at normal bitrates. SoundStream relies on a model architecture composed of a fully convolutional encoder/decoder network and a residual vector quantizer, which are trained jointly end-to-end. SoundStream at 3 kbps outperforms Opus [21] at 12 kbps and approaches EVS [22] at 9.6 kbps. In section II, we first introduce the proposed approach and then in sections III and IV, the experimental setting and assessment results are explained.

PROPOSED APPROACH

In this paper, we propose an AI audio coding approach based on adversarial learning. One of the problems of conventional coding is reconstruction artifacts. You may extract compact and informative representations of the signal but fail to reconstruct the original signal thoroughly. A good representation does not necessarily guarantee a good reconstruction.

On the other hand, if enough data is available, AI approaches could learn the nonlinear transform better and therefore, compensate for the defects usually occur in the decoding process of conventional audio codecs. What makes AI better than conventional reconstruction approaches comes back to the fact that learning methods (e.g. AI) take into account both representing features as input and the original signal as target simultaneously at the training phase. Whereas, conventional methods only have access to the extracted features and not the original signal as a target. Therefore, AI-based approaches generally have a high capacity for reconstruction if big data is available.

In this paper, we have used Mel-Frequency Cepstral Coefficients (MFCCs) for our feature extraction. These features are typically used in speech recognition [23] and music information retrieval [24]. As explained, the essential problem of conventional modelling locates the reconstruction signal out of extracted features. To overcome this problem, we suggest using a learned decoder for reconstruction. We extract audio coefficients and use the adversarial loss to generate output raw waveform. Since

Generative Adversarial Networks (GANs) produce explicit density, thus, we choose such architecture for our decoder framework.

GENERATIVE ADVERSARIAL NETWORKS (GAN)

Generative Adversarial Network (GAN) was first introduced in 2014 by Ian Goodfellow [12]. Since GAN gives implicit density estimation, therefore, such models are less prone to overfitting. GANs consist of two integral parts: generator and discriminator.

The generator tries to convert the input into the desired output. On the other hand, the discriminator acts as a strict teacher to detect real and fake data (generator output). The generator tries to fool the discriminator by generating an output similar to real target data, and then again, the discriminator tries to improve itself and not be fooled. The interaction between the generator and the discriminator finally ends with a better signal reconstruction.

Figure 1 shows the general structure of GAN systems operating on speech signals. We now describe the structure of the generator and discriminator adopted in our paper:

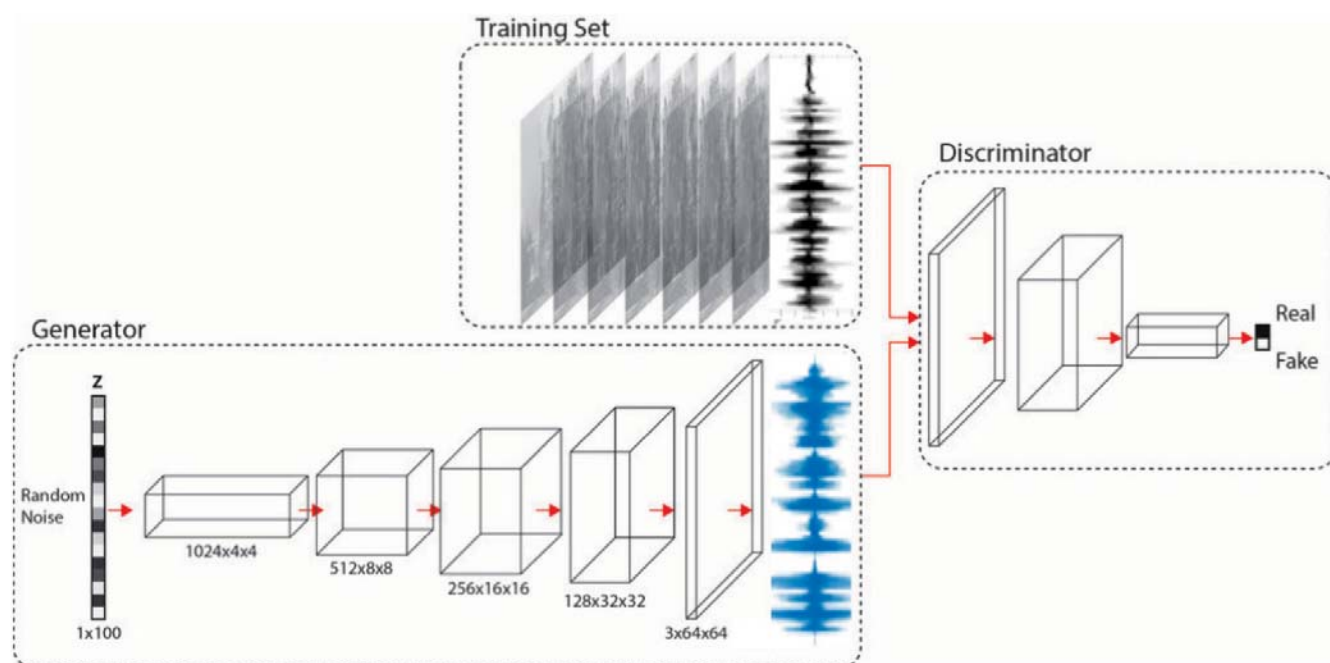


Figure 1: General structure of GAN

GENERATOR

The generator adopted here consists of fully convolutional layers converting input Mel-spectrogram to output raw waveform [1]. The output is 256X higher temporal resolution compared to the input. To upsample the resolution, a stack of transposed convolutional layers is used in sequence. Besides, each convolution layer is followed by a residual block consisting of dilated convolutions. The entire structure of the generator is illustrated in Figure 2(a).

DISCRIMINATOR

Discriminator consists of a multi-scale architecture with three discriminators (D1, D2, D3)

that have an identical network structure each operating at a different output audio scale [1]. Scaling output audio signals reveals different features; if high-frequency properties are required, a high temporal resolution signal should be taken into account. On the other hand, if low-frequency properties are desired, low-temporal resolution signals are considered. Finally, the use of three discriminators makes the final discriminator stricter and thus, forces the generator to generate signals more similar to the original one. It is illustrated in Figure 2(b).

LOSS FUNCTION

The objective functions used in the

training setting are as follows [1]:

$$\min_{D_k} E_{s,z} [\min(0, 1 - D_k(x)) + E_{s,z} [\min(0, 1 + D_k(G(s, z)))] \quad \forall k = 1, 2, 3 \quad (1)$$

$$\min_G E_{s,z} \left[\sum_{k=1,2,3} -D_k(G(s, z)) \right] \quad (2)$$

$$L_{FM}(G, D_k) = E_{s,z} \left[p_{\text{loss}} \left[\sum_{i=1}^T \frac{1}{N_i} \|D_k^{(i)}(x) - D_k^{(i)}(G(s))\|_1 \right] \right] \quad (3)$$

$$\min_G \left(E_{s,z} \left[\sum_{k=1,2,3} -D_k(G(s, z)) \right] + \lambda \sum_{k=1}^3 L_{FM}(G, D_k) \right) \quad (4)$$

Equation (1) and (2) tries to train the discriminator and the generator respectively. As explained, to increase the performance of the generator, the multi-scale discriminator adds LFM according to equation (3) and finally makes the total generator loss function according to (4).

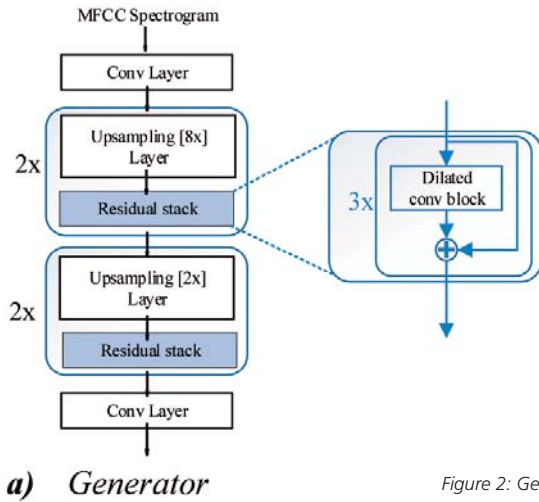
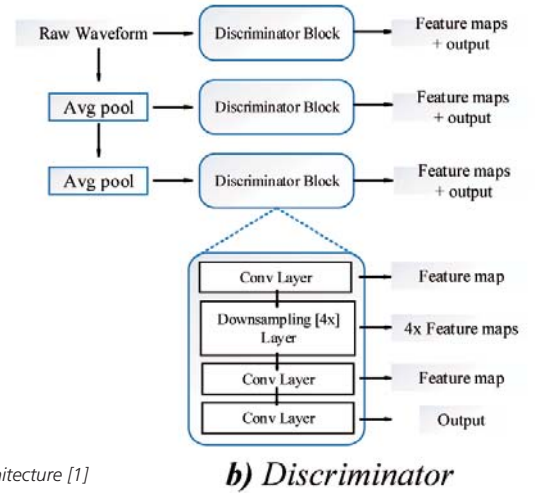


Figure 2: Generator and Discriminator architecture [1]



EXPERIMENTAL SETTING

To experiment with the results, we extracted MFCC at each frame and fed the features to the network and trained the network to generate output raw waveform. For our experiment, 13, 24, and 36 coefficients were extracted and evaluated respectively. We utilised The LJSpeech Dataset [25] which consists of 13100 audio waveforms. We separated 13090 for our training set and 10 samples for our test set with no overlapped samples. The learning rate was set to 1e-4 for both the generator and discriminator. We trained our models for 3000 epochs.

SUBJECTIVE AND OBJECTIVE RESULTS

We compared our model with five well-known codecs currently used in broadcasting and streaming technologies. The selected codecs cover bitrates ranging from 2kbps to 128kbps. We assessed our results using both objective and subjective assessments. We used SNR, STOI [26], PESQ [27], and NISQA-MOS [28] metrics to objectively evaluate our generated waveforms. To better discriminate between codecs, we choose <codec name_bitrate> format to name files and their corresponding bitrate simultaneously. According to table I, MFCCGAN_36k achieved

the state-of-art result in terms of SNR despite a lower bitrate in comparison to AAC_128k, AAC_112k, Vorbis_48k, Opus_48k, and Speex_48K. On the other hand, MFCCGAN-13k also achieved high SNR=27 which is equal to that of AAC_128k, and AAC_112k while having a significantly lower bitrate (13 kbps). MFCCGAN_25k also gained SNR=25 which is close to AAC_112 and AAC_96k. SNR indicates the ability of the codec to reconstruct the original waveform.

MFCCGAN high SNRs reveal the capacity of AI approaches for reconstruction. While AI approaches act based on learning,

rule-based approaches utilise fixed algorithmic methods. Therefore, in the case of big data, AI could outperform conventional methods. NISQA-MOS represents subjective naturalness via objective assessment.

MFCCGAN_36k achieved higher NISQA-MOS results compared to AAC_48k while having a 20% lower bitrate. Furthermore, MFCCGAN_13k obtained NISQA-MOS=3.9 which is much higher

than AAC_24k (NISQA-MOS=2.7), AAC_32k and AC3_32k (NISQA-MOS=2.6, 3.4 respectively) and AAC_48k (NISQA-MOS=3.05). STOI and PESQ illustrate the intelligibility and perceptual quality of speech. Accordingly, MFCCGAN is not as good as other codecs in terms of intelligibility and perceptual performance. We suggest adopting loss functions optimising on intelligibility and perceptual metrics. This will be taken into account in our future work.

Table 1: Objective assessment of codecs

CODEC_BitRate	STOI	PESQ	SNR	NISQA-MOS
AC3_128K	0.96639246	3.842376232	13.99329433	4.512829
AAC_112K	0.991996208	3.583273888	27.94281862	4.39592
AAC_96K	0.989615808	3.614152193	27.50264894	4.38134
AC3_64K	0.956902768	3.772472858	14.07268355	4.346048
VORBIS_48K	0.982319119	4.315928459	19.89123884	4.473292
AAC_48K	0.970645834	3.467241287	22.44192965	3.051058
OPUS_48K	0.929507751	3.851855278	14.00275241	4.478506
SPEEX_48K	0.90961242	3.55660224	14.78445809	4.278224
AAC_40K	0.959075887	3.39499712	21.35531287	2.968935
MFCCGAN_36K	0.702409688	3.093079567	30.83065793	3.995804
AAC_32K	0.953966379	3.297092915	19.61904286	2.610587
AC3_32K	0.89188321	2.463285685	10.81502084	3.462113
MFCCGAN_25K	0.598285956	1.801628828	25.97138144	2.55628
SPEEX_24K	0.877076344	3.000904083	12.91462434	3.603933
VORBIS_24K	0.94226169	3.515651703	14.62278805	3.006679
OPUS_24K	0.92259971	3.945333719	13.6733529	4.448306
AAC_24K	0.884156106	2.425422668	14.82544485	2.711517
VORBIS_16K	0.922521178	3.019296646	13.40416934	2.279955
OPUS_16K	0.889483445	3.670092344	12.87143345	4.375881
SPEEX_16K	0.831684321	2.83521533	12.63241821	3.623759
AAC_16K	0.790138556	1.741425514	9.751237205	3.149007
MFCCGAN_13K	0.447201272	1.155933857	27.21439393	3.965796
SPEEX_12K	0.819116709	2.77005887	12.03720997	3.418867
OPUS_12K	0.886875364	3.037414312	12.68146817	3.768796
SPEEX_10K	0.819116709	2.77005887	12.03720997	3.418867
AAC_8K	0.60164674	1.568306923	8.883444036	1.54391
VORBIS_8K	0.922521178	3.019296646	13.40416934	2.279955
OPUS_8K	0.804094524	1.997177839	9.142479641	2.937732
OPUS_6K	0.763997101	1.546600819	7.389424542	2.763465
SPEEX_5K	0.665002901	1.616167545	6.97172723	1.809035
SPEEX_2K	0.665002901	1.616167545	6.97172723	1.809035

CONCLUSION AND FUTURE WORKS

In this paper, we proposed AI-based audio coding using MFCC features in an adversarial setting. Based on the application and options adopted, bitrates ranging from 13kbps to 64kbps could be achieved. We compared our work with five well-known codecs named AAC, AC3, Opus, Vorbis, and Speex, performing on bitrates from 2kbps to 128kbps. MFCCGAN_36k achieved the state-of-art result in terms of SNR despite a lower bitrate in comparison to AC3_128k, AAC_112k, Vorbis_48k, Opus_48k, and Speex_48K. On the other hand, MFCCGAN_13k also achieved high SNR=27 which is equal to that of AC3_128k, and AAC_112k while having a significantly lower bitrate (13 kbps). MFCCGAN_36k achieved higher NISQA-MOS results compared to AAC_48k while having a 20% lower bitrate. Furthermore, MFCCGAN_13k obtained NISQA-MOS=3.9 which is much higher than AAC_24k, AAC_32k and AC3_32k, and AAC_48k.

For future work, we suggest adopting loss functions optimising on intelligibility and perceptual metrics in the MFCCGAN structure.

REFERENCES

- [1] Kumar, K., et al., Melgan: Generative adversarial networks for conditional waveform synthesis. arXiv preprint arXiv:1910.06711, 2019.
- [2] Van Kuyk, S., W.B. Kleijn, and R.C. Hendriks. On the information rate of speech communication. in 2017 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). 2017. IEEE.
- [3] Gârbaea, C., et al. Low bit-rate speech coding with VQ-VAE and a WaveNet decoder. in ICASSP 2019-2019 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). 2019. IEEE.

- [4] Vos, K., et al. Voice coding with Opus. in Audio Engineering Society Convention 135. 2013. Audio Engineering Society.
- [5] Brandenburg, K. MP3 and AAC explained. in Audio Engineering Society Conference: 17th International Conference: High-Quality Audio Coding. 1999. Audio Engineering Society.
- [6] Davidson, G., Digital audio coding: Dolby AC-3. 1998, Boca Raton, FL: CRC Press. p. 41.1-41.21.
- [7] Vorbis audio compression. Available from: <https://xiph.org/vorbis/>
- [8] Valin, J.-M., Speex: A free codec for free speech. arXiv preprint arXiv:1602.08668, 2016.
- [9] Schroeder, M. and B. Atal. Code-excited linear prediction (CELP): High-quality speech at very low bit rates. in ICASSP'85. IEEE International Conference on Acoustics, Speech, and Signal Processing. 1985. IEEE.
- [10] Canziani, A., A. Paszke, and E. Culurciello, An analysis of deep neural network models for practical applications. arXiv preprint arXiv:1605.07678, 2016.
- [11] Kingma, D.P. and M. Welling, Auto-encoding variational bayes. arXiv preprint arXiv:1312.6114, 2013.
- [12] Goodfellow, I.J., et al., Generative adversarial networks. arXiv preprint arXiv:1406.2661, 2014.
- [13] Oord, A.v.d., et al., Wavenet: A generative model for raw audio. arXiv preprint arXiv:1609.03499, 2016.
- [14] Oord, A.v.d., et al., Conditional image generation with pixelcnn decoders. arXiv preprint arXiv:1606.05328, 2016.
- [15] Tan, X., et al., A survey on neural speech synthesis. arXiv preprint arXiv:2106.15561, 2021.
- [16] Rethage, D., J. Pons, and X. Serra. A wavenet for speech denoising. in 2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). 2018. IEEE.
- [17] Kobayashi, K., et al. Statistical Voice Conversion with WaveNet-Based Waveform Generation. in Interspeech. 2017.
- [18] Kleijn, W.B., et al. Wavenet based low rate speech coding. in 2018 IEEE international conference on acoustics, speech and signal processing (ICASSP). 2018. IEEE.
- [19] Van Den Oord, A. and O. Vinyals, Neural discrete representation learning. Advances in neural information processing systems, 2017. 30.
- [20] Zeghidour, N., et al., SoundStream: An End-to-End Neural Audio Codec. IEEE/ACM Transactions on Audio, Speech, and Language Processing, 2021.
- [21] Valin, J., Definition of the Opus Audio Codec, I.E.T.F. (IETF), Editor. 2012.
- [22] al., M.D.e., Overview of the EVS codec architecture, in IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). 2015.
- [23] Nassif, A.B., et al., Speech recognition using deep neural networks: A systematic review. IEEE access, 2019. 7: p. 19143-19165.
- [24] Murthy, Y.S. and S.G. Koolagudi, Content-based music information retrieval (cbmir) and its applications toward the music industry: A review. ACM Computing Surveys (CSUR), 2018. 51(3): p. 1-46.
- [25] Ito, K. and L. Johnson, The LJ Speech Dataset. 2017.
- [26] Taal, C.H., et al., An algorithm for intelligibility prediction of time-frequency weighted noisy speech. IEEE Transactions on Audio, Speech, and Language Processing, 2011. 19(7): p. 2125-2136.
- [27] Rix, A.W., et al. Perceptual evaluation of speech quality (PESQ)-a new method for speech quality assessment of telephone networks and codecs. in 2001 IEEE international conference on acoustics, speech, and signal processing. Proceedings (Cat. No. 01CH37221). 2001. IEEE.
- [28] Mittag, G., et al., NISQA: A deep CNN-self-attention model for multidimensional speech quality prediction with crowdsourced datasets. arXiv preprint arXiv:2104.09494, 2021.

AUTHOR



Mohammad Reza Hasanabadi

IRIB R&D, Iran

Mohammad Reza Hasanabadi received his B.S. in electrical engineering from Ferdowsi University of Mashhad in 2013, and his M.S. in Sound Engineering from IRIB University in 2017. He is currently a Ph.D. candidate in telecommunication engineering at Shahid Beheshti University (SBU), Tehran, IRAN. In 2019, he joined IRIB R&D. His research interests include deep learning and AI audio video fields particularly focusing on speech processing, voice conversion, text-to-speech, audio coding, and their applications to broadcast systems. ■

DIGITAL BROADCASTING SYMPOSIUM 2023: BACK IN BUSINESS

6-9 MARCH 2023

OPENING SESSION



DR JAVAD MOTTAGHI

"Let go of outdated business practices, keep audiences."

It is critical to understand the changes the broadcast and media industry has gone through in the past

two to three years, the ABU Secretary-General, Dr Javad Mottaghi, said.

In his welcome address to the ABU Digital Broadcasting Symposium in Kuala Lumpur on 7 March, he observed that the industry had seen tremendous changes, especially in media delivery and audience preferences in consuming media. He said broadcasters, especially public service media, need to explore these changes and adopt a more digital and social-centric approach to take advantage of the convergence of technologies and reposition themselves to match the current industry trends and audience preferences in consuming media.

"The broadcasting industry is currently faced with several challenges, both in terms of keeping its audience and letting go of outdated business practices that do not fit the current day and age" said Dr Mottaghi.

He noted that new technologies and advanced solutions, which are fast being rolled out by tech-savvy organisations, are disrupting the usual flow of media delivery and distribution. Media consumption is becoming more and more personal and the use of digital technologies to understand the preferences of the audience was key to gaining an edge over the competition.

Expressing the ABU's gratitude and appreciation to all

DBS sponsors and supporters as well to ABU members for their strong support and partnership, Dr Mottaghi concluded: "I would like to thank each and every one of you for your valuable contributions to this event."



FAHMI FADZIL

"Transform the way we work and how businesses operate."

A major challenge for broadcasters was to ensure that those left behind by technology were not

disadvantaged, said Malaysian Communications and Digital Minister, Fahmi Fadzil, opening the Digital Broadcasting Symposium 2023. He went on to stress the importance of new technologies in reaching people in the rapidly shifting digital landscape.

"It is about helping the public come to terms, whether it's with catastrophe, disaster, epidemics, pandemics or crises; but also to shed a light and provide a space for what we need more than ever before – moral leadership."

Speaking to reporters afterwards, he suggested that broadcasting organisations in Malaysia need to make a drastic change from the traditional way broadcasters used to operate, to embrace the changes in the industry and serve audience demands. He added that broadcasters need to make the content available to them on their choice of devices at their preferred times.

The Minister stressed that it was important and necessary for broadcasters to make changes to better serve the public.



SUHAIMI SULAIMAN

"Broadcasting is here to stay and will stay relevant as long as we continue to evolve"

In his welcoming speech to the ABU Digital Broadcasting Symposium in Kuala Lumpur on 7 March, En Suhaimi, Director-General of Radio Televisyen Malaysia, went on, "Broadcasters must ensure that the public is securely occupied and constantly receives continuous updates despite limitations such as we have experienced in the past two years." He continued, "Our responsibility as public broadcasters has never diminished, in fact, for some of us, our role as 'the media' has been augmented."

"The connections and networking we have built throughout the years have been put to good use as we relied on each other for support to get through the tough times together," said En Suhaimi, "Online connection and cooperation had never been more effective than in the past two years, when we had no choice but to survive by relying on digital information technology, thus eventually we learned to value the facility of connection, when we were able to effectively conduct broadcast operations, online meetings, conferences and study groups."

"This new era which has emerged is clearly successful due to the digitalization effort," En Suhaimi admitted. Stating that, however, sometimes physical contact is crucial for better and effective understanding and communication, and that now we were again able to explore the potential to continue coproduction activities, as well as our usual activities of exchanging and marketing products.

The RTM Director General urged broadcasters to be ready to breathe in the new knowledge, which he hoped would be put to good use in planning our organisations' strategies to embrace the new era of broadcasting. He concluded;

"I am thankful that the connection and networking we have built throughout the years have been put to good use as we rely on each other for support to get through the tough times together."

INDUSTRY KEYNOTE

Storytelling in an era of 'short attention span'

En Suhaimi Sulaiman, Director General of RTM Malaysia delivered his keynote presentation on the topic, 'Storytelling in an era of short attention span'.

Audience attention of one hour or so used to be highly valued and the producer responsible would be deemed a highly competent journalist or programmer. These days, if the audience doesn't find a story interesting in the first few minutes, they will switch to another channel. Our attention span is getting shorter. Viewers prefer short duration clips; readers insist on executive summaries; young and old generations prefer 'short' news on social media. As an example, news items on twitter and social media are now catchy and short.

Based on his experience as a TV anchor and producer over 30 years, the speaker observed that 30 minute programmes used to be the best. These days, an hour or longer programme will receive a low rating and 15 minutes will do much better. Journalists need to be trained to deliver concise stories of 3-4 sentences for social media.

RTM, the government station in Malaysia, is tasked with entertaining and informing the people. Indeed, it does inform, educate, entertain a large target audience. The challenge now is to transform, with key focus on leadership, change agents and instilling a work culture.

With some promotional visuals, En Suhaimi went on to illustrate that the service is on air 24x7, with parliamentary debate, news and entertainment programmes. RTM now aims to improve its KPI score to be ranked as the No. 1 brand in Malaysia within six months. The brand created in any programme genre should be ahead and well positioned in the industry. Change agents in every department are currently working to see that a better work culture is implanted. Change is inevitable and every staff member, whether in the leadership or at the front desk, must adapt to the change, or else be left behind.

Previously a journalist's skill would be based on the '5Ws'; What, Which Where, When, Why, and '1H', How. Now, in addition to these, journalists have to adopt additional skills, to inform, educate, and entertain through their scripts, and to become experts in this. They need to learn to script stories much shorter; 30 secs, 1min etc., yet with a sense of completeness, to attract more people to tune-in. Drawing on statistics and inferring with analytics are other sought after key skills.

DIGITAL BROADCASTING SYMPOSIUM 2023: BACK IN BUSINESS

The 2023 ABU Digital Broadcasting Symposium was held from 6-9 March 2023 at Hotel Royale Chulan Kuala Lumpur. This symposium, this year aptly themed 'Back in Business', is organised once annually by the ABU, and is the nineteenth in the series. Prior to the conference proper, a workshop by Integriti Padu Sdn Bhd (IPSB) was held in the morning of 6th March followed by a WorldDAB's workshop in the afternoon. The 3-day conference, 2 Masterclass sessions, 9 workshops, together with exhibit booths, provided the unique opportunity for attendees to have access to information on all the various aspects of broadcasting, ranging from terrestrial to IP.

INDUSTRY DEVELOPMENTS AND STANDARDS UPDATE



Hamid Dehghan Nayeri, IRIB-Iran

The first session was moderated by **Hamid Dehghan Nayeri**, IRIB-Iran and the panelists were **Emily Dubs**, DVB Project; **Madeleine Noland**, ATSC and **Lindsay Cornell**, BBC.



Emily Dubs, DVB Project



Madeleine Noland, ATSC

They elaborated on the developments of the various broadcast/telecommunication technologies over the recent years and the improvements achieved.

The main focus of DVB is on IP centric solutions to

handle migrations to IP based platforms and to allow stakeholders to build on a converged 5G/IP/broadcast ecosystem. Broadcasters have to assemble the right tools to transform this challenge into a new wave of opportunities. DVB Multicast Adaptive Bit Rate (DVB-MABR) enriches broadband with the scalability of broadcast. Delivering live and on-demand adaptive streaming media to a large audience in a highly efficient and scalable way by leveraging IP multicast for media object delivery. Unicast streaming has the ability to adapt to network conditions as a means of delivering media on any type of access network. It can reuse existing network technologies that deliver other Internet services, especially HTTP and Content Delivery Networks. Dynamic bit rate adaptation allows the streaming session to degrade gracefully as network conditions worsen, and to recover as they improve. For demand of the same linear media stream at the same time by a large audience, the number of simultaneous connections to the infrastructure carrying the same media payloads results in a high degree of redundancy which can be mitigated by the use of multicast packet replication.

DVB Native IP (DVB-NIP) facilitates the integration of OTT



Lindsay Cornell, BBC

and Broadcast technologies into an efficient and contemporary IP media distribution solution. DVB-NIP brings TV to smartphones by leveraging existing broadband and broadcast infrastructure.

With DVB-NIP and DVB-I, existing DVB networks are part of the converged broadcast/broadband future. Present infrastructure can be used to connect people in rural areas or to offer new services in public areas using legacy devices. Live OTT is served with broadcast quality signal regardless of the



From left to right: Lindsay Cornell, BBC, Madeleine Noland, ATSC, Emily Dubs, DVB Project and Hamid Dehghan Nayeri, IRIB-Iran.

number of devices that are connected simultaneously. Using DVB NIP via satellite, OTT service providers can scale down infrastructure costs and extend market reach. DVB I over 5G enables a future combination with 5G Broadcast for new devices and in areas that offer 5G coverage.

In 2016, South Korea adopted ATSC 3.0 as its next generation standard and launched 4K Ultra High Definition TV later in 2017. The Winter Olympics were broadcast in UHD and ATSC 3 now covers 70% of the population. ATSC 3.0 presently covers 60% of households in the USA and Jamaica also launched ATSC 3.0 in 2022. The Telecommunications Authority of Trinidad and Tobago are beginning the transition to ATSC 3.0 in 2023 with an expected completion date of 2026. ATSC 3.0, Advanced ISDB-T2 and further evolved multimedia broadcast multicast service (FeMBMS) or enhanced TV (EnTV) are among the proposed technologies for a new next gen television system called "TV 3.0" for Brazil. In India, ATSC 3.0 is being considered by the public broadcaster Prasar Bharati for Direct to Mobile (DTM) with a cellularised network of 30,000 sites and 1 billion smartphones. A project is underway to specify Broadcast Core Network that is agnostic to DTT system and will be designed for standalone, broadcast only operation and for converged operation with 5G networks.

CYBERSECURITY AND MEDIA INDUSTRY

The moderator was **Azman Fitton**, MYTV Broadcasting with the panelist comprising **Michael Lok**, Arista; **Harme Mohamed**, MCMC; **Hamid Dehghan Nayeri**, ABU and **John Maizels**, Media Consultant.

Media companies have reported many new security

risks caused by data leak, stolen Identity, malware and ransomware. Undetected breaches compromise valuable data and systems, while increase in dwell time results in further compromise. Security architecture based on adversarial modelling uncovers complex threats with low false positives and negatives. AI-based fingerprinting can discover, profile and track devices, users and applications. The first critical step to improving an organisation's security posture is asset inventory. Organisations need to have a full view of their assets and their interaction across the organisation. Proactive maintenance needs to be undertaken to patch and strengthen the assets.

Incidence response plan facilitates effective action in case of any cyber incident. Organisations need to engage efficiently with vendors and understanding what they can provide, improves responsiveness in the case of an incident. Simulated exercises can reveal any incorrect assumptions made during the incidence. The response process can identify missing contacts or protocols critical for success. The plan should include correct contact information, restructure the line of communication and organise roles and responsibilities. The plan must be tested repeatedly to ensure its effectiveness. Employees need to understand cybersecurity risk and how they potentially contribute to it. They, in turn, will help avoid vulnerabilities as a result of human error. Non-technical staff need to understand how their actions affect security and employees need to be cyber aware.

Cybersecurity was initially seen as a business cost but is now a business investment and should be part of the budget. Cybersecurity breach is expensive and upsetting to staff, impacting both business and stock market. As part of the response to cyberattacks,



Azman Fitton, MYTV Broadcasting



Michael Lok, Arista



Harme Mohamed, MCMC



John Maizels, Media Consultant



From left to right: **Michael Lok**, Arista; **Hamid Dehghan Nayeri**, ABU; **Azman Fitton**, MYTV Broadcasting; **Harme Mohamed**, MCMC and **John Maizels**, Media Consultant.



From left to right:
Madeleine Noland, ATSC; **Gisele Nnemiga Salome**, AUB; **Wendell Lonergan**, Nautel; **Simon Keens**, Ampegon;
Nick Piggott, RadioDNS and **Otto Othman**, RTM-Malaysia.

World Broadcasting Unions (WBU) has drafted several Cybersecurity Recommendations which are available for download on WBU website.

SUSTAINABLE TECHNOLOGIES AND STRATEGIES IN BROADCASTING

The session was moderated by **Otto Othman**, RTM-Malaysia and the panellists were **Madeleine Noland**, ATSC; **Gisele Nnemiga Salome**, AUB; **Wendell Lonergan**, Nautel; **Simon Keens**, Ampegon and **Nick Piggott**, RadioDNS.

Broadcast and unicast technologies play vital roles in the

considered mature technology as it has been tested and deployed in many countries. A single digital transmitter can output numerous streams and both mobile and stationary reception are available. Significant power savings are well documented, and represent about 75-90% less than analogue FM. Broadcasters have varying goals, which include increased content, new revenue and adding emergency warning systems. They also face challenges as regards to rural vs urban coverage, mountainous terrain and operating costs. Previously, 3-5 audio services were available from a digital transmitter operating in the FM band. Digital Radio innovation has now provided the opportunity to multiplex in a single transmitter by reusing existing infrastructure and 12-18 audio services per FM band transmitter with higher coverage are now available.



Otto Othman, RTM-Malaysia



Madeleine Noland, ATSC



Gisele Nnemiga Salome, AUB



Wendell Lonergan, Nautel



Simon Keens, Ampegon



Nick Piggott, RadioDNS

world's growing demand for data services. Convergence enables the best network to be used for a given data session and heterogeneous network is needed. Several technical architectures have been developed for the interworking of ATSC 3.0 and 5G. Digital Radio

DRM reduces the energy required by AM transmissions in both the MW and SW band. DRM transmissions do not need a carrier frequency and all energy is used to transmit information which means power is not wasted. Average power for digital transmission is up to 66% lower than for analogue transmission. Digital signals have greater crest factor, resulting in lower requirements of receiver field-strength. In addition, DRM's error correction allows crystal clear stereo sound right up until signal is lost. Digital Signage advertising via DRM Broadcasting is used by Transport for London (TfL) which operates 18,000 bus stops in London. This technique allows all bus stop



From left to right: **Jay Ganesan**, Amagi; **Neil Anderson**, Codemill; **Yew-jin Cheong**, Rohde & Schwarz; **Subodh Aggarwal**, TVU Networks; **Dennis Wong**, Harmonic; **Michiel Saelen**, Skyline Communications and **Lindsay Cornell**, BBC.

advertising systems to be updated continuously with the next advert without the need for 3rd party infrastructure or visits by staff, all adverts can be replaced every day. Using DRM SW in pure data mode, signage in entire countries could be provided, even in remote areas without power.

MOVING MEDIA WORKFLOWS TO THE CLOUD

The moderator was **Lindsay Cornell**, BBC, with the panellists comprising **Jay Ganesan**, Amagi; **Neil Anderson**, Codemill; **Yew-jin Cheong**, Rohde & Schwarz; **Subodh Aggarwal**, TVU Networks; **Dennis Wong**, Harmonic and **Michiel Saelen**, Skyline Communications.

Broadcast transformation is underway by movement of all workflows to the cloud. Hence, broadcast is

more efficient, resulting in new revenue streams being generated on OTT. Next Gen Media Tech Platform on public cloud enables content ingest, linear-VOD distribution and monetisation using geo-targeting and server-side ad insertion (SSAI). Among the playout variants are traditional linear and OTT channel playout, localised and opt-out channels. Completely redundant disaster recovery is setup in alternate Amazon Web Service regions with automated content and egress-on-demand. Cloud cost savings compared to on-premise cost model are server costs, storage costs and network costs. Software costs can include database management whilst facilities costs can include those associated with upgrades, maintenance, building, security and taxes. Other on-premise hidden cost that have to be taken into account are overcapacity and workforce.



Jay Ganesan, Amagi



Neil Anderson, Codemill



Yew-jin Cheong, Rohde & Schwarz



Subodh Aggarwal, TVU Networks



Dennis Wong, Harmonic



Michiel Saelen, Skyline Communications

Public cloud is based on pay per usage with no upfront investment in hardware infrastructure. Speedy scalability is available on-demand and it is ideal for Disaster Recovery. Public cloud has flexible geography which is useful for legal and commercial reasons linked to the location of data storage and the country where taxes are paid. Public cloud can be costly, based on data throughput, time usage and number of accesses. It is optimised for IT tasks but not for real-time processing of high-resolution video/audio. Certain critical parts of the workflow may not support cloud, leading to

technical incompatibility. Geographical restrictions are another factor as public cloud may not be allowed to be deployed outside the country.

Commercial considerations of cloud are in-country availability and in-house media expertise. Other factors include cost of moving archive to another provider. Leading cloud vendors have very robust cloud security which deter cyberattacks. Existing workflows can be optimised and moving to the cloud provides a good opportunity to evaluate all existing workflows together with the adoption of standardised practices.

Technical considerations are, latency caused by encoding/decoding process, Forward Error Correction (FEC) and the control layer. Caution must be exercised, as adopting obsolete standards can occur. E.g., SMPTE-2110 uncompressed video is not suitable for cloud workflows because of bandwidth and packet throughput challenges.

MEDIA SOLUTIONS: IMPLEMENTATION AND UPDATES

The session was moderated by **John Maizels**, Media Consultant and the panellists were **Dr Les Sabel**, WorldDAB; **Ajeet Khare**, Canara Lighting Industries; **Simon Keens**, Ampegon and **Mika Kanerva**, Sofia Digital.

The DAB+ announcement system allows broadcasters to signal the availability of a new information update to listeners, which resembles the Traffic Announcement feature in FM. The Alarm and Information

announcements have different authorities, and the alarm announcement is controlled by the Multiplex Network Provider. When this announcement is used all listeners on the current ensemble will be impacted. Broadcasters decide what other services can interrupt their services for information announcements. The listener also has control of what announcements he would like to receive. The DAB system can provide a range of announcements that can make listening and life better for many. The Alarm announcement should only be used in Emergency situations with the relevant authority and messages. The Announcement system is controlled by both broadcasters and listeners. Broadcasters need to indicate that they will support information announcements and receiver manufacturers could provide support through software developments. Announcements are useful but need to be developed and integrated into broadcasters operating practices for maximum impact. If broadcasters provide new services via announcements, receiver manufacturers will follow. Adding announcements to domestic receivers can be a simple software upgrade.

DRM offers more choice for listeners with up to 3 programmes from a single transmitter. DRM provides complete coverage with robust signal and supports Single Frequency Networks (SFN). Audio quality is excellent with no distortion whilst stereo and 5.1 surround sound are available in all bands. Multimedia applications provides great listener benefits and new revenue for broadcasters. Automatic tuning is by station name and no longer by frequency, retuning when leaving the coverage area.



Dr Les Sabel, WorldDAB



Ajeet Khare, Canara Lighting Industries



Simon Keens, Ampegon



Mika Kanerva, Sofia Digital



From left to right: Dr Les Sabel, WorldDAB; Mika Kanerva, Sofia Digital; John Maizels, Media Consultant; Ajeet Khare, Canara Lighting Industries and Simon Keens, Ampegon.

One of the world's largest digital radio deployments is in India, with 35 MW transmitters and 3 SW transmitters. In addition, six more high power transmitters are carrying out test transmissions. There have been more than 5.2 million cars installed with line-fit DRM in India since 2022. Other countries adopting DRM include Pakistan, China and Indonesia. Australia tested DRM in the MW and FM band between 2019-2022. DRM Multimedia Player is available for receiving digital radio broadcasts on smartphones, tablets or PC receivers and the software can also be used for professional receivers.

ADVANCES IN MEDIA DELIVERY

The moderator was **Dr Les Sabel**, with the panellists comprising **Mats Ek**, Progira; **Peter Siebert**, IEEE BTS; **George Mikeladze**, Qarva and **Hubert Czaja**, Deutsche Welle.

Comparison was made between the network performance of 5G Broadcast and ATSC 3.0 for Handheld Reception. ATSC 3.0 Broadcast system is used in the US, South Korea and adopted by other countries whilst 5G Broadcast (FeMBMS) based on 3GPP Release 17 is adopted to meet broadcast requirements. Comparison was based on Low Power Low Tower (LPLT) Single Frequency Network (SFN) in Bangalore and RF system performance simulations

were carried out by ETRI, South Korea. 5G Broadcast requires between 40-60% more sites compared with ATSC 3.0 for same handheld indoor coverage. For handheld in mobile reception, 5G Broadcast would require about 150% more sites compared to ATSC based on C/N difference. Every 5 dB increase in Signal/Noise ratio will double the number of required sites. However, handheld indoor reception case is a challenge as broadcast infrastructure is insufficient and Mobile Network Operators have an advantage.

The lessons learnt from the past are that all High Power High Tower (HPHT) based schemes have not been successful. Commercial challenges, extra costs for handsets, networks and content and business models did not compensate for these schemes. Technical challenges have restricted indoor reception as compared to mobile outdoor or rooftop. LTE/5G Broadband can be integrated with 3GPP unicast and multicast bidirectional technology. It is part of the 3GPP ecosystem, therefore integration in chipsets and handhelds is more likely. However, it should be noted that current 5G phones do not support 5G Broadcast. There exists higher likelihood for support by mobile network operators as deployment guidelines are being drafted by 5G Media Action Group (5G MAG) and DVB. However, there is limited availability



Mats Ek, Progira



Peter Siebert, IEEE BTS



George Mikeladze, Qarva



Hubert Czaja, Deutsche Welle



From left to right: Hubert Czaja, Deutsche Welle; Mats Ek, Progira; Dr Les Sabel, WorldDAB; Peter Siebert, IEEE BTS and George Mikeladze, Qarva.

of transmit/receive equipment, regulatory situation is unclear and LTE/5G has lower spectral efficiency. It is unlikely that standalone 5G Broadcast to Handheld will be introduced as consumer interest in broadcast on handhelds is low. Additional investment is also needed from equipment and handset manufacturers. Commercial agreements between broadcasters and mobile phone operators also need to be in place.

Internet is very problematic for live video transmission, unlike managed networks. There are no guaranteed parameters and no multicast via internet. Congestions occur at internet exchanges with first and last mile saturation, especially for WiFi. Fluctuations and instability cause high Round Trip Time (RTT) and bursts of packet loss which are sometimes greater than 5%. Although Transmission Control Protocol (TCP) is dominant, newer protocols such as Secure Reliable Transport (SRT) are in the User Datagram Protocol (UDP). The internet needs to have low latency with no buffering and low cost. MultiPipe solves the problem with aggregation, enabling high bitrate and stable streaming.

AI, BLOCKCHAIN AND DATA APPLICATIONS IN MEDIA

The session was moderated by **Samina Husain**, IEEE BTS and the panellists were **Ruhi Tas**, TRT; **João Neto**,

VoicelInteraction; **Christian Christiansen**, Damsmart Asia & Silver Trak; **Tetsushi Okura**, NHK; **Takashi Koyano**, NHK and **Junghyun Kim**, KBS.

A blockchain is a decentralised digital ledger that transparently record blocks of transactions across computers based on an algorithm without modifying the subsequent blocks. It records data across many computers of a decentralised network, organizing the data into blocks that are linked together. Each computer on the network has a copy of the same data. Databases are decentralised and managed by many nodes and controlled by many users at the same time. Hence, there is no single point of dependence and no single point of failure.

A public blockchain is decentralised, allowing anyone to participate in the verification and validation of transactions. In a public blockchain, all transactions are recorded on a shared ledger, which is maintained by a network of nodes distributed across the world. A public blockchain has no restrictions on reading blockchain data and submitting transactions for inclusion into the blockchain. Anyone who wants to join the network can sign onto a blockchain platform with their device and internet connection. There is no need for anyone's permission to distribute the ledger system.



Samina Husain, IEEE BTS



Ruhi Tas, TRT



João Neto, VoicelInteraction



Takashi Koyano, NHK



From left to right: Samina Husain, IEEE BTS; Junghyun Kim, KBS; Takashi Koyano, NHK; Tetsushi Okura, NHK; Ruhi Tas, TRT; Christian Christiansen, Damsmart Asia & Silver Trak and João Neto, VoicelInteraction.

Decentralisation means that no single entity has control over the network, making public blockchains more resistant to censorship, manipulation, or corruption. However public blockchains may have limited scalability, because they require a large number of nodes to verify transactions. This can lead to slower transaction processing times and higher fees. Public blockchains are also transparent, meaning that all transactions are visible to everyone on the network.

A private blockchain allows direct access to data and submitting transactions is limited to a predefined list of entities. Businesses and organisations use private blockchain networks because they tend to work on closed networks. Private networks give companies the ability to customise the accessibility of their blockchain network as it suits their organisation. In addition, they can set the parameters for their network and manage the security according to their needs. Privacy is important for organisations, if they don't want their competitors to get access to any of their data

Private blockchains are more efficient as they can be customised to meet the specific needs of the participants and they have increased security as access to the blockchain is restricted. However, private blockchains are centralised, which means that a single entity can have control over the network.

MEDIA MANAGEMENT & DIGITAL WORKFLOW

The moderator was **John Maizels**, Media Consultant with the panellists comprising **Aale Raza**, Whiteways Systems; **Sanjay Krishan Das**, Cite De Memoire; **Alan Hoggarth**, Disk Archive Corporation; **Ahmad Shafiq Mirza Mansor**, RTM; **Joe Kelly**, Damsmart Asia and **Rueben Thomas**, Telstra International.

An open-source AI platform, 'Whisper AI' is available that converts speech to text. The platform can extract

text from speech with the exact timestamps, so that time can be determined when each word was spoken. Speech to text becomes the metadata and is attached to the video clip, making it a lot easier to search. Speech to text is also available in many languages and language translation is another area where AI can be helpful.

Face recognition technology is a very useful guide when searching a database for a specific person. It is far superior to text search, where the names of each person in a video have not been recorded in the metadata. Face recognition is the next step in media asset management



Aale Raza, Whiteways Systems



Sanjay Krishan Das, Cite De Memoire



Alan Hoggarth, Disk Archive Corporation



Ahmad Shafiq Mirza Mansor, RTM



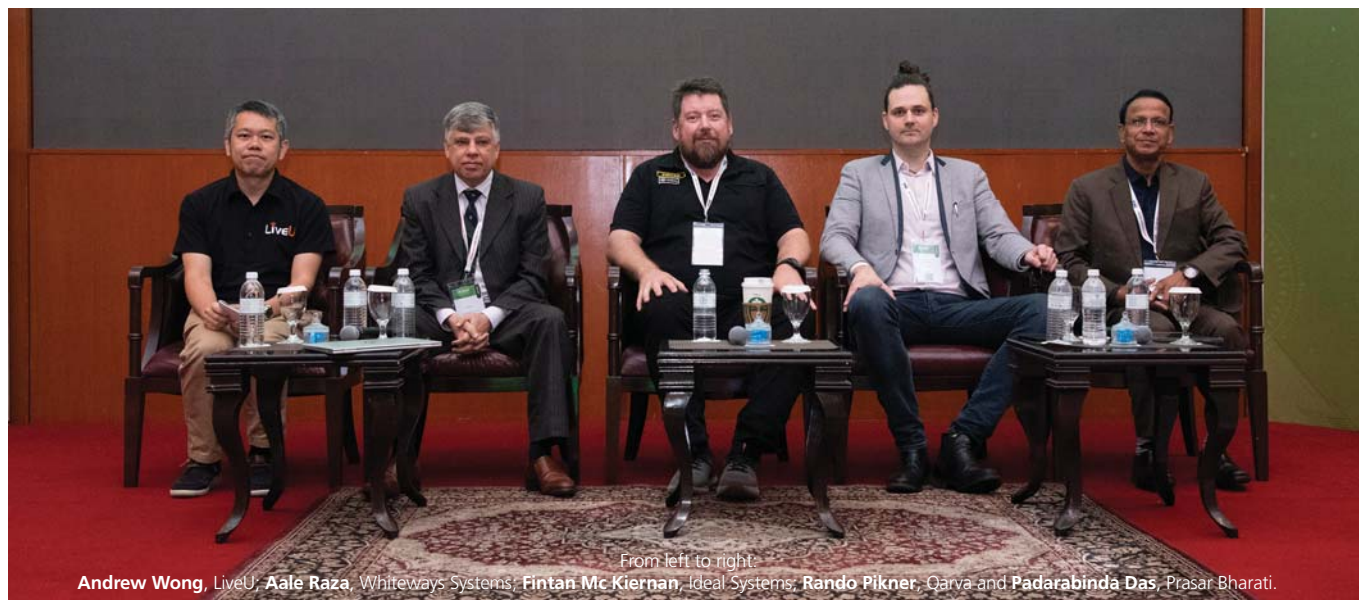
Joe Kelly, Damsmart Asia



Rueben Thomas, Telstra International



From left to right: **Joe Kelly**, Damsmart Asia; **Rueben Thomas**, Telstra International; **Ahmad Shafiq Mirza Mansor**, RTM; **John Maizels**, Media Consultant; **Alan Hoggarth**, Disk Archive Corporation; **Sanjay Krishan Das**, Cite De Memoire and **Aale Raza**, Whiteways Systems.



From left to right: **Andrew Wong**, LiveU; **Aale Raza**, Whiteways Systems; **Fintan Mc Kiernan**, Ideal Systems; **Rando Pikner**, Qarva and **Padarabinda Das**, Prasar Bharati.

search and retrieval. AI, combined with station automation, can take over repeated tasks and replace the operator. AI is already transcoding news segments and in future will be voice operated so operators just need to ask the automation to perform tasks.

Film & TV Archive and preservation faces many challenges. Demand is increasing and driven by growth in production. Files are becoming more massive caused by higher resolutions formats. Content has may have been locked into unplayable video tapes and data tapes. It is best to migrate to a futureproof media or face obsolescence because video tapes, optical disks and data tapes are disappearing.

A high proportion of data is accessed infrequently, and online spinning of disk storage is expensive to own and operate. Flash Storage cannot replace HDD, whilst disk in cloud is unaffordable and impractical for media. Data tape storage perceived as the only low-cost medium, but the reality is that there are many hidden costs and is difficult to manage well.

Robotic tape libraries offer low density storage but with a large physical footprint. High capital outlay is required to build a clean and humidity-controlled environment. Studies have indicated tape libraries have the highest lifetime cost, due to mandatory tape migration, service costs and other hidden costs. LTO Tape duopoly has caused supply issues and the limited numbers of tape drive vendors poses a risk.

Optical disk archives offer low storage density but lack performance, making it less suitable for demanding applications. Suitability is limited for HD, 2K & 4K content and it is basically a write once format. Optical disk is single vendor format and was withdrawn in 2023. High performance cloud is simply storage at a secure location and suitable for collaborative production but unaffordable for archive purposes.

Cold storage architecture implemented on high-capacity commodity disks, offer the best choice for archiving. It is based on MAID-3 concept with a Massive Array of Independent Offline Disks. It is equivalent to Tape Library but based on high capacity disks. Only disks which are reading or writing are spinning resulting in massive power saving, to less than 250 Watts per Petabyte. Disk lifetime can be measured in decades with no migration or fragmentation.

REMOTE PRODUCTION TECHNOLOGIES AND STUDIO AUTOMATION

The session was moderated by **Padarabinda Das**, Prasar Bharati and the panelists were **Rando Pikner**, Qarva; **Fintan Mc Kiernan**, Ideal Systems; **Aale Raza**, Whiteways Systems and **Andrew Wong**, LiveU.

The transport layer protocols are User Datagram Protocol (UDP) and Transmission Control Protocol (TCP). UDP is a communications



Padarabinda Das, Prasar Bharati



Rando Pikner, Qarva



Fintan Mc Kiernan, Ideal Systems



Aale Raza, Whiteways Systems



Andrew Wong, LiveU

protocol that is primarily used to establish low-latency and loss-tolerating connections between applications on the internet. UDP speeds up transmissions by enabling the transfer of data before an agreement is provided by the receiving party. TCP is a standard that defines how to establish and maintain a network conversation by determining which applications can exchange data. TCP works with the Internet Protocol (IP), which defines how computers send packets of data to each other. UDP has efficient bandwidth use but it is unreliable, with no error correction. The weaknesses of UDP can be compensated with Forward Error Correction (FEC) and Automatic Repeat Request (ARQ). However, the problem with FEC for UDP is that there is excessive data resulting in less efficient use of bandwidth. ARQ also creates another problem as retransmission increases latency. The advantages of TCP are that it guarantees the order of packages, designed to provide error correction and is friendlier to Internet.

Network Device Interface (NDI) is an IP transmission protocol designed to enable compatible devices to share compressed high bandwidth video, along with audio and metadata across IP networks for broadcast quality production. Secure Reliable Transport (SRT) is a video streaming transport protocol that delivers secure low latency streaming performance over noisy or networks such as the internet. NDI relies on IT LAN to achieve very low latency and replaces Serial digital interface (SDI). SRT replaces satellite, microwave, and dedicated fibre to deliver contribution quality video from one location to another over the Internet. NDI provides more flexibility and it is simpler to build, with massive reduction in costs. SRT reduces bandwidth and increases reliability with reduction in costs.

Remote production assumes importance when there is a need to work from a remote location requiring fewer people. Automation can reduce repetitive work by automating tasks, thus reducing the number of

persons in the control room. Cost reduction takes place and human errors are reduced as fewer people are involved. However, all this needs to be done without compromising production quality.

INNOVATIVE IMPLEMENTATIONS FROM MEDIA & INDUSTRY

The moderator was **Fintan McKiernan**, Ideal Systems, with the panellists comprising **Azman Fitton**, MYTV Broadcasting; **Akira Miyashita**, NHK; **R Krishna Das**, Prasar Bharati; **Masaru Takechi**, NHK; **SeongMin Kim**, KBS; **Mohieddin Moradi**, IRIB R&D and **Stefan Meltzer**, Fraunhofer IIS.

MYTV Broadcasting was appointed to develop and operate the infrastructure and network facilities for digital TV services in Malaysia as well as transform the nation's broadcast system from analogue to digital. Malaysia completed the analogue switch off (ASO) at the end of October 2019. MYTV operate three multiplexes, with a capacity of up to 30 TV channels, and operates 44 transmission sites nationwide.

DD Free Dish is owned and operated by Public Service Broadcaster Prasar Bharati and was launched in December, 2004 with the aim to reach uncovered areas through satellite. It is Free-to-Air DTH Service with no



Azman Fitton, MYTV Broadcasting



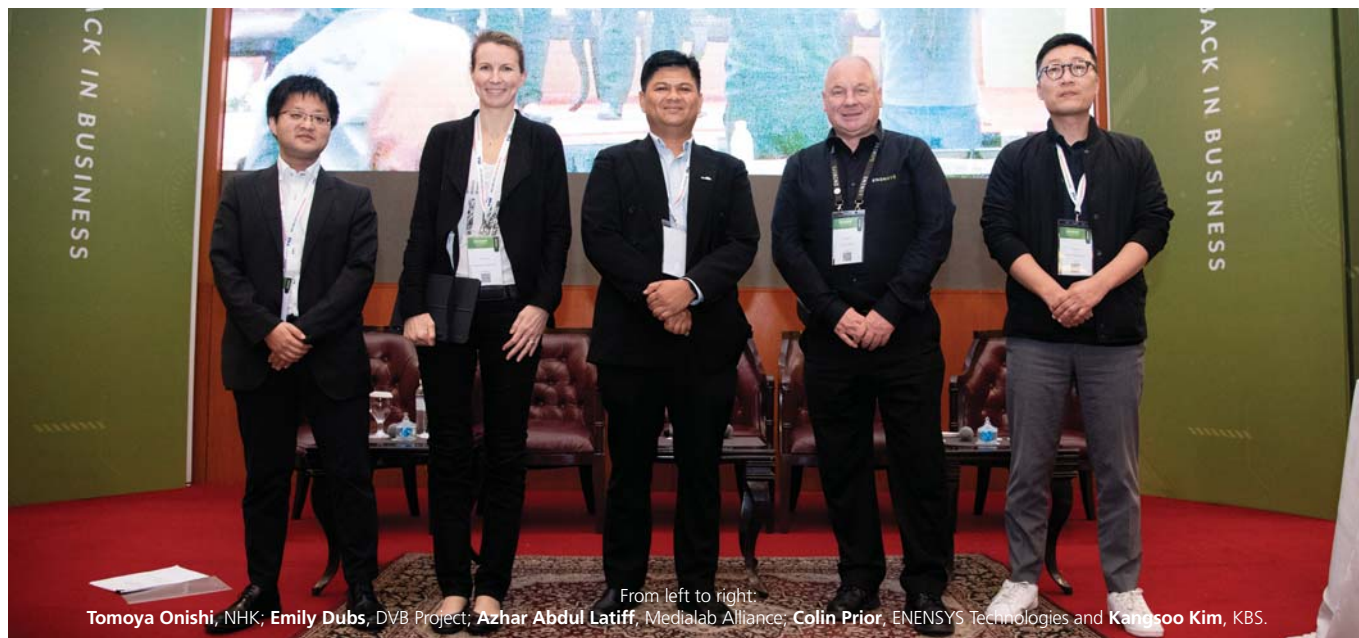
R Krishna Das, Prasar Bharati



Akira Miyashita, NHK



From left to right: **Stefan Meltzer**, Fraunhofer IIS; **SeongMin Kim**, KBS; **Mohieddin Moradi**, IRIB R&D; **Masaru Takechi**, NHK; **R Krishna Das**, Prasar Bharati; **Akira Miyashita**, NHK; **Azman Fitton**, MYTV Broadcasting and **Fintan McKiernan**, Ideal Systems.



From left to right: **Tomoya Onishi**, NHK; **Emily Dubs**, DVB Project; **Azhar Abdul Latiff**, Medialab Alliance; **Colin Prior**, ENENSYS Technologies and **Kangsoo Kim**, KBS.

monthly subscription fee and very affordable for all. Only a one-time investment of about INR 2000 (Indian Rupees) is needed for purchasing the set top box and a small sized Dish Antenna. The unique free-to-air model has made DD Free Dish, the largest DTH platform reaching more than 43 million (25%) households. DD Free Dish started as a public service for DD Channels and has evolved to include private channels which pay carriage fees.

An All IP Infrastructure for OB design faces many challenges. IP traffic shaping is vital to optimise and guarantee network performance. All signals need to be in sync, resulting in fast, frame accurate, and seamless switching. IP routers and switches, buffer packets by nature and forward those in case of sufficient bandwidth. Problems can arise because of latency, packet delay variations (PDV) and lost packets. Forward error correction mechanisms and error concealment technologies such as SMPTE 2022 7 are available to compensate some of those flaws, but they come with bandwidth and latency costs.

The vast majority of vulnerabilities in IP networks originate from operational mistakes and lack of training. Cyber threats are another issue that entails both the encryption of content and protection of the network. A variety of Software-Defined Networking (SDN) controlled switch algorithms have emerged and the industry is still settling on best practices. SDN is a network architecture approach that enables the network to be intelligently and centrally controlled, using software applications.

IP-CENTRIC SOLUTIONS FOR BROADCASTERS

The session was moderated by **Emily Dubs**, DVB Project and the panellists were **Azhar Abdul Latiff**, Medialab Alliance; **Kangsoo Kim**, KBS; **Colin Prior**, ENENSYS Technologies and **Tomoya Onishi**, NHK.

AES 67 interoperability has been standardised to enable to implementation of Audio IP (AoIP) Networking technology in radio studio. The Real Time Transport Protocol (RTP) has been designed to transport data as

quickly as possible on a network, while also conveying time and sequence information, enabling the receiving device to detect out of order or missing packets. The Precision Time Protocol (PTP) is used to share a common clock on the network. Therefore, with PTP, samples are referenced not only by sequence number and a sampling rate, but also by absolute time, allowing transport delay correction and phase alignment.

Quality of service (QoS) delivers the highest priority on the network to clock and media packets. QoS guarantees delivery of critical traffic, even if the network is congested by other traffic. In AES 67, clock traffic is given the highest priority, ensuring the highest clock accuracy. The Session Description Protocol is used to share the stream information between the sending and receiving devices. Video Quality of Service (QoS) and Quality of Experience (QoE) have to be monitored every instant. Impact of failures will lead to loss of both subscribers and services. Premium content providers report that just one failure



Emily Dubs, DVB Project



Azhar Abdul Latiff, Medialab Alliance



Kangsoo Kim, KBS



Colin Prior, ENENSYS Technologies



Tomoya Onishi, NHK

during a live event that the subscriber has paid for is sufficient for the subscriber to cancel their subscription. Advertising failures can also impact revenue, emphasising the need to monitor the end-to-end performance of the system to identify problems before they impact subscribers and content providers/advertisers. Equipment is usually protected with redundancy and needs automatic switching for instantaneous changeover to backup equipment and devices. Comprehensive monitoring of QoS and QoE is essential to maintain viewership and protect subscriber revenue. Automatic changeover switching is essential to maintain service if equipment or network links fail and both hardware appliance and software solutions are available.

NEXTGEN INFRASTRUCTURE AND IMMERSIVE AV EXPERIENCES

The moderator was **Peter Siebert**, IEEE BTS with the panellists comprising **Aale Raza**, Whiteways Systems; **Vikas Choudhry**, Vizrt; **Ran Chen**, CGTN Digital and **Mohammad Nozari Pak**, IRIB R&D.

The Next Generation immersive experience is seeing the transformation of studios and the evolution of presenter tools across multiple display platforms. Transition to cloud and remote production is taking place with high fidelity graphics. Broadcasters are currently sacrificing brand consistency and efficiency, which causes problems. True multiplatform tools for broadcast graphics have not existed. Options are limited to a single style across all channels, or multiple

parallel production lines and a choice between looking bad or spending on too many resources. Adaptive graphics is an intelligently automated way to deploy graphics to multiple output formats.

High Efficiency Video Coding (HEVC) was introduced in 2013 and is currently the most widely used video codec in broadcast use. HEVC offers up to 50% bitrate reduction, but it is not free to use and users must pay royalties. Introduced in 2020, Versatile Video Coding (VVC) is the latest video codec and offers up to 50% bitrate reduction, higher video quality with wide range of applications. VVC has not been widely adopted yet and licensing terms are unclear. AO Media Video 1 (AV1) is royalty free with similar compression as HEVC. It offers high quality video streaming on multiple devices and platforms and has significant support from Google, Apple and Amazon. AV1 is gaining support from major technology companies, but its adoption may depend on the availability of hardware support.

New codecs are emerging with better compression and speed with use of AI and machine learning. 5G and virtual and augmented reality will require new codecs. The importance of video codecs is increasing as demand for high quality content grows. The 'codec wars' between VVC, HEVC, AV1, and other emerging codecs are shaping the future of video delivery. Choosing the right codec requires careful consideration of factors, including compression efficiency, processing speed, compatibility, and royalties. ■



Peter Siebert, IEEE BTS



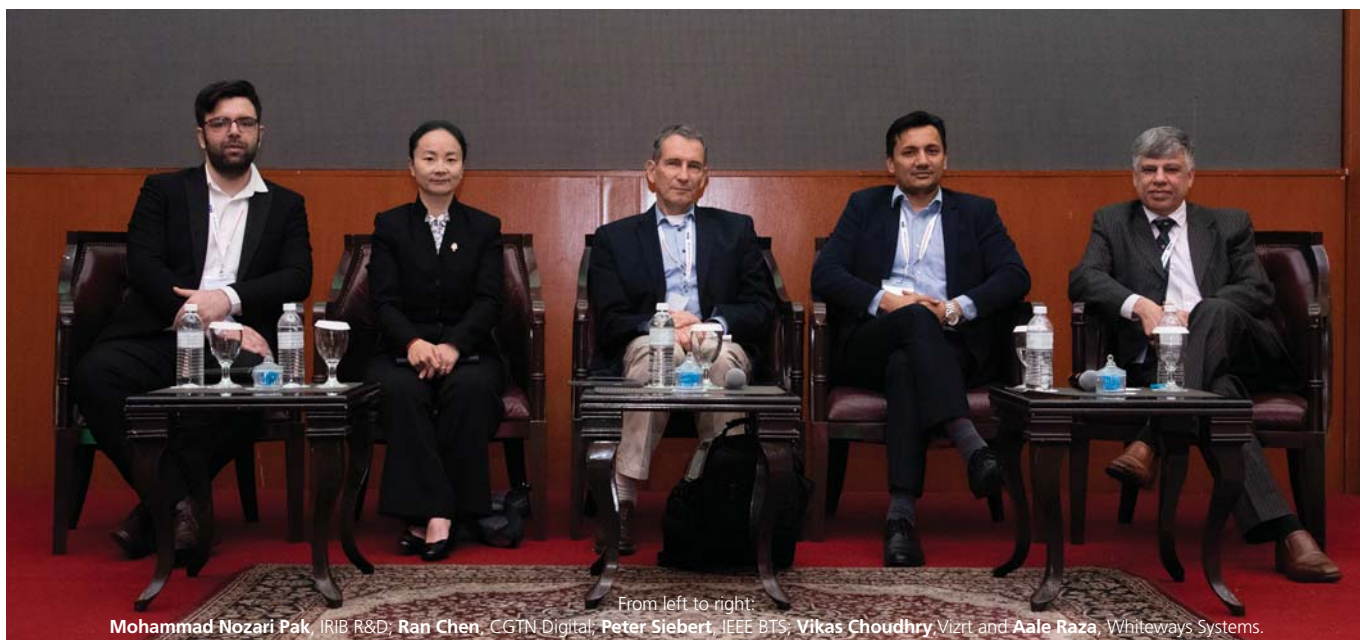
Vikas Choudhry, Vizrt



Ran Chen, CGTN Digital



Mohammad Nozari Pak, IRIB R&D



From left to right: Mohammad Nozari Pak, IRIB R&D; Ran Chen, CGTN Digital; Peter Siebert, IEEE BTS; Vikas Choudhry, Vizrt and Aale Raza, Whiteways Systems.

DBS 2023 WORKSHOPS



MONETIZATION: HOW BROADCASTERS CAN LEVERAGE ADTECH

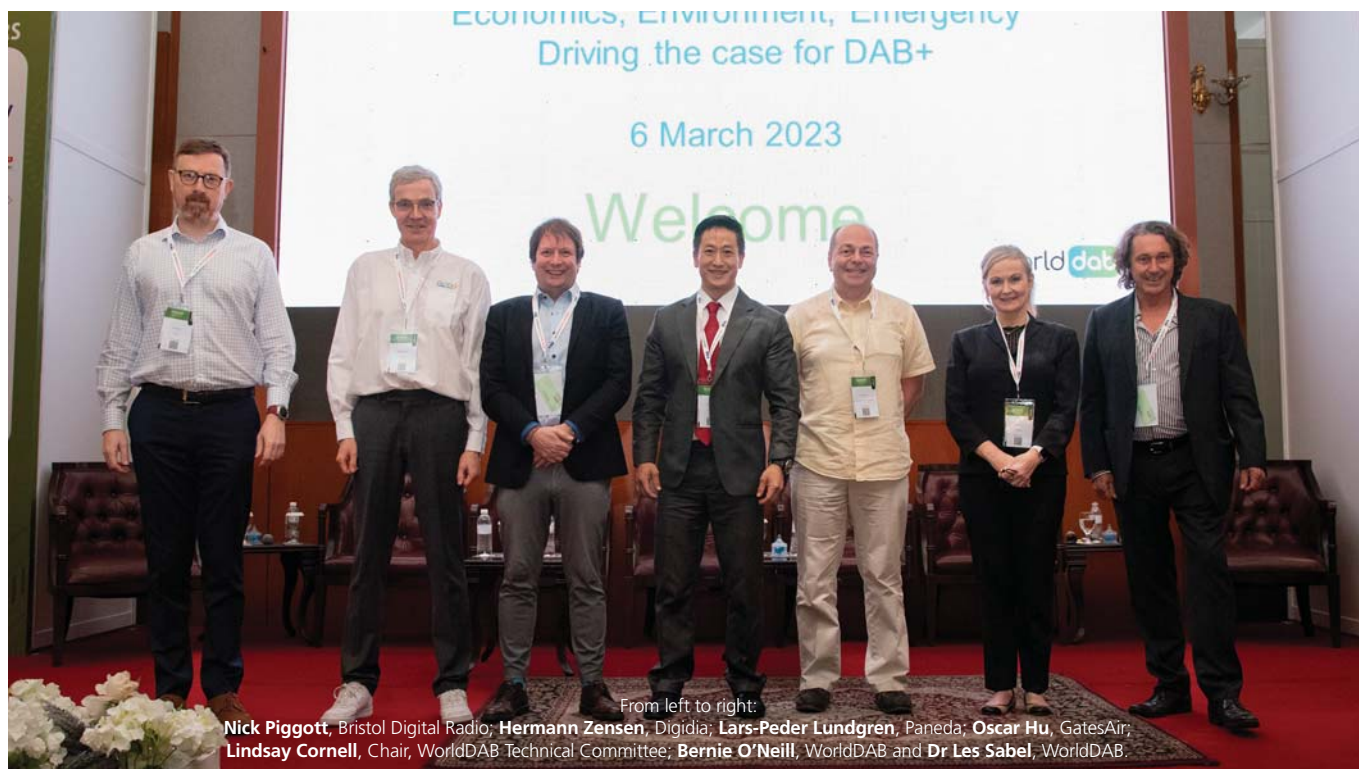
The first session was moderated by **Alia Zainal**, IPSB Technology, Malaysia and the panelists were **Desmond Ngai**, WebTVAsia; **Shad Hashmi**, Amazon Web Services; **Siva Krishnan**, MGID and **Khairil Azizi Khairuddin**, IPSB Technology.

Advertising technology (Adtech) consists of tools and software that advertisers use to reach audiences, deliver and measure digital advertising campaigns. Purchasing and selling digital adverts have become more complex resulting in the emergence of Adtech to streamline the process. Native adverts match the look, feel and function of the media format where they appear. They fit 'natively' and seamlessly on the web page. Unlike banner ads, native ads do not look like ads and don't disrupt the user's interaction with the web page. Native

adverts registered 9% higher lift for brand affinity and 18% higher for purchase intent compared to banners ads.

Behavioural targeting uses viewer's activities to determine which advertisements and messages will resonate most with them. It leverages behavioural data on what people are or are not doing on the website to trigger personalised marketing. Contextual advertising is a form of targeted advertising backed by AI and machine learning to place ads. Subscription Video On Demand (SVOD), Advertising Video On Demand (AVOD) and Transactional Video On Demand (TVOD) are the 3 types of OTT Monetization models. SVOD derives revenue from fixed subscription fees for a particular period. AVOD allows free access to content that come with advertisement. TVOD derives revenue from the purchase of content on a pay-per-view basis.





The global trend is to produce live events in the cloud, which is faster than traditional production, leading to an increase in production output by 550%. Monetisation is evolving as cloud inventory can be scaled and new channels supplied. The focus is on personalized advertising with one-to-one experience and Free Ad Supported Streaming Television (FAST). FAST is growing as result of cord cutting measures, increase in sales of connected TV and Next Gen Distribution. Server-Side Ad Insertion (SSAI) allows for a buffer-less transition from content, to ad, then back to content, providing the same user experience as broadcast TV.

Audio Video piracy in the USA is increasing annually, resulting in the loss of billions for the film industry as well non creation of jobs. YouTube has several tools that copyright owners can use to protect and manage their copyrighted content on YouTube. The copyright management tools include copyright takedown webform, copyright match tool and content ID webform. If copyright protected work is uploaded without permission, the webform can be used to submit a copyright takedown to request the content be taken down. The webform is the fastest and easiest way to request a copyright takedown. The Copyright Match Tool can automatically identify videos that are copies of other videos on YouTube. Once matches are found, removal of the content can be requested. Content ID is available to copyright owners with the most complex copyright management needs, such as record labels or movie studios. However, copyright owners must have the resources to manage it. This technique can block the entire video from being viewed and track the video's viewership statistics.

ECONOMICS, ENVIRONMENT, EMERGENCY - DRIVING THE CASE FOR DAB+

The moderator was **Dr Les Sabel**, with the panellists comprising **Bernie O'Neill**, WorldDAB; **Lindsay Cornell**, Chair, WorldDAB Technical Committee; **Nick Piggott**, Bristol Digital Radio; **Lars-Peder Lundgren**, Paneda;

Oscar Hu, GatesAir and **Hermann Zensen**, Digidia.

DAB+ offers lower costs of distribution than FM, lower energy requirements, and greater resilience in emergencies. DAB+ is established as the core future platform for radio in Europe and new cars have been equipped with DAB receivers to comply with mandatory standards from 2022. Interest in DAB is growing worldwide with activities in South Africa, Tunisia and Middle East. DAB+ is a green solution as studies by both BBC UK and the Bayerische Landeszentrale für neue Medien (BLM), Germany have determined that DAB is 33% more efficient than FM.

The ETSI standard TS 103 461 remains the basis of DAB receiver testing and for the Digital Radio UK Tick Mark certification scheme. The standard provides functional and performance requirements for DAB receivers. It provides test methods and success criteria for chips and modules. Additional requirements have been incorporated to make the specification suited to a much wider geographical area. The regional text profiles concept is integrated into the text and all receivers are tested for correct response to emergency alarm announcements. The extra core technology tests ensure that the chip sets and modules used in products will be able to deliver non-Latin text to suitable displays. The framework for using non-Latin text provides a signalling field for key complexity indicators so that receivers can implement proper display.

The Hybrid radio Service and Programme Information (SPI) specification ETSI TS 102 818 has been updated to expand the geolocation capability for IP bearers and add voice control support. Broadcasters can specify if IP streaming is to be allowed within a specified area to provide greater control for rights limited content. Phonemes and aliases for service names can be provided to allow voice assistants to correctly interpret colloquialisms for radio stations. The two parts of specification are XML description which is the same

for broadcast with IP delivery and binary encoding for compact broadcast using DAB. International standardisation is underway for testing receivers capable of responding to emergency warnings.

Small scale DAB (SS DAB) is the delivery of DAB+ multiplexers to small areas at very low cost in the UK. It is used in Europe to provide commercial and community broadcasting using Open Digital Radio (ODR) Software Defined Radio (SDR). Small broadcasters such as community broadcasters are able to enter the DAB+ market. As radio continues with digitisation and analogue switch off, it has become part of the DAB+ landscape. SS DAB is now established with regular DAB transmissions in the UK, Switzerland, the Netherlands, Denmark, Germany and France. However low cost brings about challenges in terms of equipment capabilities and restricted coverage areas.

SS DAB has caught on in the UK with a licensing scheme being developed and an auction method to select suitable multiplex areas and operators. The licensing process is now in its fourth round with over 40 SS DAB multiplexes having already been awarded in the UK. The essence of the licensing rules is the same as for existing local and national DAB multiplex operators. The advantages include operation as an SFN and support of announcements. The disadvantage is that the use of public internet may impact service availability.

Public Broadcasters have a responsibility to reach out with important information on radio. Authorities also have a responsibility to reach out to the population with important information. However, the time it takes to get information out is critical, and all platforms play important roles. Existing platforms are, mobile networks, national siren systems, broadcast networks and social media. However, mobile networks may be down, and we cannot trust the veracity of social media. Broadcast networks are independent of the internet and are self-contained systems. Existing systems can be used for warning systems without major investments. Broadcast has a built-in protection against hacking and has uptimes over 99.9%. A digital hidden code in the DAB network can activate special receivers to perform pre-defined actions. It may activate critical infrastructure such as siren system, play sound in speakers and control mechanical systems like closing/opening barriers.

The Cost-effective way of successfully building an OB Van

Requirements for an OB need to be analysed from many aspects including the type of event it is needed to cover. The maximum number of cameras required and the need for some cameras to be equipped with wireless transmission modules, must be specified. The most feasible size of the OB Van needs to be studied together with additional features required, like graphics and commentator systems.

OB Vans can be categorised by size and application. Live Radio coverage requires OB Vans with 6-12 Mics whilst DSNG uses a 3-5 Camera OB Van which is usually used for covering political events and political rallies.



A 6-12 Mid-size Camera OB Van is used for medium level sporting events and musical concerts. Large multi-purpose Trucks with 13-16 cameras are expandable type OB Vans used to cover national level sporting events and international political conferences. Larger multi-purpose expandable trucks with more than 17 cameras are specifically designed for international sporting events like the Asian Games, Olympics and other large events.

The truck will be transporting a lot of very valuable equipment. Hence, the equipment needs to be safe from moisture, wind, dust, cold, heat and a combination of these variables. The right kind of material needs to be used to safeguard the truck. The truck needs to be protected from lightning strikes and to have the correct suspension to safeguard against potholes and other road conditions which can cause damage to the equipment. The truck needs to be earthed properly while it is parked. The axle, chassis, engine type has to be designed exactly according to the weight, length and height of the vehicle.

Saving Lives and Livelihoods: Early Warning Broadcast Systems



Every broadcaster will experience a disaster sooner or later but it is possible to predict the likelihood of a natural disaster and assess outcomes. The broadcaster can plan what to do when a disaster happens and be prepared. The United Nations Office for Disaster Risk Reduction (UNDRR) and World Broadcasting Union (WBU) have launched a project named WBU/UNDRR Global Media Saving Lives Initiative. The multi activity programme for the Asia Pacific region aims to enhance the capacity of all ABU broadcast members to ensure the continuity of broadcast services during disasters by making their physical networks resilient.

Broadcasters' services should be linked to their national disaster management authorities. Members should issue timely, accurate and relevant early warning messages by developing up to date broadcast emergency plans. ABU members should broadcast mainstream climate change adaptation and disaster prevention measures in their news, current affairs, and general programmes.

Unleashing the Power of Drone-based Antenna Measurements



There is need for better testing and commissioning tools for broadcasters, mainly in the antenna validation and coverage verification domains. Lightweight receivers, drones and automation can solve broadcast coverage and antenna issues in a more timely, efficient and accurate way than was previously available. Traditional methods use spot measurements that are time consuming and difficult to diagnose. Measurement is limited to 10 m and must be done manually with a

helicopter. In contrast, drones can obtain 360 degree data with autonomous flights and automated reporting with live transmission.

Drone measurements are important as the RF polar plot pattern must comply with regulators who have filed licence applications with theoretical antenna patterns and maximum radiated power requirements which are used for administrative and engineering purposes. The regulator licence information is used to calculate interference protection ratios and broadcast market protection. Broadcast antennas are carefully designed to radiate in a certain direction with a certain power. They are designed to meet the criteria of the population that are to be covered by the broadcast station.

5G Broadcast to Create the Future of Efficient Content Delivery

In the view of the Rhode & Schwartz presenters, 5G clearly holds the promise of original technological and business opportunities and therefore creates huge awareness for various industry players. In fact, 5G is bringing new broadcast and multicast capabilities to the whole ecosystem while creating high spectral and energy efficiency, as well as reduced costs. Hence enabling a sustainable and better-connected world. Thus, it is of great interest to network operators.



With 5G Broadcast/Multicast distribution via genuine broadcast infrastructure in the UHF Bands IV and V various new business opportunities are developing. A great opportunity when most countries are nearing the end of, or have already finished, the digitisation of their broadcasting networks. This technology is not limited to live video distribution. It also enables other applications like public warning systems, positional navigation and timing systems, in car entertainment, location based advertising etc., using existing infrastructure while offering many advantages, like SIM free reception, receive-only mode, highly flexible velocities and many more.

As Broadcast/Multicast is the most efficient way content of content distribution it clearly has a bright future ahead. Various global trials and first thoughts of pre-commercial rollouts are underway. Not only are the network operators becoming more and more excited, but also chipset manufacturers are showing real interest in bringing this technology to life. Prototype devices were already available in a handheld format but now commercially available devices can be modified to support reception.

Efficiency in Broadcast Production and Delivery through Software-defined Solutions



Content production, delivery and consumption is ever-changing, and workflows need to be flexible and adapt to different requirements. Software-defined, COTS-based solutions are a key element to enabling such versatility and are the basic requirements for virtualised, cloud-based deployments.

Rohde & Schwarz has a range of Media Production solutions, from Ingest/Playout servers (Venice), to Multiviewing/Monitoring products (Prismon), to Shared Storage (SpycerNode) to Integrated Playout (PixelPower Gallium/StreamMaster). Prismon and Gallium/StreamMaster are inherently and fully software-defined, deployable on-premise, via hypervisor or on the Cloud. Future-proofness, flexibility and ease of use are the defining characteristics of these products and solutions.

IP-based Direct-to-Mobile and Direct-to-Vehicle

The ATSC 3.0 is currently the only DTT standard that specifies IP Transport; this enables many convergence scenarios between ATSC 3.0 and other IP based



networks. Broadcast Core Network (BCN) is being designed for standalone, broadcast only operation and for converged operation with 5G. BCN will accommodate scenarios where an uplink is always available or never available.

In India, more than 80% of internet access is through mobiles and consists mainly of video traffic. The explosive growth in video demand has strained the cellular infrastructure in India. Direct to Mobile (D2M) based on ATSC 3.0 can handle a significant part of this traffic. Broadcaster Prasar Bharati has over 630 (High Power High Tower) HPHT TV transmitter towers targeted for DTV conversion and these towers cover about 84% of the population. Thus, HPHT infrastructure with its huge reach can be re-purposed for D2M but existing HPHTs do not provide indoor mobile coverage. However, Low Power Low Tower (LPLT) in SFN mode with HPHT, provides the indoor mobile coverage. The LPLTs are mounted on existing roof top towers used by cellular companies and there is no set up cost.

DVB Native IP & DVB-I media delivery ecosystem



DVB-I is an Internet centric media delivery system and it is not a broadcast system based on IP. In the past, Broadcast and Broadband were operated in silos, but now DVB-I can help deliver DVB's broadcast-like experience on Broadband. DVB-Native IP is a converged media delivery system where IP based delivery is handled via broadcast, multicast and unicast networks. DVB-I underpins the converged ecosystem targeting the full range of devices. It breaks down the barriers between broadcast and broadband words. DVB-I can reach a wider audience and more devices. Common services can be deployed across devices without agreements with manufacturers. DVB-I offers higher interoperability and lower distribution costs due to optimised network usage.



From Data to Results: Building a Successful Enterprise Analytics Program

Use case and data discovery can be utilised by broadcast businesses to manage problem. Management use cases can be categorised into Audience Segmentation, Content Performance Analysis and Competitor Analysis. Producer use cases are categorised into Content Recommendation, Content Optimization and Trend Analysis. Engineering use cases are categorized into Broadcast Monitoring, Equipment Performance Analysis and Quality of Service Analysis.

Viewership and listenership analytics help broadcast and media companies to understand the audience, their profile and consumption behaviour. From the understanding, content offering can be optimised to target the right demography to increase overall viewing time and audience satisfaction. Viewership analytics solution comprises modern cloud platform and data processing capabilities to facilitate viewership data management and modelling, to prepare and visualise enhanced datasets of higher business value. ■



Digital Content Strategies



'How do digital news makers stay relevant in an environment where digital audiences are in decline and are actively avoiding news?'... This was the focus of the digital content strategies masterclass at DBS2023 led by **Esra Dogramaci**, Managing Editor Digital at SBS Australia, in which participants learned

how to apply the user needs framework to assess content performance to build a digital strategy.

During the masterclass, participants looked into strategies on how to survive in an environment where traffic is declining and also examined what levers they can pull to better engineer content success with the aid of existing user needs models from the likes of BBC, TRT, NYT and Vogue. The key take-away is that understanding the audience is the key as it helps to better understand what they are coming for.

Reiterating the important role data play in digital content, Esra shared a case study from SBS where they evaluated why their content was underperforming and analysed the content to look for emerging patterns. Based on the results, SBS made some key decisions to reduce straight wire content and set page view target goals. They reviewed monthly performance, enhanced social treatment of all content, upskilled the entire team in data journalism, and enhanced video performance. The outcome was that, after making the changes based on user needs, content performance increased across platforms.

The lessons SBS learned from the exercise showed:

- the importance of understanding their digital identity to know why audiences come to them and which audiences go where and for what
- catering existing content to new audiences and letting new audiences find old content is a valuable strategy
- the power of social media and video to drive traffic to the site
- efficiency equals opportunity when it comes to engineering content for performance

One question Esra said she often gets asked is, how to get better at doing digital content when the way we cover news is changing. The key to survive and thrive in this environment, according to Esra is, to experiment and evolve. Esra, however, added that there are risks to take into consideration when third-party platforms change rules all the time (such as when social media sites change their goal posts) so content creators have no choice but to keep up and adapt.

The participants were sent home with an updated user needs framework which focuses on generating fact-driven content to inform audiences, action-driven content to motivate audiences, context-driven content to explain to audiences, and emotion-driven content to move audiences.

More than 30 participants joined and benefitted from the practical masterclasses, delivered over three days. The results of the feedback survey conducted by the trainers showed that 80 percent of the participants found the masterclass useful for their roles in their organisations while 84 percent of them expressed overall satisfaction with the masterclasses. ■

The Transition from SDI to IP and IP Workflows & Remote Production



DBS 2023 featured a masterclass session on 'Transition from SDI to IP and IP workflows & remote production', which highlighted IP technology trends with an example of OB Van IP-based setup. The session was delivered by **Dr Mohieddin Moradi**, General Director of IRIB R&D. Participants, first, received an overview of IP basics, networks, OSI and TCP/IP model, MPEG 2 transport stream and SMPTE ST 2022 & ST 2110 standards. Likewise, other important IP based technologies such as audio and video over IP, network media open specification (NMOS), IP infrastructure interfaces like Router, Broadcast Controller and Orchestrator etc. IP technologies are incomplete without talking about compression of audio, video & images, and timing protocols specified under different standards. Whether it's remote production, live production or delivery and distribution of audiovisual contents, broadcasters have different reasons to migrate from SDI to IP workflow within their facilities.

There are several standards organisations and standards and industry specifications for implementing All-IP infrastructure and to enable audio and video over IP. SMPTE's ST-2022 suite take payloads from specialised

electrical interfaces and puts them on IP using RTP. Here, the electrical interfaces are ASI and SDI. SMPTE ST-2110 suite can be thought of as interfacing much like baseband SDI in broadcast, satellite and cable facilities. Here all the signals are carried separately. Video, audio and data are all separate streams using RTP. SMPTE specifies the PTP timing system to synchronise all the clocks such that the absolute time difference between any two clocks is within a specified limit. NMOS is another family of open specifications that enable interoperability between media devices in the IP infrastructure. The standard to enable audio over IP (AoIP) is AES67 that enables high performance audio over IP streaming interoperability between the various IP based audio networking products currently available based on existing standards such as Dante, Livewire, QLAN and Ravenna.

The IP world of broadcast & media routing deals with video, audio and data in multiple formats and protocols. The content delivery and connectivity take place via different media such as copper, fibre, or wireless (terrestrial and satellite). Multiple different variants of connectivity exist that are not all interoperable and these vary in data rate capacity. There exists different switches deployed across the networks. Nowadays, software defined networks (SDN) can be implemented and are often requested as a means of defining secure paths in IP networks.

In the implementation environment, different industry solutions allow media service management and orchestration, media over IP monitoring and SDN orchestration, end to end IP live production. A typical example of a 12G SDI or Full IP OB Truck setup includes production areas, audio area etc. Main production area design includes critical equipment such as vision mixer, character generator and graphic system, multiviewer, SloMo remote controllers along with multi-speaker configuration for monitoring. Also needed are measurement equipment, audio and video processor, test signal generator etc.

There are pros and cons of All-IP infrastructure implementation. It allows future proofing - in particular the ability to adopt new formats, flexibility-supporting new ways of working with more dynamic assignment of resources, Scaling-allows facilities to be scaled up more easily and cost efficiency- lower cost model due to adoption of COTS hardware. But the downsides are that interoperability issues still exist, obvious cybersecurity risk, the new skillsets required to operate, and support. ■

RTM'S HD NEWS DIGITAL ARCHIVE: REVOLUTIONARY BROADCAST TECHNOLOGY TOWARDS EFFECTIVENESS - FUTURE DEMAND PART 2

ABSTRACT

This article looks into the continuation of Part 1 in which Ts. Ahmad Shafiq Mirza Bin Mansor narrated the proposed new 'HD News Digital Archive System' for the whole of Malaysia's coverage. In collaboration with Mardhiah Nasir, IPSB Technology & Sam Bogoch, axle ai, we dive deep into the development of the News Digital Archive or *Arkib Digital Berita* - ADiB system to manage media coverage, either in raw or edited versions allowing media material to be published further, on either TV, radio or social media platforms. Our aim is to address the requirements, areas of improvement and showcase the outcomes through the success of this project implementation.

INTRODUCTION

Established in June 2012, the RTM News Centre, along with the Digital Archive and the News Portal, was built in order to streamline the news and current affairs for the entire country [see <https://www.abu.org.my/2012/06/06/rtms-news-centre-opened-news-portal-and-digital-archives-launched/>].

As the national broadcaster of

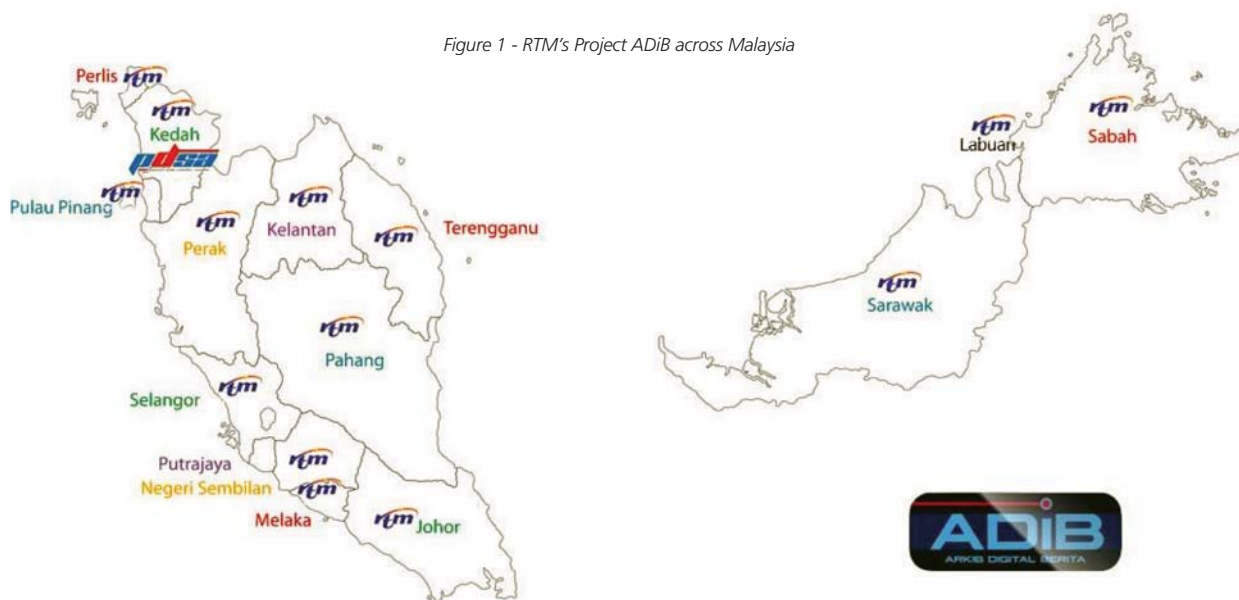
Malaysia, RTM relies on news content created daily by teams stationed in all fourteen states of Malaysia, but the current workflow creates a problem when RTM needs to reproduce content for other purposes, such as documentaries, analysis, or recaps.

The issue of limited available media footage is addressed by enhancing its Standard Operating Procedures

(SOP) and establishing a new system that allows for the effective storage and retrieval of raw footage. This will ensure that all media footage is easily traceable, reducing media double-handling and improving coverage quality.

Therefore, IPSB Technology with partners, axle ai and Arista, provided a solution using AI/ML to establish an SOP that would provide a

Figure 1 - RTM's Project ADiB across Malaysia



framework for efficient and effective media management, resulting in improved productivity and quality of news content.

1.0 PROPOSED SOLUTION

1.1 ARCHIVING, RETRIEVAL OF MEDIA AND MEDIA SHARING

Implementation of a powerful multi-site MAM platform with search engine and artificial intelligence capabilities. The simplicity of use and low-resolution proxy playback includes multiple features and user controls for commenting and approvals. Synchronising a holistic system accessible across all 14 states, allowing producers to access real-time content from credible sources.

1.2 MEDIA WORKFLOW INEFFICIENCY

Implementation of new workflows that eliminate the possibility of viruses, file corruption, and missing items during file exchange, and by establishing a system that allows for the storage and retrieval of raw footage to ensure that all media footage is easily traceable, reducing storage utilisation and unnecessary file duplication.

1.3 MEDIA SHARING & ARCHIVING REQUIREMENTS

Address data centre readiness, internal network stability and dependability, internet bandwidth, and change management while conducting an end-to-end workflow review to gain a deep understanding of past, current, and future media management requirements for news. This would ensure the infrastructure was ready to support rollout of a multi-site management platform.

1.4 SECONDARY BACKUP INFRASTRUCTURE

Providing access to secondary backup infrastructure in case of corruption or accidental removal or deletion. RTM would be able to improve its media management processes and ensure consistent long-term planning in line with the product life-cycle investment.

RTM Infrastructure Requirement Study

Workflow	Throughput	IOPS	Capacity	Stream Bandwidth
Digitisation	X	X	✓	X
Data Archiving	X	X	✓	✓
Post Production	✓	✓	✓	X
Graphical Editing	✓	✓	X	X
Video Rendering	✓	✓	✓	✓

Figure 2 - Results of RTM Infrastructure Requirement Study

2.0 IMPLEMENTATION OF ADIB VIA AN INTEGRATED SCALE-OUT INFRASTRUCTURE SOLUTION WITH IPSB'S ENTERPRISE MEDIA STORAGE AND ARCHIVING SYSTEM

Before applying the solutions to Project ADiB, IPSB Technology conducted a study to determine the appropriate update needed by RTM that would address the earlier-mentioned challenges.

The four infrastructure elements that were focused on include throughput (data transfer rate to and from storage media), Input/Output Per Second (IOPS), (measurement of performance of on-premise storage such as hard disks and storage area networks), capacity and stream bandwidth on five main workflows used by Project ADiB. It was apparent that areas which required an update were:

1. Digitisation (areas requiring solutions: throughput, IOPS, and stream bandwidth)
2. Data archiving (areas requiring solutions: throughput and IOPS)

3. Post-production (areas requiring solutions: stream bandwidth)
4. Graphical editing (areas requiring solutions: Capacity and stream bandwidth)

The best infrastructure approach was evaluated with consideration of RTM's geolocation and infrastructure capabilities and policies. RTM decided to move into a hybrid cloud infrastructure and thereby comply with government regulations and broadcasting standards.

Concerning storage, RTM opted for a combination of:

1. Conventional on-premise storage solutions that allow for complete local control
2. Communal data centres that can either be on-premise or co-location
3. Data centres that are pushed to the hybrid cloud allow specific storage spaces as required by broadcasters that enable content management instead of infrastructure management.

The hardware and network infrastructure must be designed

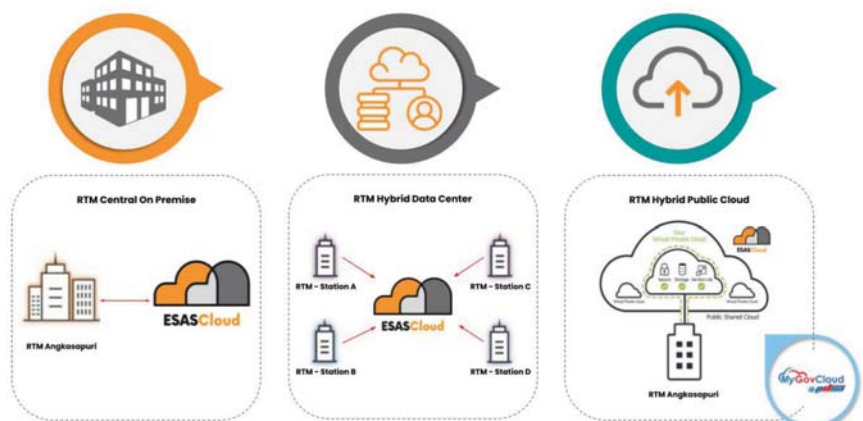


Figure 3 - Storage model options proposed by IPSB Technology

with active redundancy supported by Arista, especially during maintenance and systems backup. Additionally, the team was required to consider the security levels when incorporating a Multi-Layer Workflow execution. Apart from that, there must be an alternative workflow to ensure that the business continuity plan works without interruption to normal operations.

Below are the areas of improvement highlighted by RTM and how it was individually managed.

2.1 STANDARDISATION OF ARCHIVE MEDIA MATERIAL

In media storage management, there are two types of media format: high-resolution video and low-resolution video. The development of this system includes low-resolution storage in cloud media archiving, while high-resolution storage will remain on-premise.

Therefore, upon conclusion of the media house format for News Archive as stated in Part 1, IPSB

transcoded all media material using ADiB transcoder. The primary purpose of storing the low-resolution video in the cloud media archive is for speedier preview with nation-wide access, as this approach would not consume existing media mover bandwidth.

Hybrid cloud media archiving was also considered as an alternative workflow for any connectivity problems on the premises. Although the archived media storage in the cloud that can be used to recover on-premise storage will be in a low-resolution format, it is still acceptable quality for broadcast news content if required.

2.2 REDESIGN OF MEDIA WORKFLOW

RTM had previously been procuring more data storage or compressing the media formats, which caused data loss, making the original unsuitable for reproduction. To overcome this problem, the new system will focus more on media movement and filtering. At the same time, the media story will be

prioritised based on its creation date and time retrieval. During the media movement, the team will decide to re-prioritise the media, based on national interest, to be kept safe in RTM's archive storage.

On a daily basis, all 14 states will push the proxy to RTM private cloud, making it easy for users to browse archived material. Users are able to share material within 14 states using axle as a primary component and ADiB as a total solution.

The solution enables two types of search, Global and Local, both accessing the same media proxy for preview. The purpose of the design was based on the level of authorization, either to preview and download high-resolution or simple access to low-resolution footage. Global Search can preview the maximum amount of footage using the system's centralised Media Asset Management (MAM), while Local Search was designed for Production Asset Management (PAM).

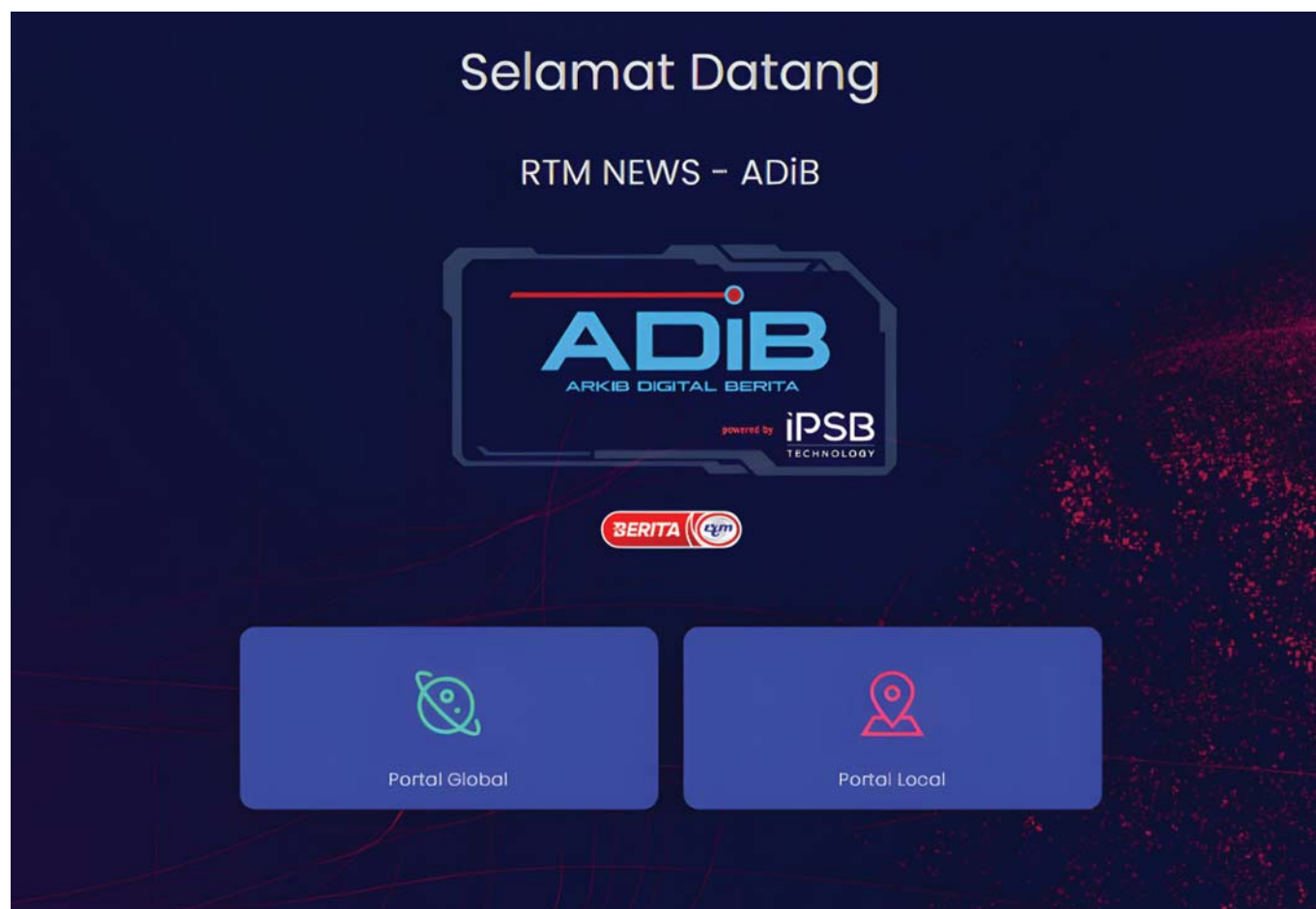


Figure 4: User Interface for ADiB shows both Global and Local Access for login



Figure 5: UI for Local Access based on the states

2.21 UTILISATION OF ADVANCED WORKFLOW AUTOMATION

A no-code media automation and customisable media workflow tool that works with any operating platform (Mac, PC, and Linux), Axle Connectr provided the best solution for media asset management for wide-area inter-connectivity, media exchange and federated search, saving time for RTM to focus on what it does best. IPSB Technology's Data Media Orchestrator with Axle Connectr focuses on four main areas:

1. Using a designer tool to **design automated workflows and process customization** hence, automate technical processes and alert the users when they need to take action
2. **Identify and respond to potential issues with real-time monitoring enabling** complete visibility into all media workflows and activity and fix issues by drilling down to the specific assets, systems, workflows, and even the data involved

3. **Orchestrate workflows in order to operate more efficiently** by orchestrating the key elements, technical processes, and manual tasks of live or post media production, publishing, and distribution workflows
4. **Integration with existing systems** which form part of the media supply-chain to transform existing applications and systems into a unified platform, allowing for shared data between systems, triggering timely actions, and reporting when completed

Connectr's advantages:

1. Rules-based processes triggered by events in axle (metadata changes) and other applications within RTM's system
2. The extendable Axle Connectr framework allows visual automation for various video toolsets
3. No re-configuration or re-ingestion required for existing storage lowering the deployment impact and shortening time to go-live

To ensure the system's effectiveness, media migration was part of the implementation from Digibeta to XDCAM to LTO to hard drive-based NAS storage. As existing media must be in a 'ready-to-use' state once the system is in place, the execution of media migration will be in the form of 'current-to-future' and 'current-to-past'. Using this method, the system will be able to retrieve any related media story from the past, according to current needs.

2.3 UTILISATION OF ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML) TECHNOLOGY

Axle ai media asset management was installed on premises at the headquarters of RTM in Angkasapuri, along with all 13 branches spread throughout Malaysia. While AI refers to the general ability of computers to emulate human processes, Machine Learning, a subset of AI, refers to the technologies and algorithms that enable systems to identify patterns, make decisions, and improve

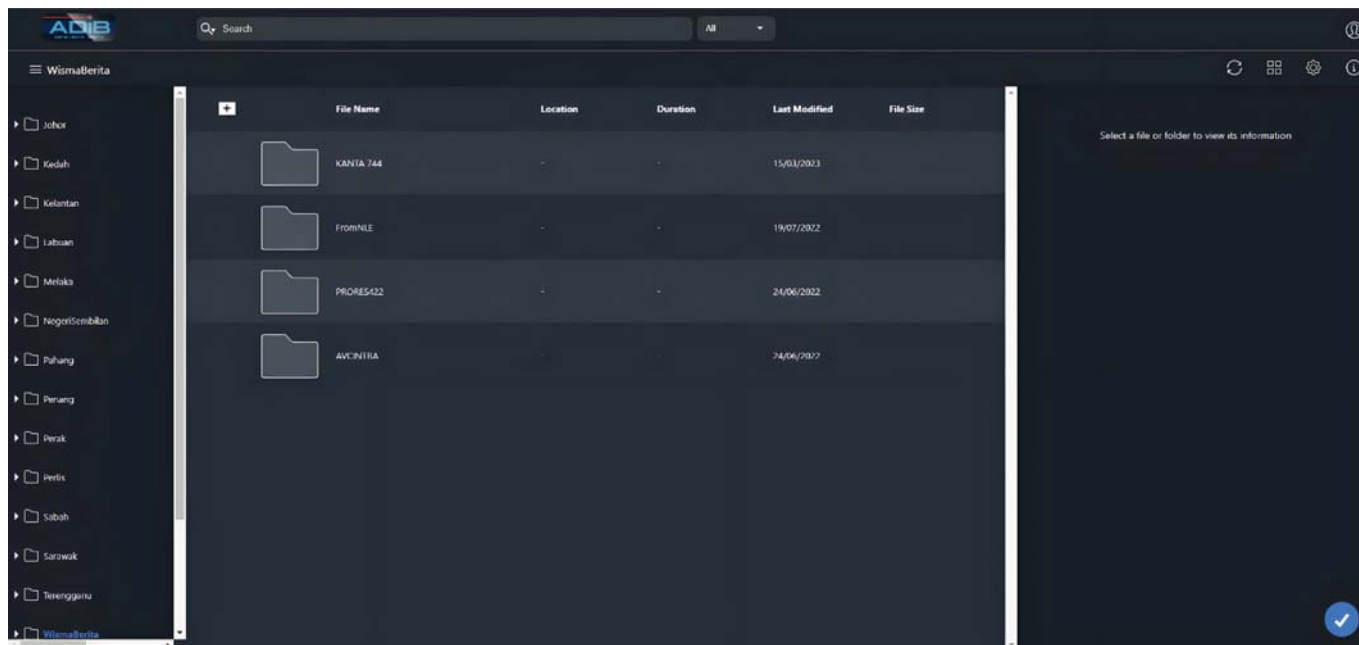


Figure 6: UI for Global Access

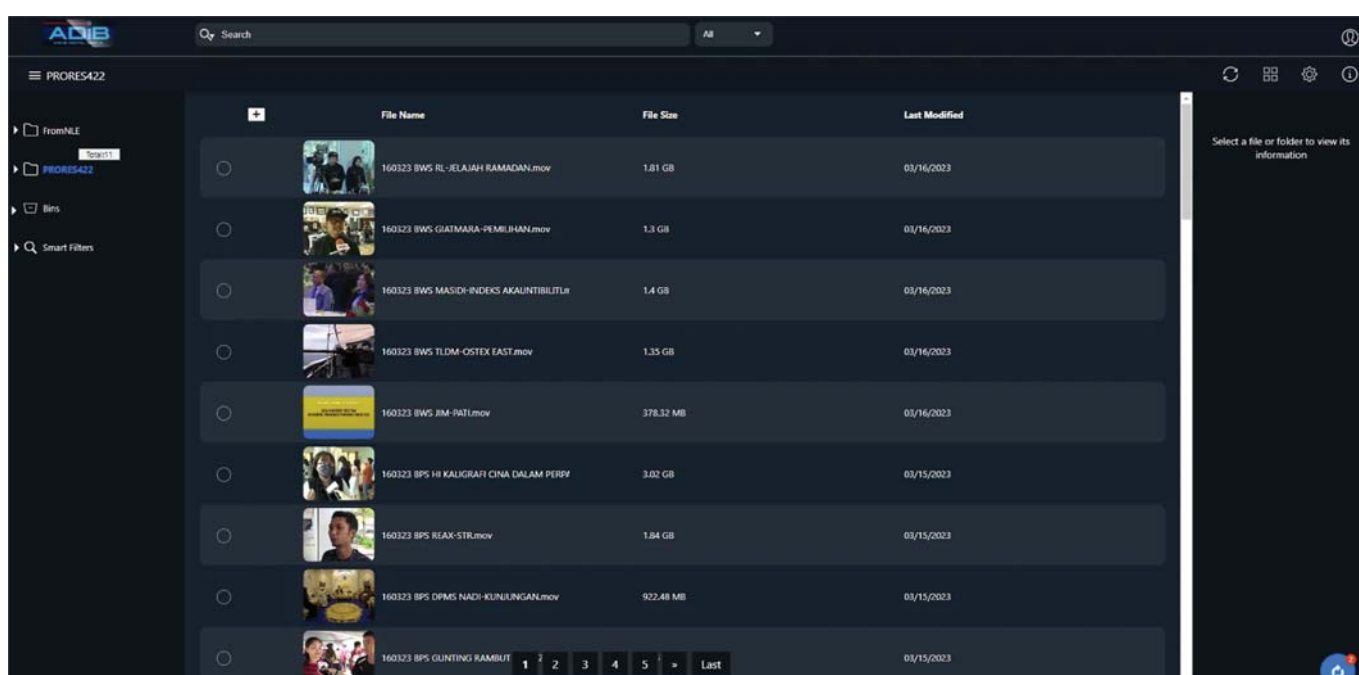


Figure 7: UI for Local Access

themselves through experience and data (see <https://ai.engineering.columbia.edu/ai-vs-machine-learning/>). Media management is more effective when information is extracted. The information shall be in the form of

- Audio to Text Transcription;
- Face Recognition; and
- Object (Tag) Recognition.

The installation enables all news stations to synchronise all relevant metadata, allowing easy access and download ability for editing and broadcasting.

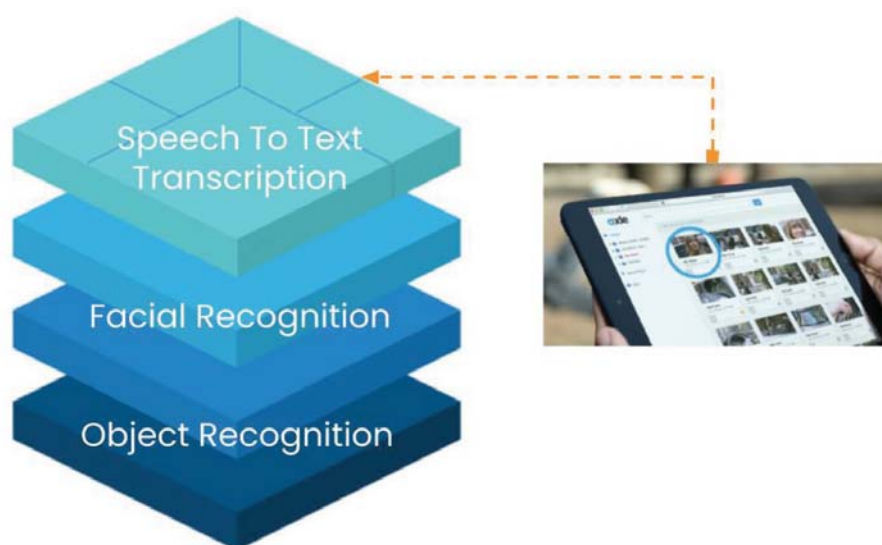


Figure 8 - ascribe.ai: how it works

As part of Axle.ai's offering, ascribe.ai is a leap forward for fast, accessible transcription. ascribe brings affordable transcription using Axle.ai's Speech cloud backend [see <https://ascribe.ai/>] which works by:

1. Providing AI-driven transcription and auto-tagging supporting both on-premise networks and cloud storage
2. Simple and user-friendly front-end media asset management tool allowing for file system cataloguing with multi-core transcoding of low-resolution media

Ascribe.ai auto-generates metadata for speech, facial, and object recognition. Supported for both on-premise and cloud networks, the AI automated tool is used to build the metadata required by and for RTM.

The form mentioned above is known

as a 'video analyser' and can assist media mover to be searchable at the required time. A more accurate process will provide additional metadata, such as face recognition or transcription audio.

Axle's AI/ML capabilities allows for:

Improved search capabilities: The ability to automatically tag media assets allows users to find and catalogue assets that are more relevant to RTM, such as 'sultan' 'perdana menteri' 'agong' etc which are important to the role of national news broadcaster. This reduces the error and time to find files that have been mislabelled.

Better decision-making: RTM can analyse the usage of media assets using AI and ML, and the data gathered can help make better decisions about content creation,

usage, and distribution. Instead of precisely following human-coded instructions, these algorithms self-adjust through trial and error to produce increasingly accurate prescriptions as more subject data is received.

Enhanced and more secure workflows: AI and ML can streamline RTM workflows and make them more efficient by automating repetitive tasks and providing more accurate tagging and categorisation. Media assets can be better protected, and access can be more precisely controlled.

2.4 CLOUD MEDIA ARCHIVING

The archiving solution was divided into three stages as previously mentioned in part 1. Based on the media moment workflow elaborated previously, the three stages are depicted as per diagram below:

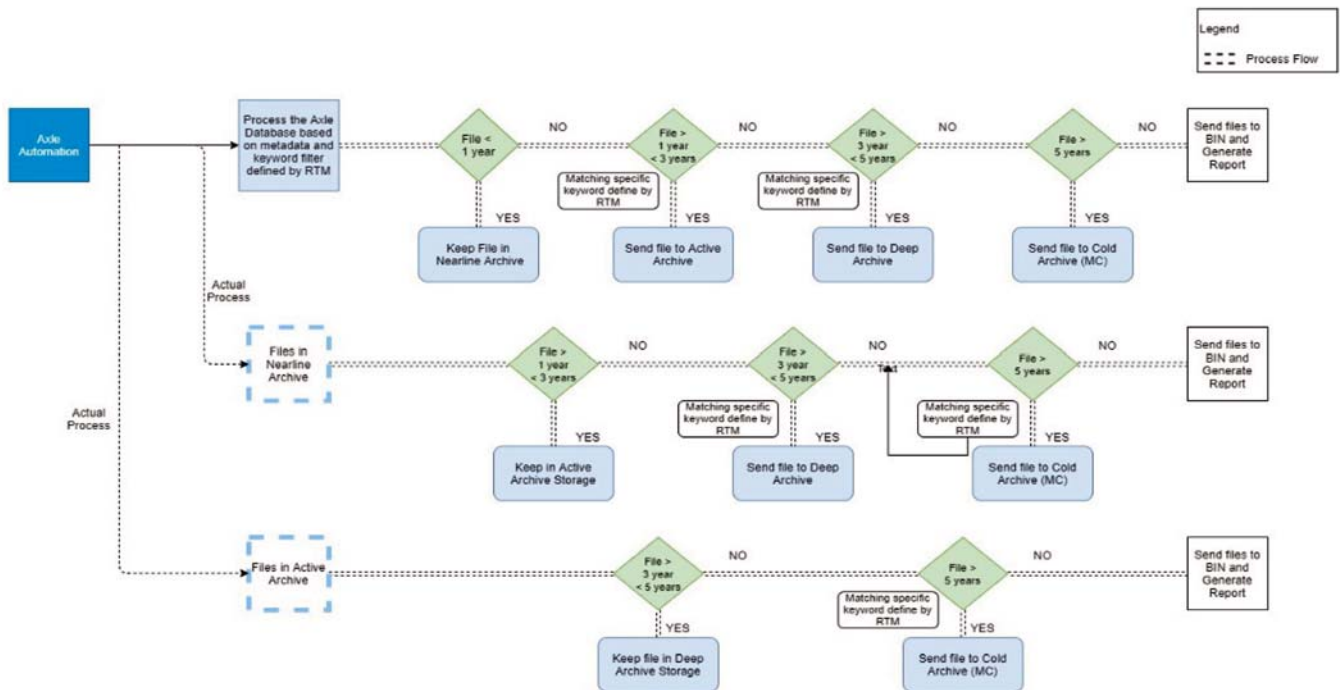


Figure 9 - Media Archiving Workflow

For optimum operation, the media movers needed to be automated. As an alternative workflow, the system required a selective overwrite and a manually triggered data mover. For optimum operation, the media movers are automated moving between the various stages of production to nearline archive, to deep and cold archive. With the policies enabled, content that does not adhere to it will have the option to be purged indefinitely

from the system subject to approval by librarians, who can monitor this via email notification. This allows for optimisation of capacity management for RTM executed seamlessly with Axle ai without so much human intervention, therefore optimising storage costs for each department.

Recovery Point Objective (RPO) measures how frequently users must send a media file over to the archive

cluster so that it contains all updated media. If a disaster should occur between these sent files, RTM can't afford to lose 5 minutes or even a days' worth of data updates. RPO represents how up-to-date the data recovered will be. In practice, the RPO indicates the amount of data (updated or created) that will be lost or needs to be re-entered after an outage.

Recovery Time Objective (RTO) is the amount of downtime a business

REGIONAL



35

HDR Vivid Standard and Application in China

ABSTRACT: HDR Vivid, a new HDR (High Dynamic Range) standard released in January 2022 in China, is one of the key technologies for ultra-high definition (UHD) video processing. Based on the existing open HDR standard such as HDR10 and HLG, the HDR Vivid standard provides the mechanism to leverage the terminal display capabilities, to ensure the video content being displayed compliantly with the content producers' artist intention. End-to-end systems have been constructed and tested based on this standard to demonstrate their technical advantages and the readiness for large-scale commercial use. More specifications for different application scenarios, test, and certification are under development and making rapid progress.

1. INTRODUCTION

With the rollout of 5G technologies and the improvement of terminal display capabilities, the era of UHD audio and video experience has arrived. HDR, one of the key technologies in the UHD audio and video industry which can provide wider colour volume and higher dynamic range, is gaining more and more attention these years.

In the 2010s, especially in 2019, Ministry of Industry and Information Technology (MIIT), National Radio Television Administration (NRTA) and China Media Group (CMG) jointly issued the "UHD Video Industry Development Action Plan (2019-2022)". With the overall technical route of "4K first, both with 8K". The UHD video industry and its application in related fields has developed rapidly in China. Also, a new HDR solution has been developed, namely HDR Vivid. After strict evaluation, it was officially released as an industrial standard before the 2022 Winter Olympics (GY/T 358-2022). With the cooperation and efforts of a large variety of industrial enterprises, it has been widely adopted by the entire industry chain and now constitutes a complete end-to-end HDR ecosystem.

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.

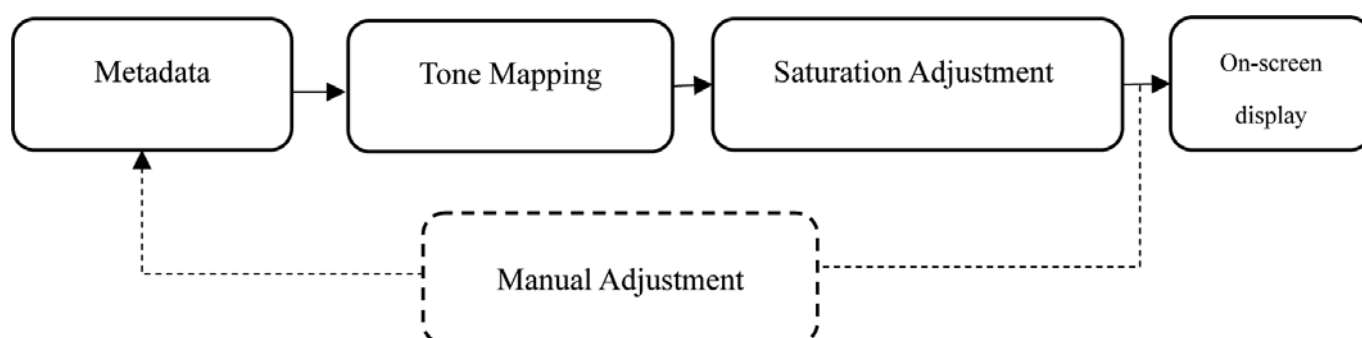
With the joint support of the state and industry, the HDR Vivid technical standard has already been applied to large-scale commercial uses.

2. CHARACTERISTICS OF HDR VIVID

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. Therefore, HDR Vivid has three core technical principles: Dynamic metadata, Tone mapping, and Saturation adjustment.

2.1 DYNAMIC METADATA PROVIDES MORE SPACE FOR COLOURISTS

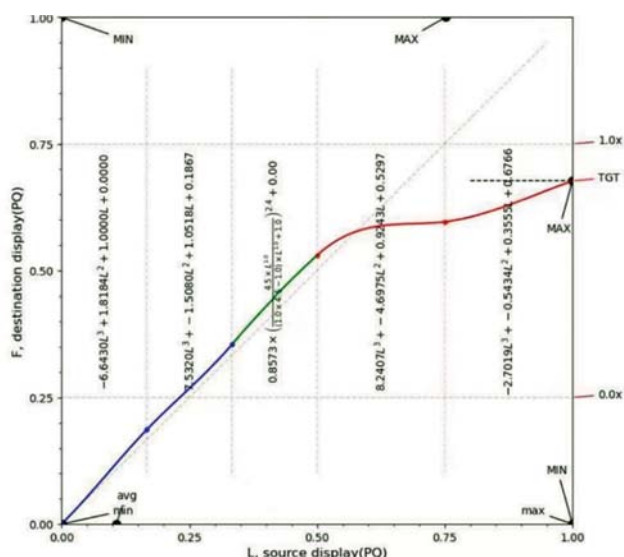
As for static metadata strategy, each piece of content uses only a single item of metadata to control the colour and details of each frame. However, dynamic metadata can record the feature information of each frame or scene, which is more adaptable and effective. In addition, from the perspective of content production, dynamic metadata creates a larger space for colour changers. Colour changers can manually adjust metadata for certain scenarios based on their personal preferences, implementing secondary creation and forming their own unique style.





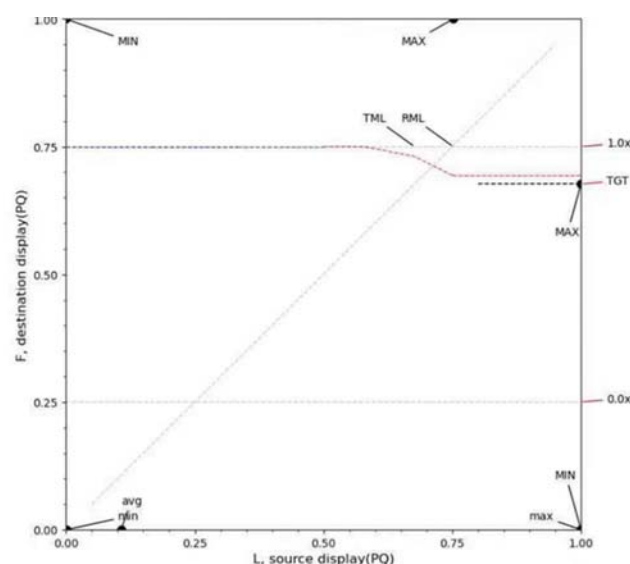
2.2 TONE MAPPING MAXIMISES THE CREATORS' INTENTIONS

Tone mapping is based on metadata, which ensures the consistency of visual experience on different devices and maximises the creators' intentions. Specifically, the tone mapping curve of HDR Vivid can be divided into two forms: basic curve and spline optimization curve. The basic curve takes the shape which is similar to the response of human visual cells, therefore can determine the overall style of tone mapping. Spline-optimised curves can further optimise the effect of tone mapping. For instance, over-darkness can be avoided by applying primary splines and low-bright area cubic splines to protect the dark region, and highlight details could be preserved by using high-bright area cubic splines at the same time.



2.3 SATURATION ADJUSTMENT GUARANTEES THE CONSISTENCY OF COLOUR PERCEPTION

The biggest problem with changing brightness is that it will also cause a change in saturation. Therefore, 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.



$$Y = Y_{TM}$$

$$U = U_{TM} \times \left(\frac{Y_{TM}}{Y_{org}} \right)^c$$

$$V = V_{TM} \times \left(\frac{Y_{TM}}{Y_{org}} \right)^c$$

3. ADVANTAGES OF HDR VIVID

Compared with other HDR technologies, HDR Vivid has five major advantages.

- 1) **Compatibility.** After receiving HDR Vivid signals, inventory display devices (such as mobile phones, tablets, and TVs) that do not support HDR (HDR Vivid) can directly discard the metadata and display the content in HDR10 format without any abnormal effects.
- 2) **Consistency.** HDR Vivid uses the dynamic metadata solution to generate mapping curves for different target displays based on the capabilities of different terminals. In this way, the display effects of the same content on different terminals are basically the same, which can maximise the creators' intentions.

- 3) **Flexibility.** In addition to supporting automated dynamic metadata extraction solutions, HDR Vivid technology also allows users to manually adjust metadata based on creative intent to create their own style.
- 4) **Adaptability.** HDR Vivid supports various application requirements, such as network audio-visual, TV station production and broadcasting, short videos, games, and industry applications (such as medical care). Both PQ and HLG format are supported as input of HDR Vivid.
- 5) **Openness.** HDR Vivid is a fully open standard. All resources, including code and implementation specifications, are available through designated channels without any charge.

4. ECOSYSTEM OF HDR VIVID

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. On 30 January 2022, HDR Vivid standard, "Technical Requirements for Display Adaptation Metadata for High Dynamic Range Television Systems" (GY/T 358-2022) was issued as a radio and television and network audio-visual industry standard.

China Media Group began the construction and piloting of the 8K UHD video production and broadcasting public service platform at the beginning of 2021, and the CCTV-8K channel was officially broadcast on January 24, 2022, according to the goal of "Winter Olympics with 8K". For the first time, CCTV-8K channels were accessible in the home. Along with it, CMG launched a three-year "Bai Cheng Qian Ping" (100 cities, 1,000 screens) UHD video and 3D audio promotion activities, showing the UHD video and 3D audio-visual effects through the outdoor and indoor UHD large screens in public. The outstanding HDR was also demonstrated as a key technology.

Internet video content service companies such as iQIYI, Tencent Video, and Youku have applied the HDR technology in their products. iQIYI has already supported HDR Vivid since September 2021. In August 2022, the "12th Beijing International Film Festival: Film Festival on the Cloud - HDR Vivid Exhibition" was held, and a large amount of high quality content was broadcast based on the HDR Vivid standard.

With the support and collaboration of partners in the entire industry chain, Migu of China Mobile play an important role in demonstrating the application in the European Cup. In early 2022, the Beijing Winter Olympics and Paralympics were live broadcast using HDR Vivid.

Telecom operators have hundreds of millions IPTV users. 4K/8K smart STBs support HDR Vivid, providing users with a more authentic HD video experience. According to telecom carriers' IPTV service planning and centralised procurement requirements, China Telecom and China Mobile both have tens of millions STBs, which will support HDR Vivid totally.

Industry partners are actively applying innovative technologies in short videos, webcasting, VR/AR, games, WeChat videos, and applications in the industry, agriculture, and healthcare industries. HDR Vivid has also been explored and researched in various service scenarios.

In the upstream and downstream of the industry chain, multiple new products of leading enterprises support the HDR Vivid. Mainstream chips such as MediaTek, Jingchen, and Qualcomm have already released related products. Mainstream colour grading tools such as Davinci Resolve and Baselight have also embedded HDR Vivid functions. Huawei, Honor, Sharp, Konka, and Skyworth support this feature in batches. Mainstream carriers such as China Telecom and China Mobile support this feature. In the future, more and more vendors will join the new team that leads the visual and auditory experience and contribute to the new development of the audio and video industry.

5. CONCLUSION

As a new force in the field of dynamic HDR video standards, HDR Vivid is dedicated to optimised content elements such as colour, brightness, and contrast, and provided a better and more comfortable visual experience on various display devices. It will create greater value for the development of UHD video industry and bring infinitely wonderful audio-visual feasts to the industry and consumers.

AUTHOR:



Ning Jinhui

National Radio and Television Administration (NRTA), China

Ning Jinhui is a Senior Engineer and Deputy Director of Programme Production and Broadcasting Institute at National Radio and Television Administration (NRTA), China.

In recent years, Ning has carried out productive work in testing, scientific research, standard establishment and technical consultation of the radio and television centre system/equipment. He has participated in a number of scientific research projects of the Natural Science Foundation, the Ministry of Science and Technology, the NRTA, and a number of important national/industry standards. He has been in charge of the testing of numerous TV projects, including major national broadcast events, major industrial projects, 4K/8K systems, etc., and pioneered research on UHD, IP, AI and other related testing methods, serving for high-quality and innovative development of radio & TV and network audio-visual. He has accumulatively compiled more than 40 national and industry standards, participated in the compilation of 2 technical books, applied for 3 technical invention patents in cooperation, and won one special prize and more than ten first prizes of the provincial and ministerial science and technology innovation awards. He has played an important role in the technology system establishment, technology application and technology promotion of the whole industry. ■

Broadcasting, Risks and Disasters: What could possibly go wrong?



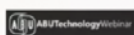
ABU Technology Webinar

On 14 February 2023 John Maizels presented an ABU webinar on the topic “Disaster Management: Simple Steps You Can Take to Avoid the Hot Seat”. The webinar was organised and hosted by ABU Technology. It was attended by over ninety participants representing close to fifty ABU member & non-member organizations from 25 countries in Asia-Pacific and elsewhere.

John’s observation is that while technologists inherently seek to manage risk, when life gets busy it’s easy to push some important support activities to the back-burner. And when that happens, even small perturbations in the space-time continuum can turn into situations that are difficult to manage. Disaster beckons, but is easily thwarted by being prepared. This paper reflects on points made during the webinar and expands on key concepts.

Tech: what could possibly go wrong?

- ▶ Broadcasting is a technology business
- ▶ Radio: between presenter’s voice and listener’s ear in radio:
 - ▶ minimum 85 pieces of tech
- ▶ Television: technology is orders of magnitude more complex
- ▶ Many - most - broadcasters have a solid Plan A - the business-as-usual signal flow
- ▶ But way too few organisations have
 - ▶ Documented Risk matrix
 - ▶ Plan B or Plan C
 - ▶ Tested backups
 - ▶ Tech strat-plan



© John Maizels

2023-02-14

5



If you're a broadcast technologist, you most likely have risk management buried in your blood and DNA, even if you don't know it yet. As broadcasters we know how to get the six-o'clock news to air at six o'clock. We are really good at solving problems in the moment. We pride ourselves in not making mistakes on air, and we push the boundaries of our craft while doing ever more clever things with whatever resources we have. But are we really good at managing real risk, and do we know how to avoid disaster in our operations?

Technorama Incorporated (www.technorama.org.au) is the peak body in Australia for the technologists who keep Community Radio running. Over the last few years, we have been looking at how to help our members to reduce their risk profile. Community broadcasters typically are not large organisations, and are staffed with volunteers. Funding is low, meaning resources are scarce, so it takes careful planning to ensure that stations stay on air and business commitments can be met. Despite this, we discovered that way too few organisations have a strategic appreciation of risk implications, and that in itself creates another risk!

As Broadcasters we must sensitise ourselves to the importance of identifying and managing risk and, because people rely on us so much, we need to very clearly understand the downsides if risk is not managed.

WHEN THINGS GO WRONG

The worst outcome for any broadcaster is that a risk situation turns into DISASTER.

As a word, disaster often triggers an emotional response. Most people think of disaster as an occurrence causing widespread destruction, distress, or catastrophe. More specifically, when someone says "disaster" they generally mean "natural disaster", like a weather pattern, a volcanic eruption, a tsunami, or an earthquake. These are all events that we might predict will happen, but we have no idea when (or if) they will happen and we have no way to prevent them happening.

There's another set of definitions for "disaster": the situation where the outcome is a grave misfortune, or a total failure. These are situations that you can avoid or lessen if you understand the risk and plan for that possibility. And that's the key message of this article. Business and operational outcomes don't have to turn into disaster: that's just the result when a risk isn't managed well enough.

What risks can you mitigate? Most risks, if you plan carefully enough. For instance, we know how

to avoid a tower coming down. We know how to integrate a second studio; how to switch to a backup transmitter; we generally have at least two microphones and two CD players; and we can find another OB truck in an emergency. We know that it's important to keep spares on the shelf. We understand that a backup power supply might never be needed, but we keep the batteries charged and the diesel tank full regardless. These are all ways in which we manage technology risk.

When things start going wrong, inaction is not an option. It's only a disaster if you don't plan for it and don't take action. How you manage risk makes the difference between a situation being a challenge (something you can handle), and a situation that's a disaster (something you can't handle).

What Technorama found when we talked to many of our members was:

- too few (maybe even hardly any) organisations have a documented risk matrix
- our members have not thought about a Plan B or a Plan C
- they do not regularly test backup procedures to ensure that they work
- they have not developed a technology strategic plan

These conditions seemed to be especially true for smaller broadcasters. The irony is that small organisations with limited resource are the least likely to be able to cope if something seriously goes wrong.

THE RISK MATRIX

To guide your thinking, It's helpful to think about how bad a situation might become. A really simple model is the Risk Matrix, a two dimensional view that maps "what's the chance of something happening?" (let's call that "likelihood") against "how bad will the outcome be?" (and let's call that "severity"). If we arrange those two concepts on paper, it looks a bit like *Figure 1*.

As you move up the chart from the bottom, a situation is going to become more likely. As you move to the right, the impact is going to be worse. The colours in the chart show how that works. Clearly the best place to be is down the bottom left. That's where a situation is not likely to occur, but if it does happen the outcome won't be so bad. As you move to the top right, the outcome for your operation becomes worse; in the extreme case you know you have a highly likely situation, and if that happens the outcome will be catastrophic. That's not a good or comfortable place to be.

		How bad will the outcome be?						
				1 = Insignificant	2 = Minor	3 = Moderate	4 = Major	5 = Catastrophic
What chance of it happening?		5 = Almost certain	Will happen most of the time	Not good	Pretty bad	Really bad	Really bad	Unbelievably bad
		4 = Likely	Will probably happen a lot	Not good	Not good	Pretty bad	Really bad	Really bad
		3 = Possible	Will happen sooner or later	Sort of OK	Not good	Not good	Pretty bad	Really bad
		2 = Unlikely	Might happen	Sort of OK	Sort of OK	Not good	Not good	Pretty bad
		1 = Rare	Might or might not ever happen	Nah	Sort of OK	Sort of OK	Not good	Not good

Figure 1: The Risk Matrix

This is easier to digest if you consider an example. Think about your transmitter tower. If the tower is in good condition, and there is a storm, and the tower is well designed, you would expect it to stay up because that's what it's designed to do. The likelihood of it falling down is low, and so the risk of failure is somewhere near the bottom left of our matrix. But if your tower is poorly maintained, if the guy wires are loose or rusty, or if the storm is more intense than the engineering design point for the construction, then there is a definite risk that the tower will come down. That's the top right of the matrix.

And if the tower does come down, is that a disaster? Sure, it's not going to be your best day, but the severity of the outcome – any outcome – depends on whether you have a Plan A, a Plan B and a Plan C, and whether you have managed the risk down to the bottom row of the matrix.

DISASTER AVOIDANCE: PLAN A, B and C

Plan A is what you do every day to manage your operation. Small things always go wrong, and Plan A covers those. When the power fails, the UPS kicks in immediately and maybe nobody even notices at all. That's Plan A in action. When the autocue monitor fails, you have another equipped camera and you switch to that; maybe nobody except the crew notices. That's still Plan A, because it's automatically part of everyone's production and engineering thinking.

Plan B is what you do when Plan A doesn't work. If the severity of a problem is bad enough, you might move from one studio to another. If the transmitter fails you could switch over to the standby. If a server dies, you have a hot standby and you can use that instead. If your antenna mast is out of service, you might have arrangement to switch to another site

for a while. This is all Plan B. Mostly your listeners and viewers won't notice.

Sometimes Plan B is called the "rip envelope in case of emergency" Plan B, a reference to a sealed standby document that has all the instructions for what to do, and who is responsible for doing those things.

Actually, a real document like that is a good thing to have. If you've written down what to do, and how to handle each possibility, and who-does-what, then you are a long way to being able to create order from chaos. Think about how airlines manage events: pilots have checklists; flight crew have instructions and they regularly do drills and rehearsals so that when something goes wrong the process that they follow is both automatic and known to work.

Plan C is your insurance against the unthinkable. Plan C is what you need when both your main and standby transmitters fail. Plan C is the set of steps you use when a cyber-attack locks up your entire IT infrastructure and nobody can access what you need to keep running. Plan C describes how to get back on air when your antenna breaks because the 110 storey building underneath it suddenly isn't there any more.

If you have thought through the unthinkable, and you have a Plan C, then the chances are that you will recover gracefully from even a really bad situation and it won't turn into a disaster.

HOW MUCH EFFORT IS TOO MUCH?

No business has infinite resources or unlimited funding. Life is a compromise and risk management is also a compromise. That's OK.



It's important to balance effort against cost and outcome. Not every risk can be avoided. If you live in the tropics, chances are you won't have to deal with snow but it would be reasonable to prepare for heavy rain storms. Since you can't avoid weather completely, where do you put your effort, and how much effort should you put into events that might never occur?

Consider that:

- All risk situations have mitigating factors. There are always plans or actions that you might take to contain the risk; it's just a matter of whether you want to spend the money, take the time, or commit the resource. Those are choices you can make. Even natural disasters can be mitigated if you consider all the possibilities.
- You can accept that a risk exists, and not take action at all. There are situations for which the right answer is *don't bother*. It might snow in the tropics, but the chance of that happening is finitely small. The technical name for deciding to do nothing is "risk acceptance", which is the same as self-insurance. If something goes wrong, you handle it at that time. You might still have a Plan B (and even a Plan C) for that situation, but you accept that it's not worth additional investment in actual resources.
- Risk management obeys the 80/20 rule. 80% of your risk profile is likely to be mitigated by the first 20% of the effort and cost. After that you move to...

- **The law of diminishing returns**, which says "you're going to expend so much additional money and effort that the result doesn't justify going any further". So maybe don't go further.

WHEN DOES A SITUATION BECOME A DISASTER?

Very simply, a situation becomes a disaster when what's happening around you puts you suddenly into overload, and events outstrip your ability to cope. If nobody knows what to do, and planning is inadequate to allow recovery, that situation is heading towards being a disaster. Good risk planning is about identifying what you can do to prevent things ever getting that bad.

And we're broadcasters, so our golden rule is that the audience should never know that we're having problems.

If the audience *does* notice, is it a disaster? That depends on the situation. Probably the worst thing that can happen to any broadcaster is dead air, because listeners and viewers have low tolerance for static or a blank screen. These days the time between silence and channel-changing might only be a very few seconds, and that's a disaster for sure! Measuring situations in terms of dead-air potential is a good way to think.

Risk situations can be mitigated by changing the factors that create the risk. Our friend in the picture is standing in front of a building that might be your studio block. It's made of wood, so there is potential for it to burn down. Sitting on a wooden crate there



are a few sticks of explosive, one of which is lit. Next to the crate is a jerrycan full of fuel. The man isn't too worried though... he's relaxing with a cigarette. What could POSSIBLY go wrong?

This is a situation packed with risk factors. It could result in a catastrophe beyond disaster. But just by teasing out how to deal with each possible failure point, it becomes relatively easy to plot a series of actions which would reduce the risk to a very low and acceptable level. The important consideration is that we have to do that work, identify the risks,

manage any potential consequences, and then act to contain, accept, and be cost-effective.

TIPS TO AVOID DISASTER

There are always simple things you can do to help reduce your risk profile. Any one of the following could be the subject of a future detailed discussion:

- Ensure your documentation is up to date. Not only your technical manuals, shop drawings and cable numbers (although those are always good things to have!), but also business-critical and

mission-critical information. Ask the question: if your best people suddenly weren't available, and their specialist knowledge wasn't available, could everyone else find enough documentation to keep the station running?

- Have solid backups for everything, both physical devices and IT systems. Do you have a test plan that you exercise regularly, and have you proved that your standby assets and IT backups actually work the way you expect and need them to work?
- **Implement 3-2-1 Thinking.** A good principle for any standby or backup resource (both physical and IT) is the 3-2-1 rule:
 - » have **three** copies/versions/instances of everything
 - » have **two** of those copies/versions in different forms (or on different media)
 - » have **one** copy/version/instance somewhere different from the other two

As a philosophy, that's not only good for IT assets; it actually works quite well for studios, transmitters, and playback material. Have a main and standby transmitter, and have a third transmitter and antenna somewhere else; possibly even a different brand and model to the others.

- Have an agreed and funded **TechStratPlan**. Most organisations have an organisation-level strategic plan that guides the business. A good option for engineering and IT departments is to develop a technology strategic plan that specifically guides the deployment of tech, also in support of the business. Ask the question: along with the asset register, do you have an equipment replacement budget, and is that an agreed and funded plan?
- Make *Plan C development* an ongoing activity. Challenge your colleagues to consider situations – even silly, ridiculous situations that you think might never occur – and identify ways that you would handle those situations. Then see if there are learnings that you could apply to situations that you think or know might occur.
- Build a strong cyber-threat plan. How much of your operation could run if EVERY computer in the building was compromised? Have at least one program delivery option that doesn't rely on servers. These days that's a necessary part of any business continuity strategy.

- Encourage your team to be risk focused, but balanced. Great programming comes from taking appropriate risks, and a zero-risk environment (even if that's possible) might not be a lot of fun to work with, and could easily stifle creativity.

AND IF YOU HAVE A DISASTER?

In any broadcast operation, something unexpected WILL eventually happen. And when it does happen, you can choose to treat it either as a misfortune or a learning experience. Some good questions to ask are:

- Who was impacted, and how badly?
- Did the audience really notice, and how much?
- Could you have done better?
- Can the same problem happen again?

CONCLUSION

No matter how much you hope otherwise, sooner or later something will happen that is not the best outcome you had hoped for. But if you've done a bit of planning, you've tested your backups, and you've rehearsed your team, you're on a good path to avoiding disaster.

AUTHOR



John Maizels is President of Technorama Incorporated (www.technorama.org.au).

He loves to share lessons learned through a long career: he's been a technologist, a commercial radio announcer, is a leader in the Community Radio sector in Australia, and currently works across many facets of broadcast TV. John has a major focus on education and training, and is especially interested in how technologists and managers deal with risks and business continuity.

When not teaching or being a hands-on Broadcast Engineer in TV and Radio, John is seriously passionate about good coffee, pipe organs, and telephones. ■

News from The ABU Region

70TH ANNIVERSARY OF THE START OF TV BROADCASTING IN JAPAN

February 1, 2023 marked the 70th anniversary of the start of television broadcasting in Japan. NHK STRL was founded on June 1, 1930 and has been researching television and other broadcast technologies ever since.

NHK launched its Tokyo Television Station and began its primary television broadcast on February 1, 1953. With the exception of the image orthicon camera, all broadcast equipment used at that time was designed by STRL and made in Japan. This trend continued in the ensuing years, as STRL research led to a long line of tools and devices developed and made in Japan –including the technology needed for the launch of color television broadcasting in 1960 and the cameras and satellite-broadcasting technology used to live-broadcast the 1964 Tokyo Olympics. Later developments included high-vision research (begun in 1964), research on satellite broadcasting (begun in 1966), and the launch of satellite and terrestrial digital broadcasting in 2000 and 2003, respectively. More recently, NHK STRL has studied 8K UHDTV broadcasting – featuring 16 times the pixel count of HDTV – and in 2018 launched new 4K/8K satellite broadcast service, testifying to STRL's ongoing commitment to pioneering new broadcast technologies. [\[NHK STRL News\]](#)

INDONESIAN RADIO STATION RRI PRO 1 INSTALLS CAPITOL IP CONSOLE

Radio Republic Indonesia is Indonesia's national public broadcaster. RRI was founded in 1945 and currently has four main channels called RRI1, RR2, RR3 and RR4 and an international channel known as Voice of Indonesia. Traditionally RRI has worked with analogue material, but the regional

management of the station has decided to modernise its main studio in the city of Banten with digital technology and has decided to use the AEQ CAPITOL IP console as the heart of the system.

In the choice of such important equipment, the characteristics of the installation and the operators, they were looking for equipment that would offer the maximum audio quality with the latest digital technology available, but always guaranteeing very user-friendly operation.

AEQ CAPITOL IP is an eight-channel fixed configuration digital audio mixing console. In CAPITOL IP the implementation of IP connectivity is based on a single module of 16 input and 16 output channels, incorporated in its core. One of the main qualities of AEQ CAPITOL IP is the wide input capacity available: four mic/line, 12 analogue, four digital stereo AES/EBU (AES3), two digital stereo USB, two optional telephone lines, and optional digital multichannel audio links; 16 AoIP channels over two ethernet connectors or 64 MADI channels input over optical fibre. [\[AEQ\]](#)

RTM SELECTS PLAYBOX NEO FOR ITS FREE OTT & FTA CHANNELS

Malaysian state broadcaster Radio Televisyen Malaysia (RTM) has installed two complete channel-in-a-box (CIAB) systems at the Angkasapuri International Broadcast Centre in Kuala Lumpur to support its RTMKlik over-the-top (OTT) service.

The project was supervised by Selangor-based broadcast system integrator Amrick Solutions, in close partnership with data storage and broadcast solutions specialist Integriti Padu.

The challenges faced by RTM were to work out how to run its OTT service with the greatest possible

ease, efficiency, stability and flexibility, while generating large audiences for its free-to-air (FTA) channels and video-on-demand (VoD) content. RTM's technical operations team identified PlayBox Neo CIAB as the ideal choice, both for live and pre-scheduled automated payout.

The new system supplied to RTM for its RTMKlik OTT service includes two triple-channel CIABs in primary-plus-one configuration, plus a Multi Payout Manager monitoring and control system. Each PlayBox Neo CIAB comprises an AirBox Neo-20 payout and IP streaming server, Capture Suite live ingest server, TitleBox Neo-20 interactive graphics and ListBox Neo-20 pre-transmission scheduler. [\[APB News\]](#)

ITU'S ASIA-PACIFIC REGION REVIEWS SPECTRUM NEEDS FOR DIGITAL TRANSFORMATION

Regulators, industry experts and academics from Asia and the Pacific gathered in Nadi, Fiji, between 15 and 20 December to discuss radio-frequency spectrum requirements with a view to accelerating digital transformation across the region. The International Telecommunication Union (ITU) briefed participants on the regulatory framework for international frequency management, particularly following the last World Radiocommunication Conference, WRC-19, where the Radio Regulations treaty was last updated. ITU also led discussions on best practices for the use of spectrum for terrestrial and space services.

The Regional Radiocommunication Seminar, RRS-22 Asia-Pacific, came amid preparations for the next World Radiocommunication Conference (WRC-23), taking place in Dubai, United Arab Emirates, from 20 November to 15 December 2023. RRS-22 Asia-Pacific was hosted by Fiji's Ministry of Communications in cooperation with the Pacific Islands Telecommunications Association (PITA) and supported by Australia's Department of Infrastructure, Transport, Regional Development, Communications, and the Arts (DITRDCA).

The regional seminar covered

the regulatory framework for both terrestrial and space radiocommunication services, along with the procedures for filing and recording frequency assignments in the Master International Frequency Register (MIFR). RRS-22 Asia-Pacific also included training on software tools developed by ITU for frequency notifications. Tutorials familiarized participants with ITU notification procedures, as well as key software and electronic publications available to ITU Member State Administrations and ITU-R Members.

RRS-22 Asia-Pacific concluded with a forum, "Radiocommunication trends: Opportunities and challenges for the Asia-Pacific region", in which telecom industry representatives shared insights on how governments could help accelerate radiocommunications development. Panel sessions during the forum spanned trends in digital broadcasting, broadband satellites, national emergency telecommunications plans, and an update on the International Mobile Telecommunications-2020 (IMT-2020) standard, widely known as 5G. The seminar was attended by more than 80 participants from over 40 countries, including about 30 Member States from the Asia and Pacific region, as well as ITU-R Sector Members, associates, academia and other relevant stakeholders. [ITU News]

BES 2023 LOOKS AT CHALLENGES FACING BROADCASTERS

A major Indian broadcasting and media technology show, BES 2023, has taken place in New Delhi. The three-day show on 16-18 February focused on helping broadcasters meet the challenges posed by OTT and digital platforms.

It was organised by the Broadcast Engineering Society (BES), whose President, Mr Sunil, Additional Director General of India's public broadcaster Prasar Bharati, gave a welcome address. Mr Sunil, who is also ABU Vice-President, said 5G and OTT were rapidly bringing a paradigm shift in broadcasting and broadcasters needed to remain future-ready.

They needed to change their business model to keep pace

with the way consumers were using a wide range of devices to access digital content, he said. The Information and Broadcasting Secretary, Apurva Chandra, said the government was planning to hold a fresh auction of FM radio stations to extend their reach to more cities. This year's BES took place after a break of two years. It featured a conference and an exhibition with more than 40 national and international exhibitors. [ABU News]

THAI PARLIAMENT TELEVISION CHOOSES IKEGAMI UHK-430 4K IP CAMERA SYSTEMS

Ikegami announces the integration of eight UHK-430 camera systems at Thai Parliament Television (TPTV), the national assembly radio and television broadcasting station of Thailand. The cameras are now in full use at the recently completed Sappaya-Sapasathan parliament house in Bangkok, allowing 4K broadcast quality coverage of legislative proceedings.

TPTV was launched in August 2006 for the main purpose of televising the sessions of the Thai House of Representatives and Senate. TPTV also airs political issues, educational and edutainment programs, both live and recorded. Its programs are transmitted via satellite and digital terrestrial platforms, distributed via YouTube as TPchannel.

4K was a crucial requirement for TPTV when choosing the cameras. Another was the need for IP connectivity, targeting future expansion. Ikegami UHK-430 cameras incorporate three 4K native sensors which allow them to capture content at very high quality. In addition to its 4K performance, the CCU-430 camera control unit has an IP interface. Plugging in an optional MoIP board makes IP network connection possible.

Ikegami's UHK-430 is a 4K-native camera system with simultaneous HDR/SDR processing. Its three 2/3-inch CMOS sensors provide full 3840 x 2160 UHD resolution plus the depth of field needed for studio and outdoor production. The camera is equipped with a B4 bayonet mount compatible with 2/3-inch broadcast lenses. An optional SE-U430 expander accommodates

large studio or OB lenses. In its standard form, the UHK-430 weighs just 4.6 kg. Dimensions are 149 mm wide x 243 mm high x 340 mm front-to-back.

An integrated Ikegami AXII processor enables the UHK-430 to deliver 40 gigabit/s un-compressed full bandwidth video transmission. The AXII also supports a wide range of features including 16-axis colour correction and focus-assist for 4K and HD video modes. [Ikegami]

KBS CELEBRATES 50TH ANNIVERSARY WITH CALL FOR INNOVATION FROM CHIEF

As KBS celebrates its 50th anniversary, President Kim Eui-chul called for innovation in order to undertake its role as a public broadcaster. At a ceremony commemorating the 50th anniversary of the broadcaster's founding, Kim announced the "2040 Vision" for the company, insisting on the need to improve outdated laws and to adjust the TV license fees.

Kim explained that the outdated laws do not recognize online services as part of the broadcaster's work; other major global networks incorporating the viral medium as far back as a decade ago. He emphasized the need for amendments that eliminate irrelevant regulations from the 1980s. Taking issue with the monthly TV license fee of 25-hundred won, or under two U.S. dollars, that the broadcaster collects from each household, he noted that it has remained unchanged for 40 years despite the current competitiveness of global media platforms.

He added that KBS will switch its system of production to focus on genre and target audiences, setting a goal for the reach of KBS content at 50 percent through multiple platforms. [KBS World]

AUSTRALIA'S ABC AND TIMOR-LESTE'S RTTL SIGN MOU

The Australian Broadcasting Corporation (ABC) has signed an historic agreement with Rádio e Televisão de Timor-Leste (RTTL). The agreement between the two public broadcasters allows for

increased content sharing and media development programs. It recognises both organisations' importance as cultural institutions and custodians of media archives, as well as the vital role they play in connecting and informing audiences and contributing to democracy.

The Memorandum of Understanding builds upon an existing strong relationship between the ABC and RTTL. ABC Radio Australia has been available to Timorese audiences via FM radio for many years. More recently, ABC International Services entered a content sharing agreement for the distribution of ABC Australia and ABC Education content on RTTL digital platforms. This agreement was announced as part of RTTL's 20th anniversary celebrations in 2022.

ABC International Development has supported media development in Timor-Leste over the last decade, working with Timorese media to develop inclusive and diverse reporting processes, advising on reporting of natural disaster preparation, maintaining technical broadcasting equipment and conducting media training on accurate COVID-19 reporting and combatting misinformation.

Under the Indo-Pacific Broadcasting Strategy, ABC International Services will work with RTTL to help it establish a news service for its new English-speaking channel, sharing content from the ABC newsrooms and working with RTTL staff to enhance their journalism and content making skills. Other activities include establishing a network of Pacific journalists, with a local correspondent based in Dili, the syndication of ABC content to local media providers and a broader capacity-building program for Timor-Leste media and journalists' associations to build media craft skills. [\[ABC News\]](#)

AWS TO LAUNCH INFRASTRUCTURE REGION IN MALAYSIA

Amazon Web Services (AWS) has announced plans to launch an AWS infrastructure Region in Malaysia. As part of its commitment to the region, AWS is planning to invest USD\$6 billion (approx. MYR 25.5

billion) in Malaysia by 2037.

Datuk Seri Anwar Ibrahim, Prime Minister of Malaysia said that AWS has committed to the largest international technology investment to date in Malaysia, which will advance our Malaysia Madani vision of a highly skilled, innovative, prosperous, and sustainable economy. He also added- Bringing access to world-class AWS infrastructure, advanced technologies, and cloud skills programs to Malaysia will unlock opportunities for local businesses of all sizes to build and expand globally, cultivate a highly skilled workforce, spur new job creation, and deliver long-term economic growth. The announcement is a vote of support for Malaysia's leadership in the global digital economy, and we look forward to deepening our collaboration with AWS to advance our nation's cloud-first ambitions.

The new AWS Region will consist of three Availability Zones at launch, adding to the existing 99 Availability Zones across 31 geographic regions globally. With the announcement, AWS has plans to launch 15 more Availability Zones and five more AWS Regions in Canada, Israel, Malaysia, New Zealand, and Thailand. AWS Regions consist of Availability Zones that place infrastructure in separate and distinct geographic locations, with enough distance to significantly reduce the risk of a single event impacting customers' business continuity, yet near enough to provide low latency for high availability applications that use multiple Availability Zones. Each Availability Zone has independent power, cooling, and physical security and is connected through redundant, ultra-low latency networks. AWS customers focused on high availability can design their applications to run in multiple Availability Zones and across multiple Regions to achieve even greater fault tolerance.

The new AWS Region will enable customers with data residency preferences to store data securely in Malaysia, enable customers to achieve even lower latency, and serve demand for cloud services across Southeast Asia. Customers

from startups to enterprises to government organisations and non-profits will be able to use advanced technologies from the world's leading cloud to drive innovation. AWS offers the broadest and deepest portfolio of services, including analytics, compute, database, Internet of Things (IoT), machine learning, mobile services, storage, and other cloud technologies. [\[Amazon News\]](#)

SBS AUDIO GOES LIVE WITH BRAND EVOLUTION

SBS has gone live with a rebrand of its audio offering for multilingual audiences by switching on SBS Audio. The launch of SBS Audio means that audiences can now enjoy SBS's full audio offering in one unified digital experience for the first time. Improvements include better showcasing of podcasts, individual station pages and music search features.

The change coincides with a refresh of SBS Audio's digital offering, designed to better showcase and improve access to the public broadcaster's podcasts and live streaming services. The move was announced last November at SBS's Upfront where the network unveiled its 2023 content line-up to reflect the evolution of SBS's cross-platform offering across more than 60 different languages. It comes on the same day that the public broadcaster announces the findings of its five yearly Language Services Review. [\[SBS News\]](#)

INDONESIA'S TVONE UPGRADES ETERE PLAYOUT

Indonesian free-to-air TV network, tvOne, upgrades to Etere 33.2 and expands its broadcast and playout capabilities. tvOne upgrades to Etere 33.2, bringing new levels of efficiency and agility to its system. Since 2009, tvOne has been leveraging Etere Ecosystem's integrative framework to manage the playout of their channels. Etere provides users with unlimited software updates and upgrades as part of its support contract. Furthermore, Etere ensures the system is always optimized to perform at its best with its exceptional 24/7 worldwide support.

tvOne uses Etere Automation to

deliver its programs, including secondary events, logos, and transitions. Etere Automation combines real-time device control and media asset management in a single product for a fully redundant and reliable performance. It transmits streaming events according to the video server capabilities, play in A/B switch mode, and remotely control devices using the network, serial, and GPI connections. Additionally, Etere Automation database-independent capabilities enable different levels of fault tolerance, allowing it to run on Backup Mode, Master/Clone Mode, and Disaster Recovery Modes. In addition, Etere Automation connects with the database of Etere Media Asset Management, effectively integrating all activities with a centralized database.

With Etere Executive Scheduling, tvOne can prepare its program schedule grid based on its planned broadcast and the placement of programs, series, promos, and commercials even before the content acquisition. [\[Etere News\]](#)

VIETNAM'S VTV4 EXPANDS ETERE MEDIA LIBRARY

VTV4, a TV channel managed by VTV, the national broadcaster of Vietnam, has expanded the scope of its media library managed by Etere HSM, a part of the Etere Ecosystem.

The system now comprises 375 slots. Etere HSM effectively manages archives in an integrated environment. Its centralised dashboard gives direct access to real-time data from multiple libraries, all on a single system. Additionally, Etere supports a mix of archive technology, including Linear Tape-Open (LTO) storage, Sony Optical Disc Archive (ODA) storage, Disk Archive, Object Storage, and Cloud Storage. The centralised dashboard features real-time data across all your archive systems, including on-site archives, management of offline tapes, and libraries across multiple locations worldwide.

With integrated workflow orchestration, users can manage and automate multi-vendor and multi-format file transformations across unlimited storage tiers in a hybrid cloud environment.

[Content+Technology]

ZDF'S REMOTE PRODUCTION OF FIFA WORLD CUP

German public broadcaster ZDF chose Apantec's KVM-over-IP solutions for its remote production of the recently concluded 2022 FIFA World Cup Soccer in Qatar. ZDF produced and showed the World Cup live in Germany on free-to-air television, with the games production handled remotely at the National Broadcasting Centre (NBC) located at ZDF in Mainz, rather than on-site in Qatar.

The mobile production unit (MPE) founded and driven by ZDF and fellow German public broadcaster purchased more than 150 KVM-over-IP transmitters (Tx) and receivers (Rx) (models: KVM-IP-Tx-PL/KVM-IP-Rx-P) and "free flow" software licenses from Apantec through Broadcast Solutions, Apantec's representative in Germany.

With the Apantec KVM-over-IP extender/receiver solutions, the technical team in the MPE was able to extend and switch video signals, keyboard, and mouse functions, as well as embedded and analogue audio signals over IP.

Operators were also able to access all their computers and servers on the network from any display, keyboard and mouse consoles. The receivers allowed scaling of the incoming video to match the resolution of the computer console monitor, regardless of the source computer resolution. [\[APB News\]](#)

VIZRT'S XR SET EXPRESS A SIMPLE EASY-TO-OPERATE VIRTUAL STUDIO

XR Set Express is a fully-equipped, virtual studio-in-a-box graphics solution that leverages Vizrt's Virtual Studio capabilities alongside the connected workflows of the Network Device Interface (NDI) IP-video standard.

Vizrt has launched XR Set Express, an easy to set up virtual studio-in-a-box graphics solution that leverages Vizrt's Virtual Studio capabilities alongside the connected workflows of the Network Device Interface (NDI) IP-video standard.

NDI is used to enable video, tracking data and full control of the Panasonic UE100 PTZ camera through a single cable connection. Viz Arc provides intuitive and flexible control for studio setup and configuration, while positioning of graphics, studio customisation, auto-setting of the keyer and presetting desired camera positions and much more can now be accomplished within a few clicks.

The addition of a fully functional virtual scene, with its three main areas and pre-built AR graphics, provides users with the ability to hit the ground running to tell engaging visual stories. XR Set Express' built-in flexibility allows users to still run any virtual studio created in-house, and is part of the Vizrt Extended Reality Suite, also available via its Flexible Access plan. [\[APB News\]](#)

NAGRA DEEPENS AWS PARTNERSHIP

Becoming the latest in a number of firms in the broadcast technology market to gain the hyperscaler's technical validation, content protection and multiscreen TV solutions firm NAGRA has completed the AWS Foundational Technical Review (FTR).

Specifically, the completion of the Foundational Technical Review accelerates AWS engagement with NAGRA's NexGuard Forensic Watermarking. This is said to be provides AWS customers with the peace of mind that the solution's integration with AWS infrastructure is fully validated and uses AWS resources efficiently to deliver forensic watermarking for audio and video content.

In addition, AWS FTR enables NAGRA to identify and remediate risks in its products or solutions, providing specific guidelines to adopt a subset of AWS best practices to reduce risks around security, reliability, and operational excellence, as defined by the AWS Well-Architected Framework. Following FTR guidelines, NAGRA can review projects against FTR requirements to ensure best practices and client experiences when using AWS technology. [\[Rapid TV News\]](#) ■

DIGITAL BROADCASTING *Updates*

WORLD'S LEAST DEVELOPED COUNTRIES THREATENED BY DEEPENING DIGITAL DIVIDE

The digital connectivity divide separating the globe's least developed countries (LDCs) from the world as a whole shows no sign of narrowing. In fact, it is widening on key factors, according to ITU's Facts and Figures: Focus on Least Developed Countries. While the share of the population in LDCs using the Internet has increased since 2011 from 4 per cent to 36 per cent, about two-thirds of the LDC population remains offline. LDCs also still face numerous barriers to meaningful connectivity, including lack of infrastructure, affordability, and skills.

Although no single figure can capture all aspects and complexities of the digital divide, the gap between LDCs and the world in the share of people using the Internet has actually increased from 27 percentage points in 2011 to 30 percentage points in 2022. ITU Secretary-General Doreen Bogdan-Martin said, The path to prosperity for the world's least developed countries runs through digital development. This special edition of ITU's Facts and Figures highlights the challenges confronting LDCs and should help strengthen commitments between the least developed countries and their development partners.

The ITU study, prepared ahead of the Fifth United Nations Conference on the Least Developed Countries (LDC5), focuses on trends in digital connectivity in LDCs since 2011, when the UN last held its global conference on least developed countries.

According to the research, which uses data from ITU's Facts and Figures 2022, an estimated 407 million people in LDCs were using the Internet in 2022. The 720 million people still offline in LDCs represent

27 per cent of the global offline population, even though the LDC population accounts for only 14 per cent of world population. The study highlights that only 83 per cent of the combined LDC population is covered by a mobile broadband signal 3G or above, the main way to connect to the Internet in most developing countries. This compares with 95 per cent coverage for the overall world population.

The latest edition of Facts and Figures, ITU's annual overview on the state of digital connectivity, found that the cost of using Internet services inched downward across the globe in 2022. The special ITU analysis produced for LDC5 highlights that accessing the Internet is more costly in LDCs than anywhere else in the world. According to ITU, the challenge of getting communities online has also become more complex over the last decade than just constructing physical connections.

For LDCs, the goal of universal and meaningful connectivity – when a safe, satisfying, enriching, productive and affordable online experience is available to all – remains a distant prospect. Even many of those who can access the Internet do not, because of the barriers ranging from awareness, to skills, to costs. [\[ITU News\]](#)

AUTOMATIC SHOOTING TECHNOLOGY FOR SOCCER BROADCASTS USING AI-BASED ROBOTIC CAMERAS

NHK STRL is currently researching automatic shooting technology for realizing high-quality and high-efficiency program production in sports broadcasting. Since a "base camera" that captures a bird's eye view of the field is often used in soccer broadcasting and performs many standardized movements, there are significant advantages to be gained by increasing automation. Therefore, it is developing a robotic camera system that can perform automatic shooting using an artificial intelligence (AI) that has been trained to perform camera work by a highly experienced camera operators.

The AI-based robotic camera system consists of a camera that captures the entire soccer field, a feature extraction component, a framing AI component, a mechanical control component, and a camera mounted on an automatic

pan-tilt head. The feature extraction component uses the camera video to acquire information about the positions and speeds of the players, the ball position and the directions the players are facing, then converts this imagery into a feature map. The framing AI component infers the area to shoot from the feature map, after which the mechanical control component performs automatic shooting by converting the inferred shooting area to camera control information and sending it to the robotic camera.

The framing AI is trained to perform camera work by a highly experienced camera operators. The area that needs to be shot next is judged from the state of the game on the field and the movements of the camera over several seconds. Video footage of the entire soccer field and camera operators' operation data acquired during an actual soccer match are used for training the AI. The operation data is acquired using a special pan-tilt head that can sense camera motions and zoom amounts.

One problem for the AI-based robotic camera system is the operating delay caused by the processing time of the system. In experiments using official soccer games, a delay of around one to two seconds was observed. Accordingly, NHK STRL is currently investigating the introduction of predictive processing in order to eliminate this delay. [\[NHK STRL News\]](#)

STATEMENT OF THE WORLD BROADCASTING UNIONS TO SCCR 43 ON THE PROPOSED WIPO BROADCASTING ORGANIZATIONS TREATY

The World Broadcasting Unions (WBU), representing broadcasting organizations from all regions of the world, have released a statement to be presented to the 43rd Standing Committee on Copyright and Related Rights (SCCR/43) at WIPO. The protection of broadcast signals has been under discussion at WIPO since 1997 following updating of the protections of other rights owners by WIPO treaties in 1996. Protection of broadcast signals granted by the Rome Convention of 1961 is obsolete in the continuously developing digital communications environment.

WBU Members agree that the Second Revised Draft Text for the WIPO Broadcasting Organization

Treaty (SCCR/43/3) generally reflects their objectives for updated international protection of broadcast signals, and covers the necessary elements to further protection of broadcasting organizations globally. Broadcasting organizations worldwide urge WIPO Member States to support it as the basis for final work to recommend a Diplomatic Conference to adopt a treaty. [\[WBU News\]](#)

DVB PUBLISHES UPDATED MULTICAST ABR SPECIFICATION AND GUIDELINES

The DVB Steering Board, at its recent meeting in Geneva, approved the publication of two DVB BlueBooks related to adaptive streaming over IP multicast. BlueBook A176r3 is an update of the DVB-MABR specification itself, while BlueBook A181r1 is an update of the implementation guidelines for the specification.

The latest version of the DVB-MABR specification addresses several change requests along with some new topics related to the Phase 2 Commercial Requirements. Examples of the latter include the addition of two new optional multicast transport protocols as well as sections dealing with reporting, authenticity assertion and tampering protection.

The two new optional transport protocols, which join the existing mandatory FLUTE and ROUTE protocols, are MSYNC and NORM. Both protocols are already used in commercial deployments of MABR and are described in technical specifications published by IETF. Their inclusion in DVB-MABR will accelerate market adoption, providing a viable transition path for legacy deployments that use NORM or MSYNC to DVB-MABR without having to change an already deployed transport protocol.

A parallel update of the implementation guidelines and worked examples for DVB-MABR has also been published. It includes a new fourth worked example along with additional guidance on several existing clauses. [\[DVB News\]](#)

ESTABLISHING DAB+ DIGITAL BROADCAST RADIO

WorldDAB has published a ground-breaking new book, "Establishing DAB+ Digital Broadcast Radio".

It offers a unique, in-depth guide to the regulatory, technical and commercial aspects of establishing a successful DAB digital radio service. The book provides guidance to new adopters, as well as offering advice for countries which have already started the process, and those who are nearing permanent service status.

The book covers the complete DAB+ establishment process from initial interest through to analogue switch-off. The topics covered include the seven major stages in establishment: Initial interest; Technical demonstrations; Formal standard adoption and regulation including coverage requirements and frequency planning; Systems planning and design - both transmission and multiplexer network design; Rollout activities including construction, content, receivers, and launch marketing; Operations, including ongoing content development and sustained marketing campaigns; and finally, Analogue switch-off. [\[WorldDAB\]](#)

AS MORE STREAMING CONTENT AVAILABLE, COMPETITION IS FIERCER BY THE MINUTE

Although global streaming continued to grow in 2022, the sheer number of content options meant that individual services on average captured a smaller share of users' daily watching time.

According to the 2022 Video Streaming Industry report by NPAW, providers around the globe saw a year-on-year increase in the total number of video plays for a second consecutive year. This, however, was offset by daily consumption per user and service dropping for both video-on-demand (VoD) and linear TV, at -12% and -23% respectively.

While daily linear TV playtime per user and service dipped, global linear TV quality improved. This, said NPAW, demonstrated how highly broadcasters and operators continue to prioritise linear TV QoE and this uptrend is likely to continue.

More content is also being consumed on big screens, with lesser viewers choosing to consume content on small-screen devices. As for what content viewers favour, sports proved to be the big winner, with providers that had streaming rights to the Qatar World Cup enjoying an

increase of 80% in the total number of plays and 83% higher total playtime when compared with the previous six months. [\[APB News\]](#)

HBBTV ASSOCIATION PUBLISHES NEW VERSION OF CORE SPECIFICATION

The HbbTV Association, a global initiative dedicated to providing an open standard for the delivery of broadcast and broadband services through connected TVs and set-top boxes, announced the immediate availability of HbbTV 2.0.2. This update of the second version of the core HbbTV specification enables HbbTV applications to benefit from new "Ultra High Definition" video and audio technologies such as High Dynamic Range, High Frame Rate and Next-Generation Audio – delivered as streaming services using, e.g., MPEG-DASH.

More specifically, the new release brings the following enhancements to HbbTV content: High Dynamic Range (HDR), which significantly increases the contrast ratio in video content, producing crisper and livelier video. The specification supports both Hybrid Log Gamma (HLG) and Perceptual Quantizer (PQ) coding.

High Frame Rate (HFR), which increases the current 50/60 frames per second to 100/120 fps. HFR offers sharper images of moving objects. This is especially useful in fast-moving sports content.

Next Generation Audio (NGA) technologies, which support object- or scene-based audio for a much more immersive audio experience. The specification supports both AC-4 and MPEG-H.

The HbbTV 2.0.2 specification has been under development since October 2017, and it builds on significant work done in DVB during 2017. Many HbbTV devices already support these technologies today, but there has been no standardized way to use these features. The new specification defines a common, standard mechanism for accessing them from HbbTV applications. To promote interoperability of the newly added features, the HbbTV Association will order tests that are planned to be available in time for products going on sale in spring 2019. [\[HbbTV\]](#)

MEDIA IN THE CLOUD: ONTOLOGY AND SEMANTIC WEB TECHNOLOGY NAVIGATION GUIDE

SMPTE, the home of media professionals, technologists, and engineers, has collaborated with the European Broadcasting Union (EBU) and Motion Pictures Laboratories Inc. (MovieLabs), a technology joint venture of the major Hollywood studios, to publish 'Media in the Cloud: Ontology and Semantic Web Technology Navigation Guide'. The new guide, available for free on the SMPTE website, is a primer on the use of ontologies and other semantic web technologies within a modern media landscape characterised by the movement of workflows into the cloud.

The guide explains media ontologies in simple terms, provides a useful discussion of mapping data across different information systems, and offers practical examples of how media organisations are using semantic web technologies to bring greater efficiency to real-world workflows.

Understanding and managing the complex relationships between all elements in the content life cycle – from scripts to assets to the tasks being performed across media workflows – require richer metadata. An ontology provides a framework needed to support application and service integration, asset and content management, and search and discovery, among other functions.

Recognising a need for greater awareness around this topic, MovieLabs, the EBU, and SMPTE collaborated to provide the industry with an explanation of media-specific ontologies, the ontologies already in existence, where they are applicable, and how to deploy them. The resulting document presents media organisations with a starting point for the move to the cloud and toward microservice-based deployments that integrate semantic technologies. [\[Content+Technology\]](#)

DIGITAL UK REBRANDS AS EVERYONE TV

Everyone TV is a joint venture owned and supported by the BBC, ITV, Channel 4 and Channel 5 with the latter joining as a member in late 2021. Freesat merged with Digital UK in the same year with the UK's two

free-to-view TV services now under the leadership of one organisation.

As Digital UK, the organisation was originally set up to manage and deliver the digital switchover (DSO) from analogue TV signals to Freeview. The rebranding is said to be part of a plan to ensure everyone in the nation can enjoy high quality TV across satellite, terrestrial and internet delivery and better reflect the company's mission to champion free TV for all.

The name change is also said to reflect a revised mandate for the organisation: to lead the evolution of free, universal, high-quality television, in a way that protects and strengthens the social glue provided by Britain's broadcasting heritage. Freeview and Freesat, which together offer 100% coverage of the nation. [\[Rapid TV News\]](#)

CONFORMANCE TESTING FOR ATSC 3.0 RECEIVERS

Labwise the provider of digital TV conformance testing solutions has announced the availability of StreamWise-ATSC its latest digital TV test suites that enable testing of ATSC 3.0 (NEXTGEN TV) receivers and TV sets to ensure their conformance with ATSC 3.0 TV service features.

Labwise was acquired by Allegro DVT, the developer of video codec compliance streams, in June 2022. Labwise has been operating as an independent, impartial, and objective testing house since 2004, providing professional digital TV test suites and services to major TV OEMs, digital TV broadcasters and operators across Europe.

StreamWise-ATSC by Labwise enables the testing of NEXTGEN TV broadcast service profile. These test suites allow device manufacturers to verify the compliance of products, or have devices tested as a service at Labwise laboratory to cover all the features and help tackle the technological complexity brought by the ATSC 3.0 standard.

The laboratory test environment is targeted for the device black box testing and is provided with optional HW environment for broadcast modulation. The test system includes the ATSC 3.0 test plan and the test case information

i.e., test configuration, procedures, and specification references to make it easy for the tests engineer to perform the tests. The test streams are provided in playout formats-ROUTE/DASH and MMT. [\[Content+Technology\]](#)

BRIGHTCOVE LAUNCHES 'AD MONETIZATION' SERVICE FOR MEDIA CLIENTS

Brightcove announced the launch of Brightcove Ad Monetization, a new bespoke service designed for media companies to better monetize their content. To supplement the service, the company also created a new global advertising operations team to support media organizations and help them maximize their advertising strategy and revenue.

Brightcove Ad Monetization builds on Brightcove's recently announced strategic partnership with Magnite, the world's largest independent sell-side advertising platform. Through the integration of Magnite and SpringServe, Brightcove now offers an advertising monetization service with end-to-end solutions for media companies to generate additional revenue from their advertising strategy.

Brightcove Ad Monetization will help media companies realize maximum, measurable returns on advertising with actionable insights. The solution supports the monetization of live and video-on-demand (VOD) content with improved yield optimization to fill unsold ad inventory and increase revenue. It includes client-side advertising insertion (CSAI) and server-side advertising insertion (SSAI) capabilities for web players, iOS, Android and connected TV platforms. Brightcove Ad Monetization also seamlessly integrates into independent and existing advertising servers, including Google Ad Manager and FreeWheel.

Companies that utilize the service will benefit from the expertise of Brightcove and receive direct support from its newly established global advertising operations team. From onboarding to implementation and refining the strategy, the team will tap into its deep insights and expertise to help customers every step of the way, no matter where they are on their advertising journey. [\[Brightcove\]](#) ■

A23 Global Coordination Conference

5-9 February 2023, Tunis



Delegates from short wave broadcasters and frequency management organisations had an important opportunity to coordinate their frequencies directly with the frequency managers of other broadcasters in Tunis. Out of many requirement files submitted, a sizable number of frequency collisions and interference instances were eliminated with the face-to-face coordination, or email coordination with those who could not be present at the A23 Conference.

The A23 Global Shortwave Coordination Conference was held as an in-person event and was hosted by the Arab States Broadcasting Union at the Royal ASBU hotel in Tunis, Tunisia between 5 and 9 February 2023. Some 44 frequency managers, representing 30 organisations, attended. The opening plenary meeting was held on 5th of February and the final plenary meeting took place on 8th February. The plenary meetings were chaired by Jeff White, HFCC Chairman. On behalf of the host, Bassil Zoubi of ASBU welcomed everyone to the Conference. Representatives of Asia-Pacific Broadcasting Union (ABU) and International Telecommunication union (ITU) also welcomed the participants.

Election of steering board officers was held during the final plenary. Two nominations for posts of Vice Chairman of the HFCC; Jérôme Hirigoyen from Telediffusion de France (TDF) and Essa Al Rais from Abu Dhabi Media (ADM), were received. With no objections from the members, both were elected as vice chairmen of the steering board. The delegates also witnessed Jeff White present Abdelrahim Suleiman, Director General of the ASBU, with the Oldrich Cip memorial award for his leadership of the Arab States Broadcasting Union and commitment to SW broadcasting.

Alongside the plenaries, there were presentations from shortwave tube manufacturers- Communications & Power Industries and Thales AVS. A presentation by Ampegon, on DRM updates, was heard by the audience. A regular event, the Group of Experts meeting, discussed several important issues of SW broadcasting, such as Tube Manufacturing, HFCC-IBB Monitoring Project and Submission of IRDR Requirements. A representative of the ITU gave the members an update on the HFBC software project and ITU Article 12.

The A23 Conference was a joint coordination of the High Frequency Coordination Conference (HFCC), the Asia-Pacific Broadcasting Union (ABU) and the Arab States Broadcasting union (ASBU). The B23 Conference is to be held in Surfers Paradise, Australia from 4 to 8 September 2023. ■

Equipment Trends

decode to/from SDI. BRIDGE LIVE's NDI functionality offers:

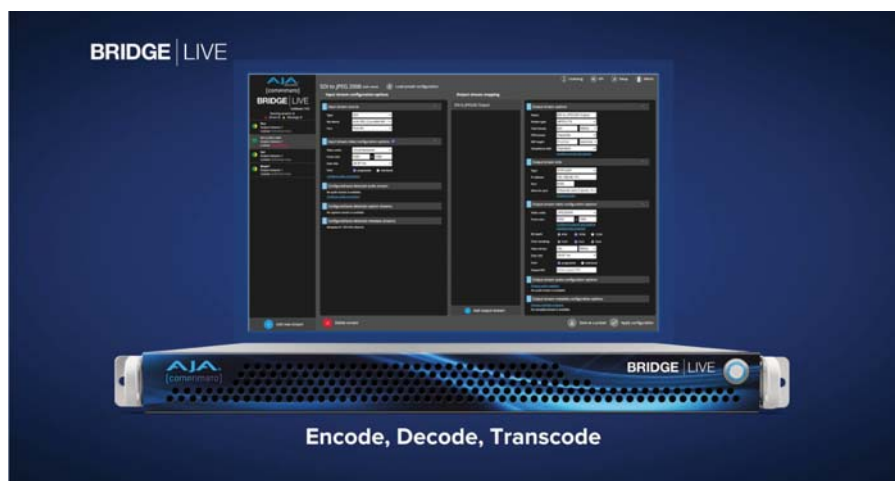
- SDI to NDI (encode)
- NDI to SDI (decode)
- IP Video Streams to NDI (transcode)
- NDI to IP Video Streams (transcode)

Used in conjunction with BRIDGE LIVE's broad codec and protocol support, collaboration between geographically separated (remote) NDI facilities can be realized. BRIDGE LIVE provides broad NDI product compatibility across software and hardware transmitters and receivers.

BRIDGE LIVE can take independent SDI source inputs, and maintain their synchronous relationship while transporting the content to end-point destinations. This functionality can take place between a pair of BRIDGE LIVE units for a synchronous end-to-end SDI workflow, often referred to as SDI backhaul, or site-to-site SDI workflows.

BRIDGE LIVE's synchronous multi-channel capability is also supported for cloud contribution, whereby a BRIDGE LIVE system can send to a cloud instance of Comprimato Live transcoder software, for delivery to various platforms / cloud services as IP video. Furthermore, Synchronous Multi-Channel Transport can be scaled up from a single BRIDGE LIVE pair to additional BRIDGE LIVE pairs, to enable workflows where multiple BRIDGE LIVE systems can be receiving SDI and sending to multiple BRIDGE LIVE systems outputting SDI, all in synchronicity. For end-to-end SDI workflows, HDR is also supported.

<https://www.aja.com/>
<https://comprimato.com/>



AJA & COMPRIMATO, BRIDGE LIVE

BRIDGE LIVE is a broadcast quality, low latency turnkey system for REMI, Synchronous Multi-Channel Video Contribution, Remote Collaboration, Direct to Audience Streaming, and Multi Bit Rate/Format Delivery.

Equipped with 12G-SDI I/O plus the power and flexibility to enable real time bidirectional encoding, decoding, and transcoding for critical Ultra-HD and HD workflows, BRIDGE LIVE is an essential part of any modern live video production toolkit. Whether facilitating remote production, two-way interviews, live event streaming, synchronous multi-cam backhaul with HDR, cloud contribution, program return, confidence monitoring, collaborative production, ABR ladder profiles to hand-off for OTT packaging, BRIDGE LIVE ensures simultaneous, secure, and stable

workflows whether over private lines or the public internet.

BRIDGE LIVE supports simultaneous bidirectional encoding and decoding with Ultra-HD, HD, and SD sources. For example, with a pair of BRIDGE LIVE systems, a broadcast facility can receive three incoming encoded HD camera sources from a remote location and decode them back into SDI for editing and production, while simultaneously providing an HD program return to the remote location.

Starting with v1.12 software, BRIDGE LIVE includes support for NDI (Network Device Interface), the high quality, real time, low latency live video standard developed by NewTek. BRIDGE LIVE can support up to 4 simultaneous 60p HD encodes/decodes or 1x 30p Ultra-HD encode/



SONY, SRG-A40 AND SRG-A12, 4K IP-BASED PAN-TILT-ZOOM CAMERAS

Sony Electronics is expanding its line-up of pan-tilt-zoom (PTZ) cameras with the addition of two 4K models with built-in AI analytics. The SRG-A40 and SRG-A12 cameras automatically and consistently track, and naturally frame presenters, regardless of movement or posture, for seamless content creation and control – all without operating a computer.

The new PTZ Auto Framing technology features automatic operation for quick object tracking and rediscovery, as well as multiple Auto Framing options.

Highlights of the cameras include image quality with automation, the flexibility of IP, powerful zoom, remote control, and easy configuration and operation. They can be used in education, corporate, medical, government, broadcast, and faith applications, as well as for live events.

New to this series of advanced cameras is Sony's built-in PTZ Auto Framing technology with AI analytics, which improves usability and productivity. Multiple Auto Framing angles provide well-framed options for close-ups, waist-up or full body images, enabling additional creative freedom and customization options.



With auto operation, the cameras begin to operate as soon as the power is turned on, searching for

and rediscovering an object to track. A combination of advanced and consistent recognition technologies are employed, including facial recognition which can even detect masked faces. A new user-friendly tally light allows users to easily identify which camera is actively in use and tracking movements.

The new models offer 3G-SDI, HDMI, and IP connectivity (NDI®|HX available through optional license) and can be controlled remotely through VISCAN/ISCA over IP, using a single network cable for power, output and control. They also include Power over Ethernet Plus Plus (PoE++), allowing

for simplified integration into new or existing environments – without separate power supply cabling. With robust connection and integration options, the new series takes advantage of PTZ cameras' distinct ability to provide capture and control even in hard-to-reach locations, while offering new angles and vantage points. Support for Real Time Streaming Protocol (RTSP) allows for remote viewing, while Security Reliable Transport (SRT) protocol enables safe, smooth, stable video streaming.

https://pro.sony/en_MY

OSPREY VIDEO & CATON ; TALON 4K-SC 10BIT HEVC ENCODER

Caton Technology, has formed a partnership with Osprey Video to provide an integrated encoder and decoder which connects direct to IP circuits using Caton Transport Protocols (CTP). The integration was initially developed in response to a user request around a large worldwide sporting event.

The partnership involves integrating CTP into the Osprey Talon 4K encoder and decoder. These are compact, cost-effective hardware devices providing high quality conversion from linear feeds into IP, at extremely low latency.

By embedding CTP into the Talon 4K encoder, users have a single point device which takes the source feed (at up to 12G SDI or HDMI), encodes



it to H.264 or H.265, and packages it for CTP to provide secure transport over IP circuits, including the public internet. At the receiving end, the Talon 4K decoder takes in the stream and delivers SDI or HDMI into the broadcast infrastructure.

The mobility of the Osprey solution means that it can be readily packaged

for delivery in a tight space such as an outside broadcast truck, in a control room, connected to a camera, or as part of the master control in front of a stage.

www.ospreyvideo.com
www.catontechnology.com

DJI RONIN 4D FLEX

DJI has introduced Ronin 4D Flex, a new way to use the Ronin 4D professional cinema camera platform. 4D Flex allows operators to separate the Zenmuse X9 gimbal camera from the main body, reducing handheld weight and size to achieve professional footage with even more flexible camera movement, the company said.

Ronin 4D Flex features seamless compatibility with the 4D Hand Grips and Main Monitor, effectively transforming a camera operator into a one-man cinema unit. Also the DL PZ 17-28mm T3.0 Lens, DJI's first-ever cinema-grade zoom lens, allowing for 100% native focus and zoom for a new level of image quality into the Ronin 4D system. Finally, an activation license key for the Apple ProRes RAW



codec on Ronin 4D is now available for purchase at the DJI Store, making it even easier to integrate Ronin 4D footage into cinema productions.

Ronin 4D Flex provides creators with a more flexible and efficient camera

movement system and a unique creative experience. Solo operators can separate the X9 gimbal camera from the main body, reducing the handheld weight of Ronin 4D to just 1.8kg, letting them shoot for long durations more easily in mobile situations like

events and documentaries. 4D Flex also makes the X9 gimbal camera compatible with a variety of rigs and lets professional crews shoot footage that was previously extremely difficult or even impossible, such as cinema-quality through-shots and dynamic camera interiors.

Connecting Ronin 4D Flex to the main body is a 2m ultra-thin coaxial cable, supporting lossless transmission of up to 8K. This allows high-speed signals from the camera sensor to reach the main body instantly, and also control and monitoring signals to be delivered in real-time. This solid cable connection lends 4D Flex unprecedented flexibility of camera positions, no matter how limited the space. It also allows the Zenmuse X9 gimbal camera to be

used as an ultra-small cinematic-grade remote head.

Ronin 4D Flex is compatible with the ever-growing Ronin ecosystem of professional cinematography solutions. Native compatibility with Ronin 4D's Hand Grips and the Main Monitor provides cinematographers with a whole set of solutions, including cinematic imaging, 3-axis stabilization, LiDAR focusing, and professional monitoring and control. The result is a convenient and efficient creative experience unparalleled in the industry today, according to the company.

The DL PZ 17-28mm T3.0 Lens is DJI's first-ever cinema-grade zoom lens and features precise back focus control and native system calibration, with

more accurate autofocus, manual focus and automated manual focus (AMF). Mounted on Zenmuse X9, this lens delivers ultra-high resolution from center to edge while covering ultra-wide to wide-angle focal lengths with a minimum object distance of 0.19 m.

Constructed of aluminum magnesium alloy, the DL PZ 17-28mm T3.0 Lens weighs approximately 520 g, providing a size-to-weight ratio that is a perfect match for the X9 gimbal camera. The internal servo zoom motor delivers a smooth and reliable zoom that eliminates the need for an external focus motor or lens calibration. And the DL PZ 17-28mm adjusts zoom without requiring re-balancing.

<https://www.dji.com/>



VISLINK, CLIQ OFDM MINI CAMERA TRANSMITTER

With its small form factor design and high-quality encoding, the Vislink Cliq has the ability to transmit a single 4k HDR video feed or two HD video services. By utilizing HEVC video coding technology, broadcast organizations can deliver high quality images over less RF bandwidth or over longer ranges than was possible with older MPEG-4 systems. This enables creative freedom to deliver richer, more engaging video productions through move camera feeds over robust RF transmission links. In addition to support for Tier 1 live events including delivering shots from body-worn cameras, the wireless transmitters can also support a wide variety of applications including onboard vehicles, PoV cameras and drones.

The transmitter features four stereo pair audio streams in an exceptionally small form factor. The new transmitter is designed with highest quality 4:2:2, 10-bit HEVC low latency encoding capability and is suitable for HDR broadcasts; LMS-T, ISDB-T, DVB-T/ T2 Modulation; RS-422 and CAN camera Control system connectivity and an IP Data Pipe to bring full data connectivity to the edge to deliver features such as camera control or communications to 3rd party devices.

<http://www.vislink.com/> ■

PHABRIX, QXP - PORTABLE WAVEFORM MONITOR

PHABRIX is released its first example of a traditional 'Waveform Monitor' – but with a twist. Inheriting all of the class leading features and flexibility of the QxL Rasterizer the QxP features an integral 3U multitouch LCD screen and an integral V-Mount or G-Mount battery plate, integral mains PSU and 12v external DC input. You now have 12G SDI and 25G ST 2110 compliance monitoring in a portable form factor using industry standard Camera Batteries.

The QxP is the world's first portable, 12G-SDI, 25G-ST 2110, combined waveform monitor, generator and analyzer, with support for mains, external DC power and comes with a V-mount or G-mount battery plate as standard, allowing for the unit to be powered by an external camera battery. This makes the QxP ideally suited for On-Set Production, Outside Broadcast, Commissioning, Engineering and R&D environments. With its class-leading Waveforms, the QxP is equally at home on-set in SDR or HDR Productions, Grading, Shading, or QC, MCR, Engineering and R&D environments. The user is free to use the integral screen, or plug in an external HDMI monitor and use

the flexible tool layout to view up to 16 instruments simultaneously. A rich set of remote access options, including NoVNC and the UI as a 2110-20 flow, provides all of the 'headless' operational flexibility of a conventional Rasterizer.

The QxP includes SMPTE ST 2110, 2022-6 and a wide range of formats as standard. In-field upgrades are available for a rich set of options: UHD/4K, IP-MEAS, HDR, Dolby E decode, PCAP capture, EUHD and extensive AV-ANC test signal generation. Factory-fitted options provide SDI interfaces or RTE™ real-time SDI eye and jitter analysis, with an engineering grade data view and an optional, advanced SDI-STRESS toolset.

For real-time IP workflows the QxP supports simultaneous Generation and Analysis of HD/3G/UHD/EUHD 2110 payloads on generic SFP28/25 GbE interfaces, with ST 2022-7 Seamless IP Protection Switching (SIPS) and independent PTP followers on both media ports for fully-redundant media network operation – all with AMWA NMOS IS-04 and IS-05.

Whether working in HD, UHD, SDR, HDR, SDI or IP, conventional or remote production, the QxP combines the user-configurability and advanced tools required for full operational flexibility when transitioning to next generation workflows.

<https://www.phabrix.com/>



DBS2023 TEAM



The ABU team led by Director of ABU Technology, **Mr Ahmed Nadeem**, coordinated and worked tirelessly to bring the DBS 2023 to a successful completion.

The Royale Chulan Hotel, Kuala Lumpur was chosen as the DBS2023 event venue. The theme of the event was "Back in Business," commemorating the first in-person DBS event comeback after the Covid-19 restrictions. For the previous two years, DBS2021 and DBS2022 had been conducted as a virtual event.

In addition to the usual audio-visual conference setup, Open Broadcaster Software (OBS Studio), a free and open-source software suite for production, was used to manage the audio-video signal flow, record and combine the live sessions with promo clips, titles, timer, etc.

Slido, an online Q&A and polling app, was embedded during the conference sessions and this allowed delegates to interact and engage during presentations.

For the first time, Amazon Alexa Voice AI was included and played a key role as the host for the DBS conference sessions.

Among the other notable hardware used included, Blackmagic Design's ATEM Mini Pro, DataVideo PTZ-140, ezcap HDMI video capture device, and Logitech Spotlight Presentation Remote. ■



Personalities & Posts

NEW TECHNICAL LIAISON OFFICER

SEONJEONG KANG



Seonjeong Kang joined KBS in 2004 in TV & Radio Technical Operations in the KBS Jeju Local Station. After six years of regional work in Jeju she transferred to the head office, working as an TV audio engineer at KBS HALL until 2015.

For a period she worked on organising and operating the budget for the overall broadcasting technology of KBS in the Investment Strategy Department before becoming a TV post production manager at the Production Technologies Centre.

Seonjeong Kang is currently working in the KBS Technology Management Department, in charge of international technical relations and the ABU Technical committee meeting 2023 in Seoul. ■

KHAMPHONG DUANGLILATH



KhamPhong Duanglilath was appointed Chief Technical Officer of Laos National Radio (LNR) in 2022. He started working as a technician with LNR Broadcasting in 1984 and has built up more than thirty years of experience in

the field of technology and broadcasting.

KhamPhong Duanglilath graduated with a bachelor's degree in electronics from Laos and is currently a technical coordinator throughout Laos as well as being a technical coordinator with the ABU. ■

GALINA FEDOROVA



Galina Fedorova graduated with honours from MAI, a reputable Russian technical university, and obtained a Ph.D. in digital data processing.

In Galina's current role as RTR's Deputy Director

of Foreign Affairs she works in Working Bodies of the RCC (Regional Commonwealth in the Field of Communications) Commission on the Regulation of the Usage of the Radio Frequency Spectrum and Satellite Orbits. Galina is a member of the ministerial project group on preparation for WRCs, ITU Radiocommunication Assemblies, CEPT Assemblies, meetings of the RCC bodies. Galina takes part in the work of the ITU Study Group 6 (SG 6) "Broadcasting Service".

For 8 years Galina was a member of the EBU Technical Committee. ■

As the Project Manager New Media at ABU, **Mr Hamdhoon Rashad**

provided dynamic service over the past seven years, from March 2016 to March 2022. In his role, Hamdhoon was well known for his expertise in copywriting, news writing, proofreading, editing, and content strategy.

Hamdhoon will embark on a new career journey at ABU's sister organisation, the European Broadcasting Union (EBU) in Geneva.

The entire ABU secretariat bids farewell to Mr Hamdhoon. We wish you all the best in your future endeavours. ■

"FAREWELL TO HAMDHOON RASHAD"

INTRODUCING THE NEW DIRECTOR OF ABU TECHNOLOGY



Dr Veysel Binbay has been appointed the new Director of ABU Technology. Dr Binbay is an accomplished Electronics Engineer with a distinguished career in broadcast engineering spanning over 24 years. His expertise and contributions making him a respected figure in the field.

Dr Binbay's academic journey commenced with a Bachelor's Degree in Engineering from Gazi University, Ankara, Türkiye. He then pursued a Master of Science Degree from Dicle University, Faculty of Science, Diyarbakir, Türkiye. Driven by his passion for knowledge, he further pursued a Doctorate in Science from Dicle University, Institute of Science, Diyarbakir, Türkiye.

Dr Binbay's professional journey began at the Turkish Radio and Television Corporation (TRT). From 1998 to 1999, he worked as an Electronics Engineer, contributing to the maintenance services of Video Tape Recorder (VTR) systems. In 1999, he transitioned to the role of a Broadcast Engineer, operating crucial broadcasting equipment and leading a team of technicians.

Recognizing his exceptional skills and dedication, TRT entrusted Dr Binbay with higher responsibilities where he served as a Technical Manager and IT Director from 2002 to 2019. He overseeing multiple technical teams responsible for the smooth operation of broadcasting systems, studios, and transmission equipment. His ability to analyse and resolve technical issues earned him the position of Chief Engineer and IT Director from 2009 to 2019.

In 2019, Dr Binbay joined the Asia-Pacific Broadcasting Union (ABU) as a Specialist Engineer-Transmission in the ABU Technology and Innovation Department. He plays a pivotal role in managing department activities and fostering technological advancements in the broadcast industry. Dr Binbay's responsibilities include enhancing knowledge of broadcast and IT technologies, developing training programs, establishing collaborative relationships with broadcasting unions and organizations, and spearheading projects that benefit ABU members.

Beyond his professional accomplishments, Dr Binbay has shared his expertise as a lecturer at various universities. He has delivered comprehensive lectures on subjects such as Radio and Television Technologies, Analogue and Digital Communication Techniques, Radio Frequency Technique, Telecommunication Systems, and Satellite and Cellular Communication Systems. Dr Binbay's dedication to knowledge sharing extends to his proficiency in various software applications, including FORTRAN, C, Delphi, Edius, Final-cut, Audition CC etc. ■

ABU TECHNOLOGY CALENDAR *of Events* 2023

16-19 May	Seoul, Korea
KOBAShow	
24 May	Online
Webinar Series on Member Innovations	
7-9 June	Singapore
BroadcastAsia2023	
9-10 June	Singapore
ABU Technical Bureau Mid-Year Meeting	
22 June	Online
Webinar Series on Member Innovations	
18-20 July	Online
ABU-ASBU Technical Workshop on Digital Radio	
1-3 August	Kuala Lumpur, Malaysia
Broadcast Archive Systems Workshop	
August/ September	Online
Engineering Fundamental Training Course Level 3	
September	Kuala Lumpur, Malaysia
IP Workflows and Remote Production for Broadcasters Workshop	
September	Kuala Lumpur, Malaysia
Cloud Technologies Workshop	
15-18 September	Amsterdam
International Broadcasting Convention 2023	
9-13 October	Tunis, Tunisia
ABU-ASBU Satellite Workshop	
October (TBA)	Seoul
ABU Technical Bureau Annual Meeting	
28-29 October	Seoul
ABU Technical Committee Meeting	
28 October - 1 November	Seoul
ABU General Assembly	
15-17 November	Japan
Inter BEE 2023	

Dr Javad Mottaghi, a familiar face to ABU members and colleagues, has been ABU Secretary-General since May 2010 and completed his term on 31 March 2023 after a career of more than four decades in broadcasting. Dr Mottaghi's ABU service, of more than 13 years, has seen significant growth for the ABU, in terms of both membership and new activities. His focus has been on strengthening core events and introducing innovative new activities.

A highlight of his term was the initiating and launching the ABU Media Academy in July 2020. Other ABU activities introduced during his term include the Pacific Media Partnership Conference, the Central Asia Media Forum, the ABU TV Song Festival, ABU-Rai Days, Media 2020 and Media Culture Days, the Women With the Wave Forum, #ABUDigital, ABU TV-CON and ABU CON-FEST. Also launched were the Global News Forum, the Asia-Pacific View and the Media Summit on Climate Change and Disaster Risk Reduction.

In his farewell note Dr Javad said; "I would like to extend my gratitude for your trust in me and your invaluable contribution to the ABU. I would also extend my sincere thanks to the ABU Acting President, the Vice Presidents, Administrative Council, and all ABU members and partners for their trust and support throughout my time here. I am also grateful to my colleagues in the Secretariat who have been instrumental in our achievements over the past 13 years. We worked as a team."

Dr Mottaghi received recognition as an Honorary Councillor and the Lifetime Achievement Award from ABU members. He pledged to continue to support the ABU in any way he could whilst in his new academic role at HEC Montréal, Québec, Canada.

In bidding farewell to you Dr Javad Mottaghi, the ABU secretariat thanks you for your managerial expertise and wishes you all the best in your future endeavours. ■



**“THANK YOU
AND FAREWELL
DR JAVAD”**



CABSAT

16–18 MAY 2023
DUBAI WORLD TRADE CENTRE

CREATIVE.
CONNECTED.
CONSCIOUS.

**THE MEASA REGION'S LEADING EVENT FOR
CONTENT CREATION, BROADCAST, PRODUCTION,
AND SATELLITE INDUSTRIES**

Tap into new business potential as thousands of key buyers, thought leaders and decision makers from over 120 countries come together to design, shape and co-create the future.

CREATIVE

Discuss and dive into trends, challenges, innovations and opportunities.

CONNECTED

Explore, meet and exchange experiences with a diverse range of stakeholders including industry executives, integrators, engineers, solutions providers and more.

CONSCIOUS

A focus on sustainable practices across the content creation and delivery ecosystem with special conference content and workshops.

Get in touch with us to exhibit, sponsor or visit: www.cabsat.com

    @cabsatofficial

#CABSAT2023

Organised by



مركز دبي التجاري العالمي
DUBAI WORLD TRADE CENTRE

Next Stage?
Break the Frame!

2023
KOBA

31st Korea International **Broadcasting,**
Media, Audio & Lighting Show

16-19 MAY 2023
COEX SEOUL KOREA

ORGANIZERS

Korea E & Ex Inc.

Korea Broadcasting Engineers & Technicians Association

Contact . Korea E & Ex Inc.

Tel. +82-2-551-0102 Fax. +82-2-551-0103

E-mail. koba@kobashow.com

www.kobashow.com



CALL FOR SPONSORS

**BE A SPONSOR OF THE
2023 ENGINEERING
AWARDS**



**STAND A CHANCE TO AN OPPORTUNITY
TO PRESENT THE AWARDS**

📍 **SEOUL**



OCTOBER

FOR MORE DETAILS:
engineering.awards@abu.org.my