Asia-Pacific Broadcasting Union

Technical Review

NO. 290 APRIL-JUNE 2022

PP 2412/11/2012 (031331) • ISSN 0126-6209

CYBERSECURITY:
A Rising Concern within Broadcast and Media Organisations

ALSO INSIDE

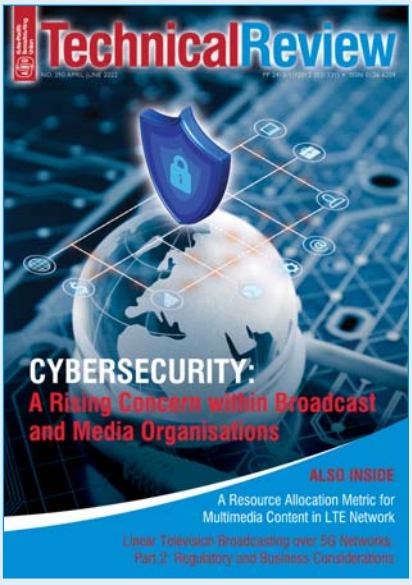
A Resource Allocation Metric for Multimedia Content in LTE Network

Linear Television Broadcasting over 5G Networks, Part 2: Regulatory and Business Considerations

IBC2022

BACK AT THE
RAI AMSTERDAM | **9-12 SEPTEMBER 2022**

Inside



Cover: Cybersecurity: A Rising Concern within Broadcast and Media Organisations

Asia-Pacific Broadcasting Union

from the Editor

This edition of the TR focuses on the area of Cybersecurity, specially within the broadcast and media environment. During the past few years, the importance of cybersecurity has been noted by many experts in light of some major cyber-attacks targeted at broadcast and media entities mainly in the US and Europe. These include hijacking of channels, disruption of services in addition to stealing of valuable content. The ABU Technical Committee has noted this as a critical area that needs attention of our member broadcasters. The ABU has been organising workshops in this area and recently organised webinar series which received a lot of interest from members. The discussions and points from the webinar series is included in this edition.

As usual this edition also includes three featured articles contributed by our members and industry partners. The first articles titled “A Resource Allocation Metric for Multimedia Content in LTE Network”, contributed by colleagues from IRIB-Iran, looks at ways to improve the bandwidth usage within LTE networks specially for video and multimedia content. The next article is a continuation of the “Linear Television Broadcasting Over 5G Networks” which was published in the previous edition with this second part looking at the regulatory and business considerations. The third article contributed by our industry partner IPSB Technology highlights some success stories in implementation IP and cloud-based technologies within the media environment and how they are helping broadcasters together with their partners in building such facilities.

This edition also includes a short report on the outcomes of the recently held mid-year meeting of the ABU Technical Bureau. It also highlights some key webinars organised for members including the “Virtual Forum on Cybersecurity and Media”. As usual the edition concludes with our regular highlights from Industry news, digital updates and the latest in equipment trends. We hope you will benefit from the informative articles and other materials included. We welcome such contributions from our members and the industry, so if you would like to contribute, please feel free to get in touch with us.

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.

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
Hamidah Rani
email: hamidah@abu.org.my

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

A RESOURCE ALLOCATION METRIC FOR MULTIMEDIA CONTENT IN LTE NETWORK

ABSTRACT

New Generations of wireless networks such as LTE, should support bandwidth-consuming services like VoIP, Video, and multimedia streaming. Adding multimedia services to wireless communication networks leads to a lot of challenging issues in the radio resource allocation process. One of the fundamental resource management schemes in LTE networks is flow scheduling based on pre-defined metrics. Scheduling metrics definition, in particular, plays a fundamental role in selecting and distributing radio resources among different stations with fine time and frequency resolutions taking into account, channel conditions and QoS requirements. In order to reach acceptable performance, both frequency and time domain allocations for LTE resource blocks should be considered in the metric definition. One of the well-known LTE scheduling metrics, is EXP-Rule which controls real-time multimedia traffic delay. However, as a drawback, EXP-Rule does not consider the differences between flow characteristics like VoIP head of line delay compared to the video. In this paper, an exponential metric is proposed based on some modifications in the concept of resource allocation of EXP-Rule in order to differentiate between flow types with different heuristic queue sizes. This flow type differentiation, improves the metric fairness between flow types like VoIP and Video compared to EXP-Rule. Simulation results show a balance between VoIP delay and video packet loss rate. For the number of users equal to 70, in a single cell with interference, the proposed CB-EXP improves the video packet loss rate by 7.9%, 35%, 54.7%, 50.7%, and 56.6%, compared to EXP-MT, EXP, mEXP, sEXP and E2M respectively, also improves VoIP delay by 57%, 66%, 75% and 114% compared to mEXP, sEXP, EXP and EXP-MT respectively. In single cell without interference, for 70 users, the proposed CB-EXP metric improves video packet loss rate by 11.3%, 17% and 30% compared to LOG-RULE, EXP / PF and PF respectively and for VoIP packet delay, 11%, 15%, 103% and 32% compared to MLWDF, LOG_Rule, EXP / PF and EXP_Rule, respectively. On the other hand, applying the maximum throughput metric in the proposed formula, leads to better throughput results, especially in an interference including single-cell channels.

Keywords: Resource allocation, LTE, QoS, Video, VoIP.

INTRODUCTION

Packet delay and loss ratio are the main parameters that affect QoS in LTE access networks. Therefore, resource allocation policies including scheduling play important role in network performance. Scheduling is one of the main aspects of the LTE network to distribute available time-bandwidth resources efficiently among active users. Different QoS and QoE-related parameters like SINR, flow resource allocation history, queue status, and buffer status should be considered in resource allocation among user equipment (UEs) [1, 2]. Radio access in the LTE system uses Orthogonal Frequency Division Multiple Access (OFDM) technology that supports both frequency division multiplexing (FDD) and time-division multiplexing (TDD) [3, 4]. In the frequency domain, the total available bandwidth is divided into 180 kHz sub-channels where each sub-channel consists of 12 subcarriers. Resources are framed in the time domain with 10 ms duration where each frame consists of 10 Time Transmission Interval (TTIs). Each TTI, consists of two 0.5 ms slots each corresponding to 6 or 7 OFDM symbols. Each time-frequency segment called a resource block (RB), consists of a frequency domain sub-channel and a time slot with length of 0.5TTI in the time domain. *Fig. 1* shows an LTE frame structure [1, 4]. LTE resource allocation is a process based on which a scheduling metric is calculated for all users and for each resource block, in order to determine priority for each user to be scheduled. The most appropriate modulation and channel coding, is applied for each RB allocated in scheduling process [5]. It should be noted that the scheduling process is performed after sending channel quality indicator (CQI) (the instantaneous Signal to Interference plus Noise Ratio, SINR) by users to the related Evolved Node B (eNB). The scheduling module allocates

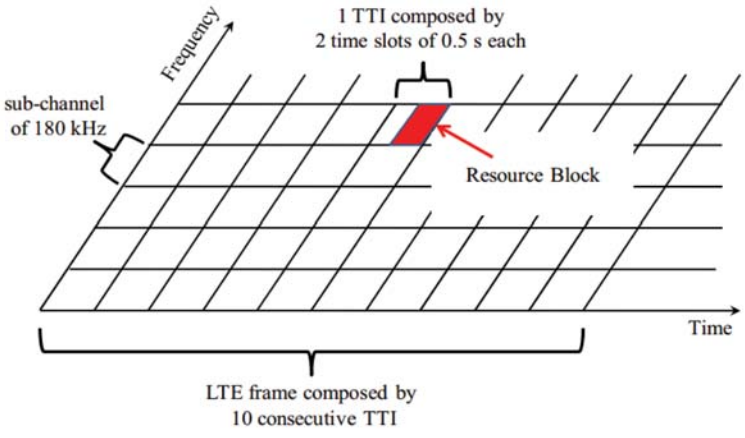


Fig. 1 LTE frame structure [1]

resource blocks between active users based on CQI and other QoS parameters [1, 5]. First Input First Output (FIFO) and Round Robin (RR) are well-known algorithms generally applicable to wireless networks and fall into the category of channel unaware and QoS unaware algorithms.

Earliest Deadline First (EDF) and Largest Weighted Delay First (LWDF) are two metrics defined for real-time traffic in wireless networks for sending packets prior to expiration [6, 7] by applying D_{HoL} in their corresponding formula. The EDF and LWDF metrics are only aware of the QoS requirements and are not able to monitor instantaneous channel conditions. In [8, 9] the Proportional Fair scheduling metric for multi-carrier data transmission systems is introduced. This metric allocates resource blocks to users at each TTI, by getting feedback from the user's channel condition and calculating the capacity using the Shannon theorem as well as the history of resources allocated to each user. The metric is according to (4) and (5) indicates the Shannon theorem.

$$m_{i,k}^{PF} = d_k^i(t) / \overline{R^i}(t-1) \tag{4}$$

$$d_k^i(t) = log\left(1 + SINR_k^i(t)\right) \tag{5}$$

Where $d_k^i(t)$, is the expected data rate of ***i-th*** user on the ***k-th*** resource block at time ***t*** and is calculated by the Shannon theorem. On the other hand, $\overline{R^i}(t-1)$ is the average received throughput by the ***i-th*** user before time ***t*** and $SINR_k^i(t)$ is the signal to interference plus noise ratio of the ***i-th*** user in the ***k-th*** resource block. The Proportional Fair scheduling algorithm falls into the category of scheduling methods that are channel condition aware with the drawback of not supporting QoS.

Another channel aware and QoS unaware scheduling algorithm is maximum throughput (MT) metric that is provided in equation (5) [10].

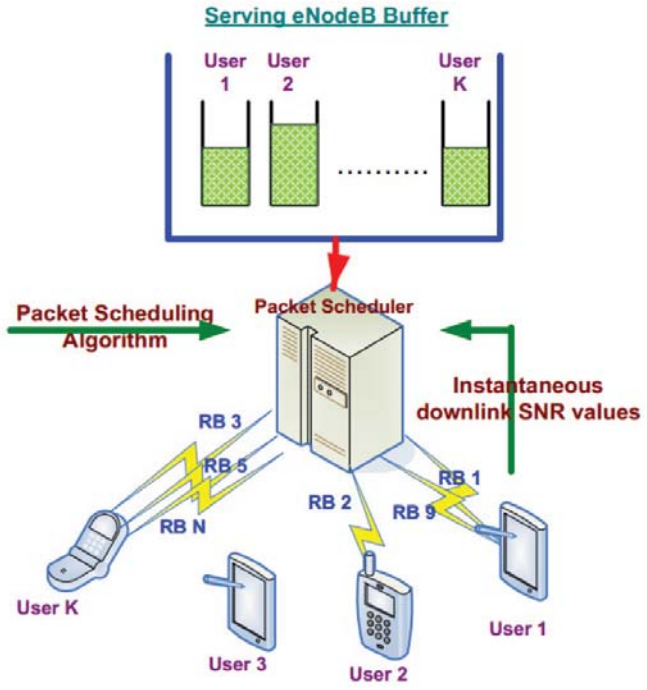


Fig. 2 General model of multi-carrier wireless scheduling [9]

Other important LTE scheduling metrics falling in the category of channel and QoS aware algorithms, are discussed briefly as follows.

In [8], M.Andrius et.al proposed Modified LWDF (MLWDF) as a modified version of LWDF considering QoS requirements [11] as shown in (6):

$$m_{i,k}^{MLWDF} = \alpha_i . D_{HOL,i} m_{i,k}^{PF} \tag{6}$$

Where α_i is computed by $\alpha_i = \frac{\log \delta_i}{\tau_i}$ and its value is selected based on legitimate requirements of acceptable PLR and packet expiry deadlines of two flows with the same HOL packet delay [1, 12]. The considering terms in MLWDF is as follows:

1. $Pr\left\{D_{HOL,i} > \tau_i\right\} \le \delta_i$
2. The average provided throughput to the ***i-th*** user must be greater or equal to a predefined limit.

Thus, by applying quality parameters, the MLWDF metric can differentiate real time and non-real time traffics [11, 13]. The performance of this algorithm degrades with increasing number of users [14]. Authors in [14] have defined the Exponential / PF (EXP/PF) metric as shown in (7):

$$m_{i,k}^{EXP/PF} = exp\left(\frac{\alpha_i D_{HOL,i} - \chi}{1 + \sqrt{\chi}}\right) * m_{i,k}^{PF}$$

$$\chi = \frac{1}{N_{rt}} \sum_{i=1}^{N_{rt}} \alpha_i D_{HOL,i} \tag{7}$$

$$\alpha_i \in [\frac{5}{0.99\tau_i}, \frac{10}{0.99\tau_i}]$$

In [15], the LOG-RULE metric is presented to support real time and non-real time services. The scheduling metric is as follows:

$$m_{i,k}^{LOG-RULE} = b_i log(c + a_i D_{HOL,i}) . \Gamma_k^i \tag{8}$$

Where $c = 1.1\ ;\ b_i = \frac{1}{E\left[\Gamma^i\right]}$ and $\alpha_i \in \left(\frac{5}{0.99\tau_i}, \frac{10}{0.99\tau_i}\right)$ and Γ_k^i is the spectral efficiency of the ***i-th*** user for the ***k-th*** resource block. In [15-17] the EXP-RULE is introduced for real time traffics. This metric is an improved version of EXP / PF based on equation (9) in which one user queue delay is normalized by the total experienced delay by other active users [1]. In overall conclusion, it also performs better than MLWDF and LOG-RULE [18].

$$m_{i,k}^{EXP-RULE} = b_i exp\left(\frac{\alpha_i D_{HOL,i}}{c + \sqrt{\left(\frac{1}{N_{rt}}\right) \sum_{j=1}^{n} D_{HOL,j}}}\right) \Gamma_k^i \tag{9}$$

Where $m_{i,k}^{EXP-RULE} = b_i exp\left(\frac{\alpha_i D_{HOL,i}}{c + \sqrt{\left(\frac{1}{N_{rt}}\right) \sum_{j=1}^{n} D_{HOL,j}}}\right) \Gamma_k^i$ and $c = 1$.

PROBLEM STATEMENT, MODEL, AND ASSUMPTIONS

With evolution of LTE system architecture, improving network performance encounters new challenges for radio resource management to offer fairness while providing bandwidth efficiency and users' QoS requirements [19].

Based on the existing results of scheduling metrics, the objective of this paper is to propose a metric to improve EXP_Rule metric while attempting to maintain the VoIP delay and video packet loss in an acceptable range as well as increasing the number of concurrent active users.

Consider the following system characteristics:

- N user input streams ($N = \{1, 2, ..., N\}$)
- One physical channel
- M CQIs at any time interval $[t, t+1]$ and $t = 0, 1, 2, \ldots$.
- A service data rate vector $\left(\mu_1^m, \mu_2^m, \ldots, \mu_N^m\right)$ assigned for each $CQI=m$,
  - Where μ_i^m is average service data rate for *i-th* user for $CQI=m$.
- Statistical priority vector $\left(\sigma_1, \ldots, \sigma_N\right)$ represents the random priority allocated to each user [16, 17, 20] where $\forall i \sum \sigma_i = 1$.
- The channel condition random process is assumed to be an irreducible discrete Markov chain with finite state space M.
- The number of users with the stream type i entering in the time slot t is represented by $A_i(t)$.
- Also, the average input data rate of i, which means the average of users of type i entering in the slot t, is represented by λ_i and $i = 1, ..., N$. It is assumed that all $A_i(t)$ are Independent and Identically Distributed (i.i.d) random variables with constrained exponential torque and shown as follows.

$$A = \left\{A_1(t), \ldots, A_N(t), t = 1, 2, \ldots, N\right\} \tag{14}$$

In addition, it is assumed that the average stream data rates of the above definition converge exponentially to their average data rates, meaning that for any $i \in N$ and $v > 0$, a fixed number $a = a(v) > 0$ exists so that equation (15) could be as an estimation relatively large n's [7, 21, 22]. The behavior of the whole system with the random process S is described as (16).

$$Pr\left\{\left|\frac{1}{n}\sum_{i=1}^{n} A_i(t) - \lambda_i \geq v\right|\right\} < e^{-an} \tag{15}$$

$$S(t) = \{(U_{i1}(t), \ldots, U_{iQ_i(t)}(t), \quad i = 1, 2, \ldots N; m(t)\} \tag{16}$$

Where $Q_i(t)$ length of the queue of type i at time t, according to (17). $m(t)$, is the instantaneous channel condition and $U_{ik}(t)$ is delay of the *k-th* user with *i-th* stream at time t. Users are numbered by order of entering. Hence, the number of each user will be between 1 and $Q_i(t)$. Also, if we show the number of users with *i-th* service served in the time slot t by $D_i(t)$, for each time slot t and for each *i-th* we have:

$$Q_i(t+1) = Q_i(t) - D_i(t) + A_i(t) \tag{17}$$

1.1 THE EXP_RULE METRIC

The mapping H that takes the system with state S(t) in the time slot t into the probability distribution of H(S(t)) fixed on the vector cluster, called the scheduling rule or queue order. In Section 2, the overall system model, the underlying assumptions, and the overall scheduling operation corresponding to a channel and QoS aware approach are discussed. The important result of the discussion is to derive a scheduling rule based on the model and general assumptions for the system. This scheduling rule can take into account the QoS requirements that apply to the metric function with its corresponding variable [22]. In the following, after introducing the scheduling EXP_Rule in general, a new metric based on EXP_Rule is proposed.

The following equation shows the general form of EXP_Rule with positive and constant parameters $\gamma_1, \ldots, \gamma_N, a_1, \ldots, a_N, \beta$ and $\eta \in (0,1)$.

$$i \in i\left(S(t)\right) = \arg\max \; \gamma_i \mu_i(t) \exp\left(\frac{a_i Q_i(t)}{\beta + \left[\overline{Q(t)}\right]^{\eta}}\right) \tag{18}$$

$$\mu_i(t) = \mu_i^{m(t)}$$

Where a_i, are positive values and represent a function of QoS requirements and γ_i, are positive arbitrary values that usually considered to be 1 [22]. Also $\mu_i(t)$ is the weight that is multiplied by the exponential expression and can be the output of any channel aware algorithm such as PF or MT.

1.1.1 SCHEDULING PROCEDURES AND GENERAL FLOWCHART OF EXP_RULE

The step-by-step scheduling procedure based on the EXP_Rule metric is expressed as follows:

1) Classify and prioritize packets based on their calculated metric;
2) Calculate HOL packet delay based on the arrival time of packets and total delay that each packet has experienced;
3) Compare Total Delay with the tolerable delay threshold value of each packet;
4) Removing the packet if it exceeds the acceptable delay threshold;
5) Calculate a_i using the equation defined for it; and
6) Calculate the service data rate vector $\mu_i(t)$.

The general flowchart for a TTI is shown in *Fig. 3*.

PROPOSED SCHEDULING METRIC

Based on general idea of exponential metrics, a new metric is proposed to improve VoIP delay and video packet loss compared to EXP. Since the main idea of proposed metric is applying the effect of content type in formula, the authors, name it "content based EXP" or CB_EXP with the below formula:

$$m_{i,k}^{CB\_EXP} = \exp\left(10 * \exp\left(D_{HOL,i}\right)\right) m_{i,k}^{MT} \tag{19}$$

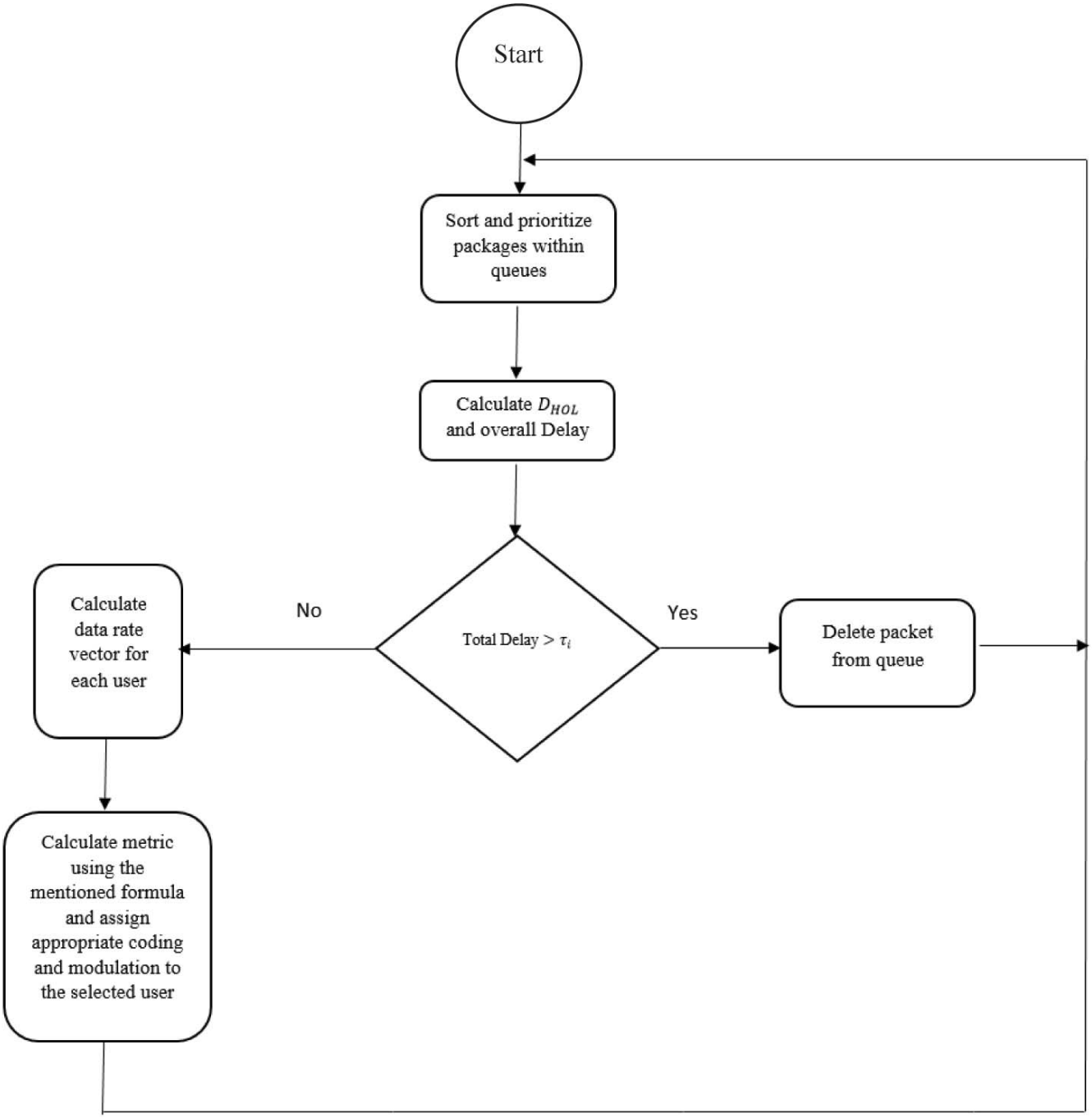


Fig. 3 General flowchart of EXP_Rule scheduling

Where:

- $D_{HOL,i}$, represents the head of line packet delay for *i-th* user.
- $m_{i,k}^{MT}$ is MT metric for *i-th* user in *k-th* resource block.

Applying MT factor in the proposed channel and QoS-aware metric, improves performance, especially in cells with interference.

Due to the special mobile channel conditions in the interference scenario, to prevent retransmission of the packet, which results in waste of resources, the weight MT is considered to give less priority to resource allocation for states with low SINR. There is also a good and acceptable tradeoff between delays and packet loss. It is necessary to explain how the system works. One reason for using the exponential function is to give higher priority to video streams rather than VoIP streams. The reason for this is as follows:

Since the average D_{HOL} for video packets usually is greater than for VoIP ones, its exponential effect will make the priority for video streams noticeably higher than that of VoIP streams. In other words, since packet delay and packet loss are usually inversely correlated, the scheduling metric needs to operate in such a way as to provide a balance between the two parameters and maintained at an acceptable point of QoS value. Experimental results show that the average overall delay as well as the D_{HOL} of video are higher than VoIP and this factor may increase the probability of the video packets expiring and being eliminated from the queue. So the metric needs to act in a way that takes this factor into account. If packet entering time is not considered in the scheduling, the video packets could be removed from the queue and increase the overall packet loss rate of video traffic [23]. As a result, Since D_{HOL} for video packets are greater than VoIP ones [1], the exponential function in the metric causes selective treatment of video packets. On the other hand, by increasing the waiting time in the queue (D_{HOL}), the performance of the proposed metric is appropriate due to the use of exponential function within the metric argument.

In the proposed CB_EXP method, due to the mathematical conditions underlying the exponential function, a metric is proposed considering the QoS parameters, which provides a good tradeoff between delay and packet loss for video and VoIP traffics. The difference between this algorithm and the existing metrics is to balance the two opposite parameters, delay and packet loss. The proposed metric has acceptable performance on video packet loss and VoIP delay parameters, especially in the presence of interference.

PERFORMANCE EVALUATION

In this section, the proposed CB_EXP metric will be compared to the existing metrics, such as PF, MLWDF, EXP / PF, EXP-RULE. The simulation results are obtained using LTE-Sim simulator [18] in two scenarios. In the first scenario, the comparison is performed in a single cell with interference. In the second scenario, the proposed metric will be compared in a single cell without interference.

2.1 SCENARIO 1: SINGLE CELL WITH INTERFERENCE

In this scenario, the performance of proposed CB_EXP metrics are compared to the EXP family methods considering two parameters, packet loss and delay, for both video and VoIP traffics. The simulation conditions are as shown in **Table 1** [1, 24].

Table 1: Simulation conditions of single cell with interference

Parameters	Values
Bandwidth/Frame length	5MHz/10ms
Frame structure	TDD
Modulation	QAM, 4-QAM, 16 QAM
Simulation Duration	46s
Stream Length	30s
Traffic Model	Real time traffic: Video & VoIP
Mobility	Fixed eNB but The user has a completely random move With speed of 3 km/hour
Number of users	5:5:70
Video traffic type	128 kbps/ foreman_H264_
VoIP traffic type	G.729 codec with a fixed packet length of 20 bytes over a period, plus 12 bytes of RTP header, totally 32 bytes
Cell number	7
Cell radius	1 km

According to the results of [18, 25], EXP-Rule performance in terms of packet loss rate and delay is generally better than MLWDF, PF, MT and EXP/PF. Therefore, the proposed metric only compares to EXP-RULE and other EXP-RULE extensions. Due to the statistical network features and random output at each test step, the simulation is performed up to 5 times and results are averaged for more accuracy.

Fig. 4 shows the video packet loss rate of the proposed and other metrics in the first scenario. As can be seen, the proposed CB_EXP metric has lower packet loss rate compared to sEXP, mEXP, E2M and EXP_Rule metrics. Albeit the proposed metric has higher packet loss rate than EXP_MT for number of users below 50, but as the number of users increases over 50, the packet loss rate decreases remarkably.

This result can be explained as follows: As more packets enter the queue and service demands increase, naturally the packet waiting time in the queue increases (D_{HOL}), and this variable is more significant for the video packet. In this case, due to the exponential function of the proposed metric, with the increase of the delay value of the video packet (D_{HOL}), its priority becomes noticeably high and as a result, the video packets are scheduled with higher priorities.

As depicted in *Fig. 4*, three CB_EXP, EXP-RULE and EXP_MT scheduling metrics are suitable for supporting video traffics. The CB_EXP metric performs better than the others in the number of users over 50. The percentage of improvement over EXP, mEXP, sEXP and E2M for 70 users are 35%, 54.7%, 50.7% and 56.6%, respectively. On the other hand, the proposed CB-EXP metric decreases the packet loss rate 7.9% compared to EXP-MT for a number of users equal to 70. It should be noted that the packet loss rate is computed using the equation (20) [26, 27].

Due to the expanding use of packet switching network users, attention to VoIP traffic is urgently needed. *Fig. 5* shows the packet loss rate result of the proposed metric compared to existing ones. As depicted in this figure, increasing the number of users leads to increasing VoIP packet loss rate. Also the proposed metric has more packet loss rate than the other metrics except E2M.

This is due to the increased speed of sending and scheduling of VoIP packets and naturally, reducing the integrity of scheduled VoIP packets. For packet loss rate of VoIP traffic, EXP-RULE metric has the best performance and can be used for VoIP traffic. Subsequently, sEXP and mEXP also have acceptable performance. It is worth mentioning that the proposed algorithm has acceptable performance up to 35 users. On the other hand, each metric is not capable of fully supporting all QoS parameters. Also, by recalling the purpose of this research to establish a state of equilibrium between delay and packet loss rate with the limited capacity of the system, in terms of the overall result, the proposed metric performs better than all existing metrics. For example, EXP_MT, which performs better in terms of video packet loss rate, has the worst performance in VoIP packet delay.

$$Packet\ loss\ rate = \left(1 - \frac{recievd\ packets}{sent\ packets}\right) \quad (20)$$

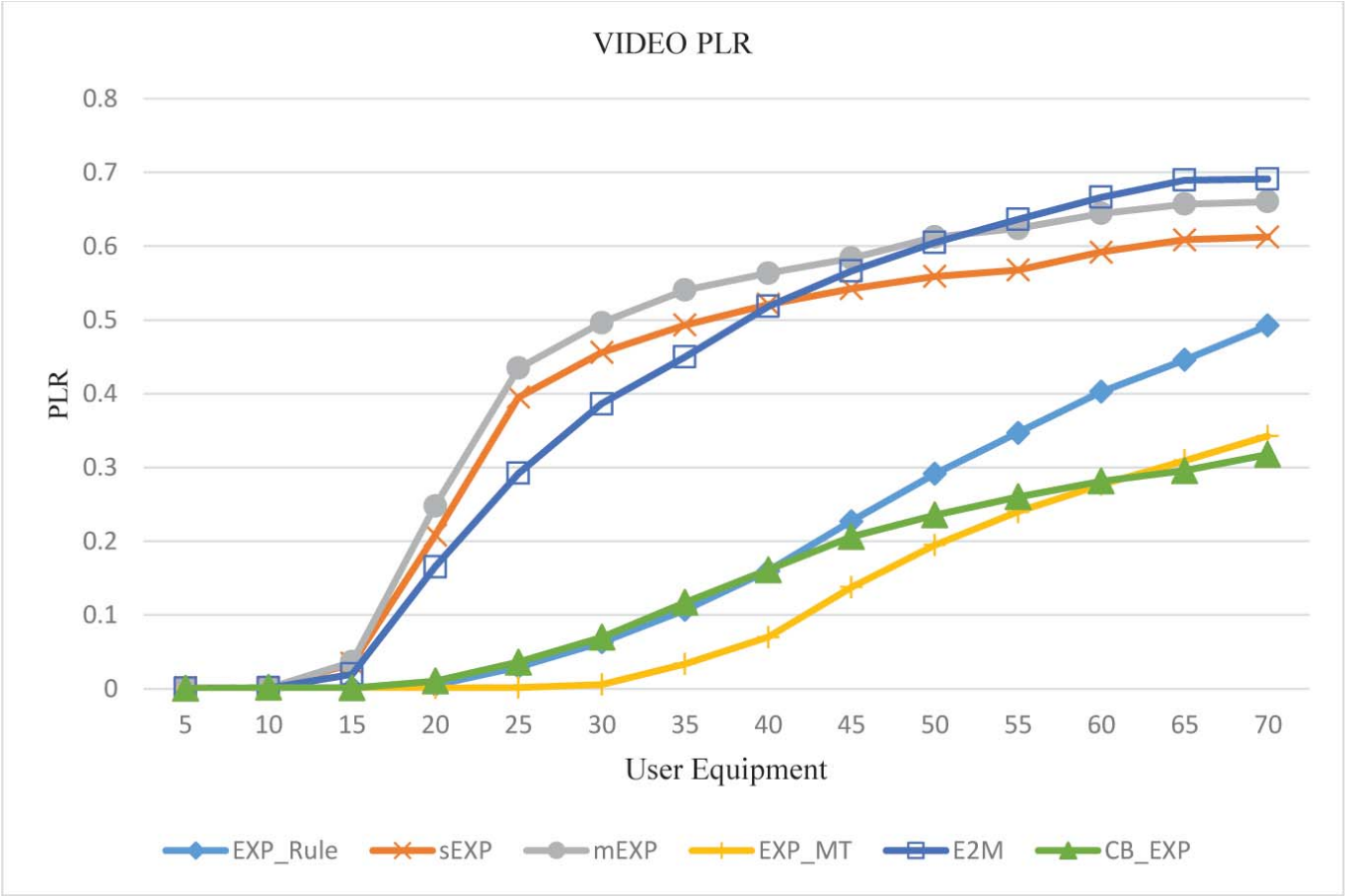


Fig. 4 Video packet loss rate in scenario1

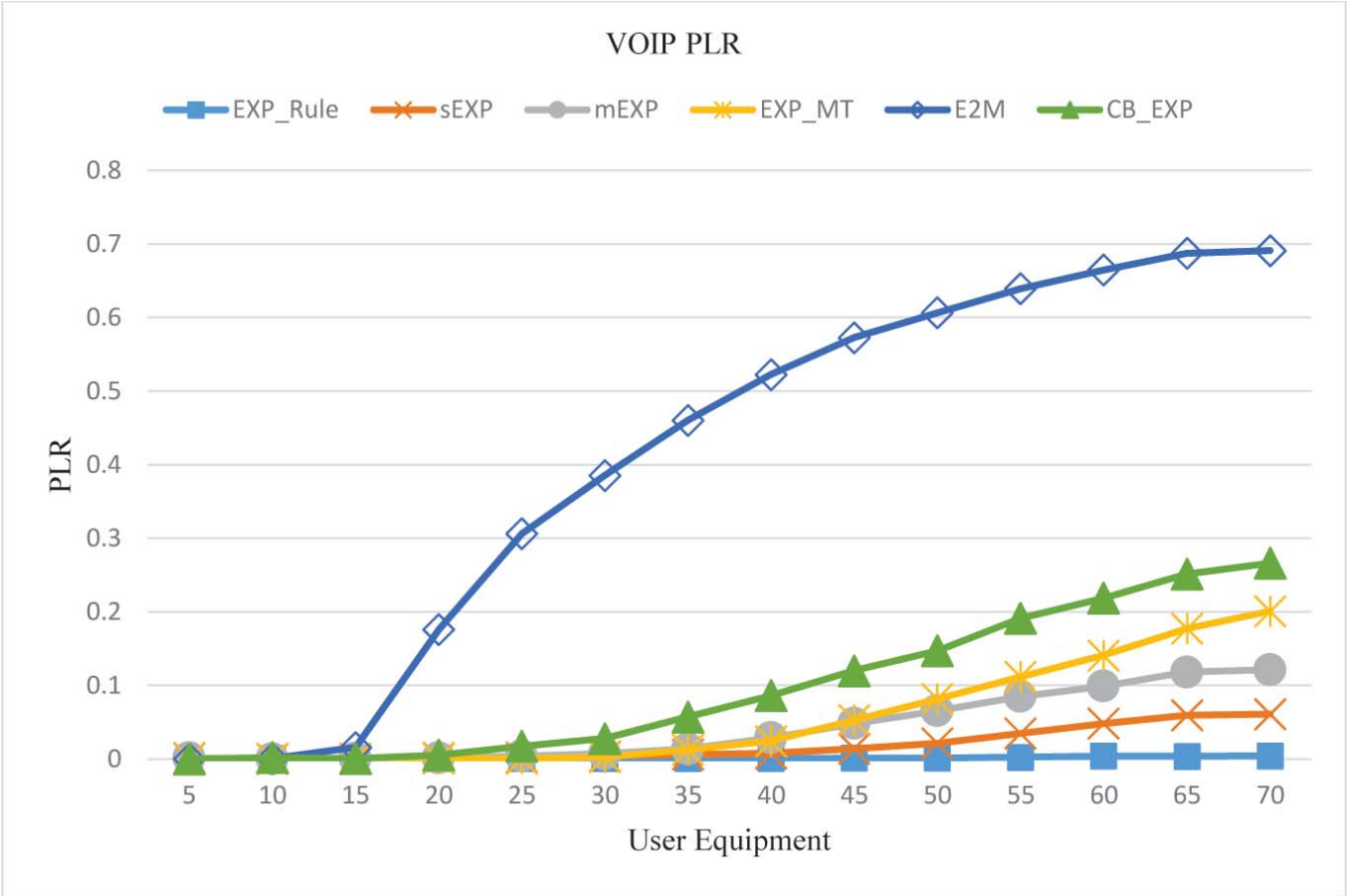


Fig. 5 VoIP packet loss rate in scenario1

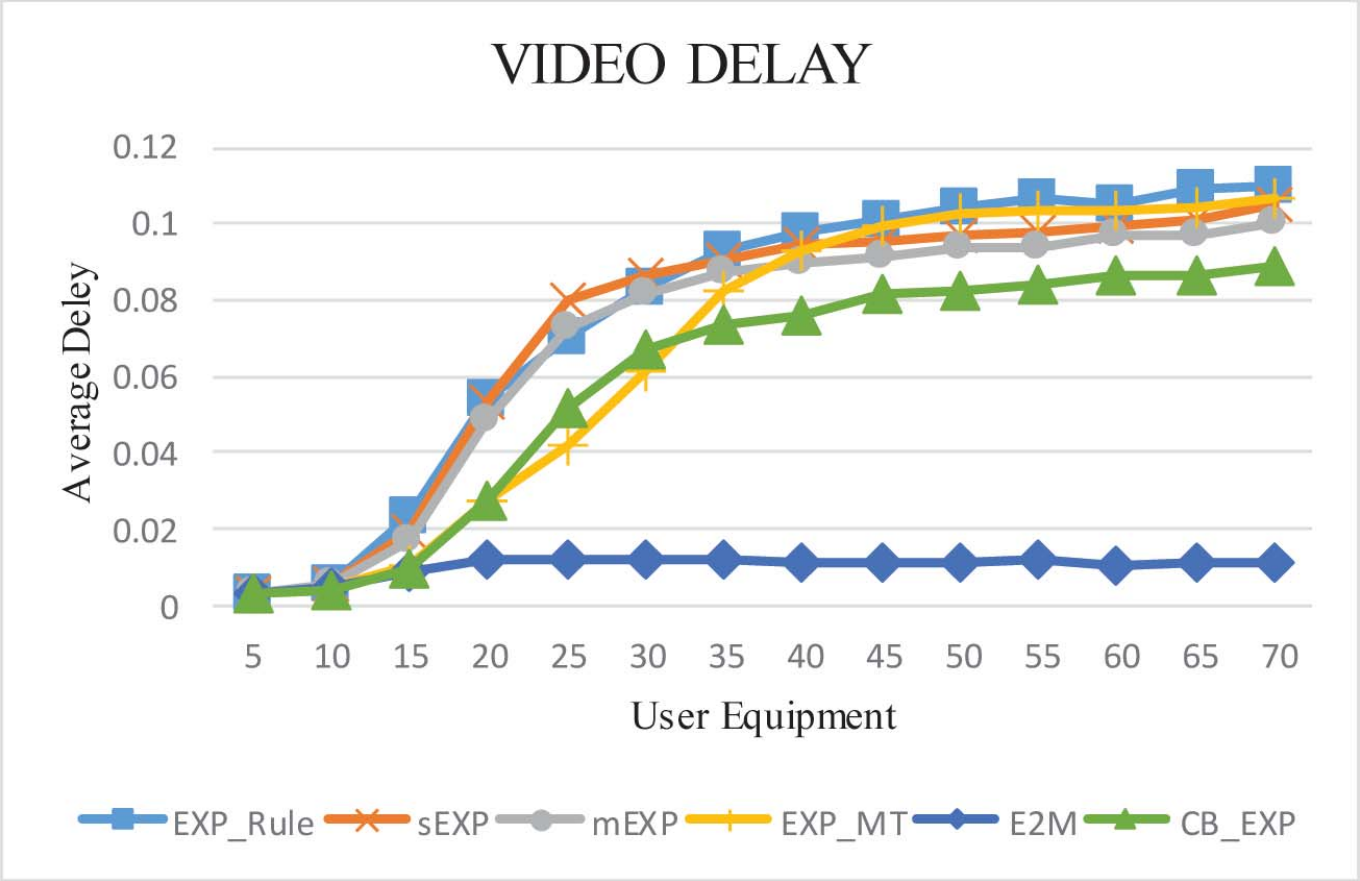


Fig. 6 Video packet delay in scenario1

Fig. 6 shows video packets delay by applying proposed CB_EXP metric compared to EXP, sEXP, mEXP, E2M and EXP_MT as a function of the number of users. As demonstrated, E2M metric has the least delay in scheduling video packets, but the overall performance of all metrics satisfies the threshold delay for real time video traffic [18].The CB_EXP metric has improved the video delay than other metrics except E2M. It should be noted that video and VoIP traffics delays are computed using the following equation [26]:

$$Delay = \frac{Sum\ of\ delays}{n_i} \quad (21)$$

Where, i indicate the type of traffic and n_i is the number of traffic with type i.

Fig. 7 shows the delay comparison of VoIP traffic. As can be seen, the EXP_MT metric enormously increased the delay for VoIP traffic. However, the CB_EXP metric has an acceptable delay for VoIP traffic [11, 28]. For the number of users equal to 70, the proposed CB_EXP metric improves VoIP delay by 57%, 66%, 75% and 114% than mEXP, sEXP, EXP_Rule and EXP-MT respectively.

The following general conclusion can be deduced in the single cell with an interference: the proposed CB_EXP metric competes with the EXP_MT and E2M metrics in two parameters, video packet loss rate and VoIP packet delay. The proposed CB_EXP metric improves packet loss rate for video traffic for the number of users more than 60. In other words, by using the proposed scheduling metric, the user number capacity for each cell in LTE system would be increased. Although EXP_MT decreases video packet loss rate remarkably, but excessively increases VoIP packet delay. E2M scheduler metric also works well in the delay parameter but does not improve video packet loss rate. The proposed CB_EXP metric not only decreases video packet loss rate, but also maintains video and VoIP traffic delays within an acceptable range.

2.2 SCENARIO 2: SINGLE CELL WITHOUT INTERFERENCE

In this scenario, CB_EXP metric performance is compared to PF, MLWDF, EXP_Rule, EXP / PF and LOG-RULE metric in terms of packet loss rate and delay for video and VoIP traffics. The simulation conditions are given in **Table 2**.

Table 2: Single cell without interference simulation conditions

Parameters	Values
Bandwidth/Frame length	5MHz/10ms
Frame structure	TDD
Modulation	QAM, 4-QAM, 16 QAM
Simulation Duration	190s
Stream Length	180s
Traffic Model	Real time traffic: Video & VoIP
Mobility	Fixed eNB but The user has a completely random move With speed of 3 km/hour
Number of users	5:5:70
Video traffic type	128 kbps/ foreman_H264_
VoIP traffic type	G.729 codec with a fixed packet length of 20 bytes over a period, plus 12 bytes of RTP header, totally 32 bytes

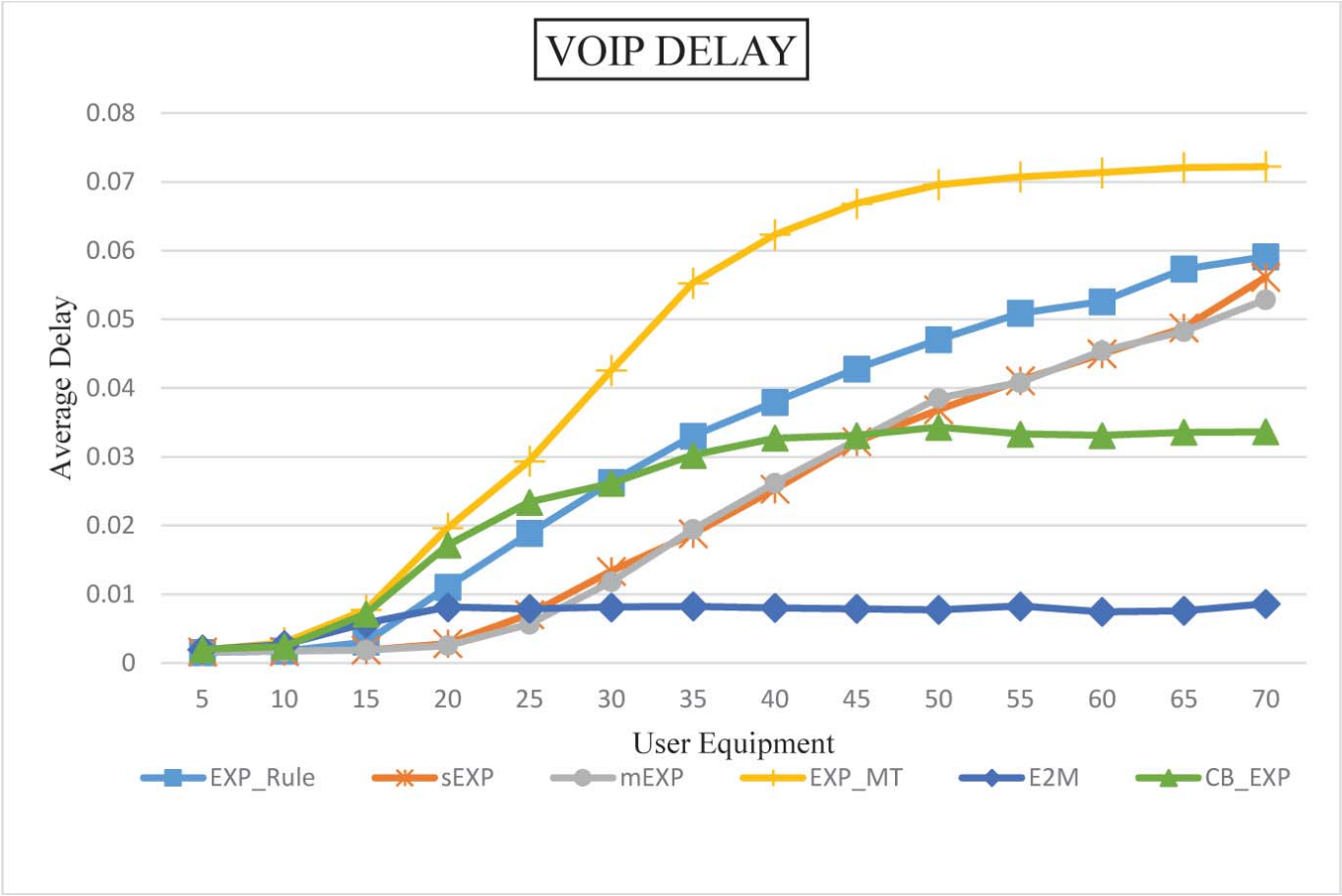


Fig. 7 Comparison of VoIP traffic transferred packets delay

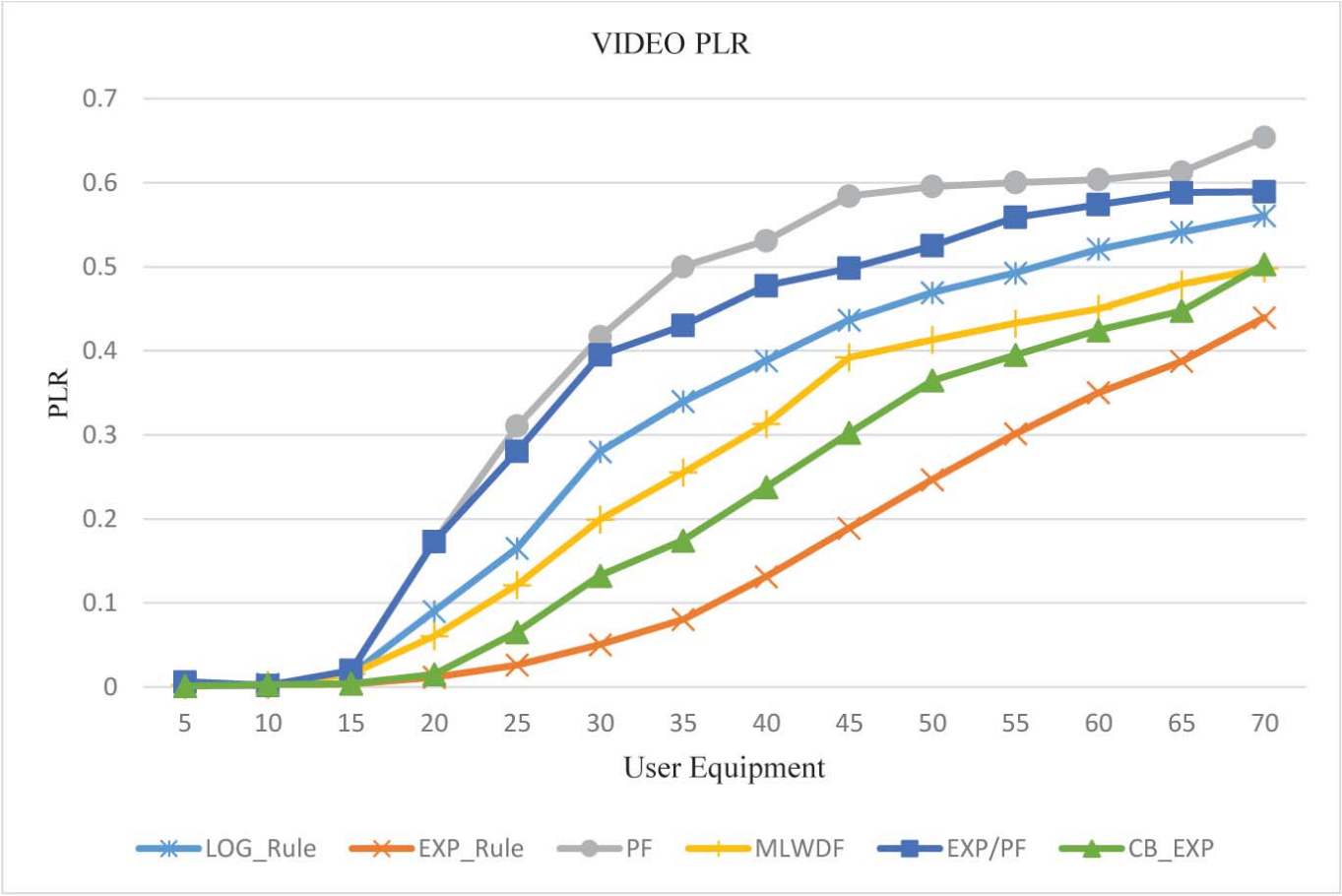


Fig. 8 Comparison of video packet loss rate

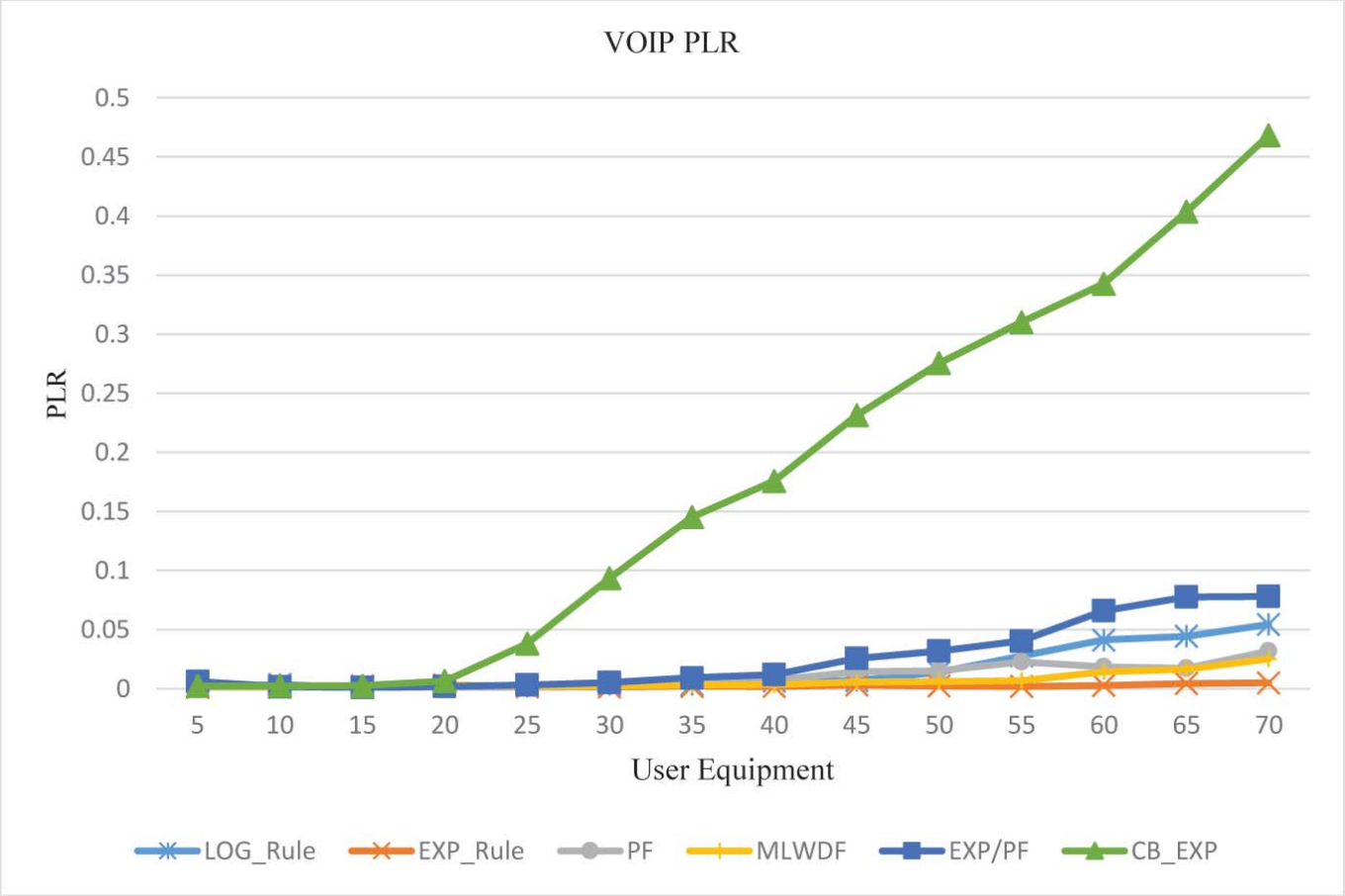


Fig. 9 Comparison of VoIP packet loss rates

In this section, the comparison is assumed to be the case that the serving cell receives no interference from adjacent cells. As mentioned, the three MLWDF, LOG-RULE and EXP-RULE are channel and QoS aware, but the PF metric can only monitor the status of the channel and is unaware of the QoS. Simulations were performed ten times for different methods and then averaged.

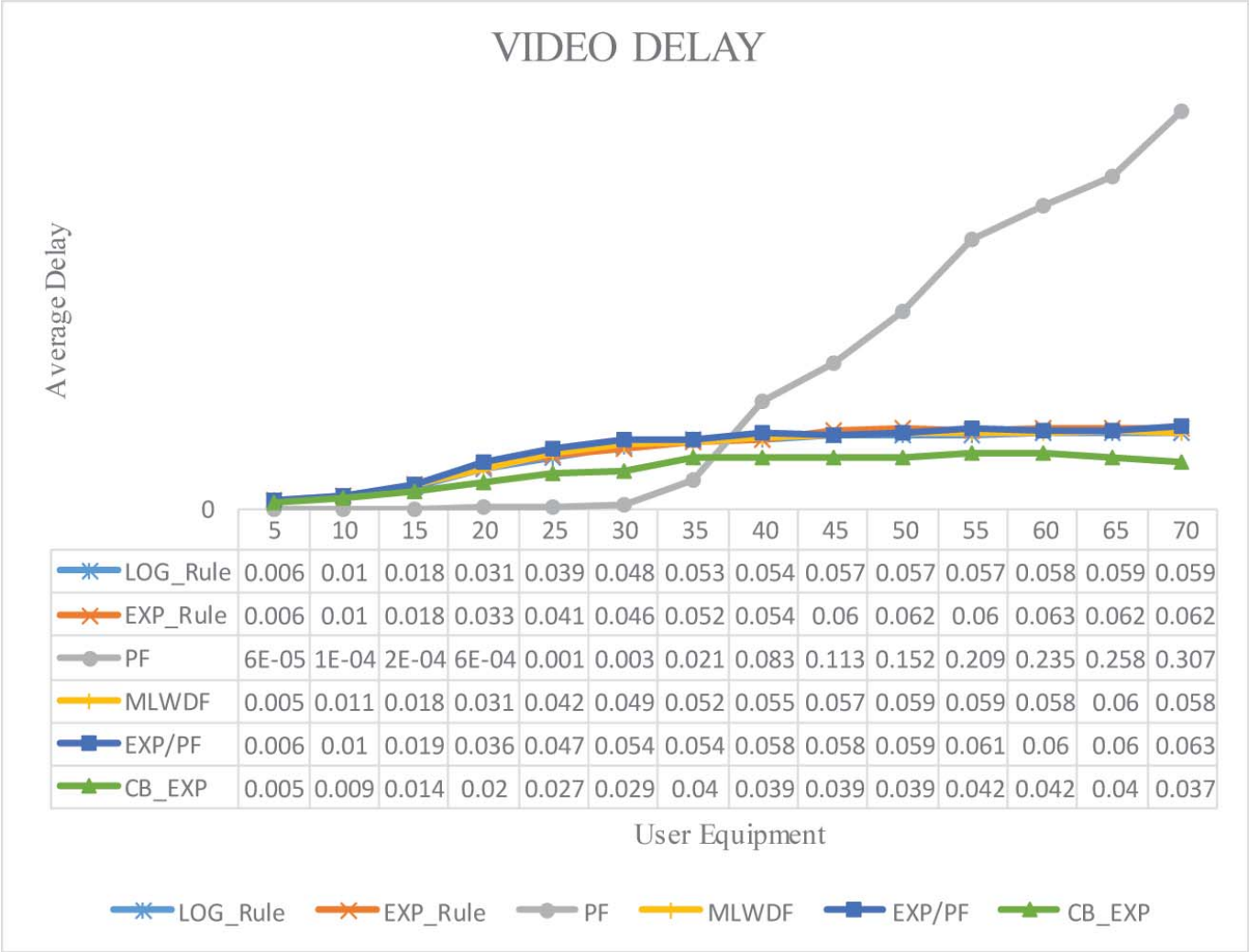
Fig. 8 shows a comparison of the video packet loss rate for proposed CB_EXP and existing metrics. It is shown that CB_EXP metric has better performance than all algorithms except EXP-RULE. For the number of users equal to 70, the proposed metric improves video packet loss rate compared to LOG-RULE, EXP / PF and PF by 11.3%, 17% and 30%, respectively. But its performance is 14% degraded compared to EXP- RULE. As discussed in the last section, in a scenario of serving cell with interference, proposed metric performs the best. In the single cell scenario with interference, it was concluded that proposed metric has better performance rather tEXP-RULE, especially for number of users more than 45.

The reason for the poor performance of the proposed metric in the second scenario, single cell without interference, is as follows. Based on real time channel conditions in this scenario and since SINR ratio for each user is suitable, the proposed metric decision for resource allocation based on channel status cannot make a significant distinction between users. Also, MT expression value is almost the same for all users. However in EXP Rule, given the average resource history allocated to each user, the user who has a higher resource receiving history, should receive less resources at the next TTI.

Fig. 9 shows the comparison results of VoIP packet loss rate obtained for each metric in scenario2. As depicted, the proposed CB_EXP metric does not improve VoIP packet loss rate. The main reason is due to the goal of improving VoIP delay and video packet loss for CB_EXP. Naturally, by reducing the VoIP packet delay, the VoIP packet loss rate increases. On the other hand, other existing metrics in this scenario are generally designed to support VoIP traffic meaning that their performance is improved specially for VoIP.

Fig. 10 shows the comparison results of video packet delay for proposed CB_EXP metric and other existing metrics in scenario2. As demonstrated, the proposed metric outperforms the other metrics remarkably. In other words, the proposed metric is the more appropriate for the case where video packets need low delay like online game applications. The maximum delay for online game application is less than 50 ms in order to have real time interactivity [29, 30].

Fig. 11 shows the comparison results for VoIP average delay. As depicted, proposed CB_EXP metric outperforms other metrics significantly. For 70 users, the proposed metric has improved the VoIP packet delay by 11%, 15%, 103% and 32% compared to MLWDF, LOG_Rule, EXP / PF and EXP_Rule, respectively.



	5	10	15	20	25	30	35	40	45	50	55	60	65	70
LOG_Rule	0.006	0.01	0.018	0.031	0.039	0.048	0.053	0.054	0.057	0.057	0.057	0.058	0.059	0.059
EXP_Rule	0.006	0.01	0.018	0.033	0.041	0.046	0.052	0.054	0.06	0.062	0.06	0.063	0.062	0.062
PF	6E-05	1E-04	2E-04	6E-04	0.001	0.003	0.021	0.083	0.113	0.152	0.209	0.235	0.258	0.307
MLWDF	0.005	0.011	0.018	0.031	0.042	0.049	0.052	0.055	0.057	0.059	0.059	0.058	0.06	0.058
EXP/PF	0.006	0.01	0.019	0.036	0.047	0.054	0.054	0.058	0.058	0.059	0.061	0.06	0.06	0.063
CB_EXP	0.005	0.009	0.014	0.02	0.027	0.029	0.04	0.039	0.039	0.039	0.042	0.042	0.04	0.037

Fig. 10 Comparison of video packets average delay

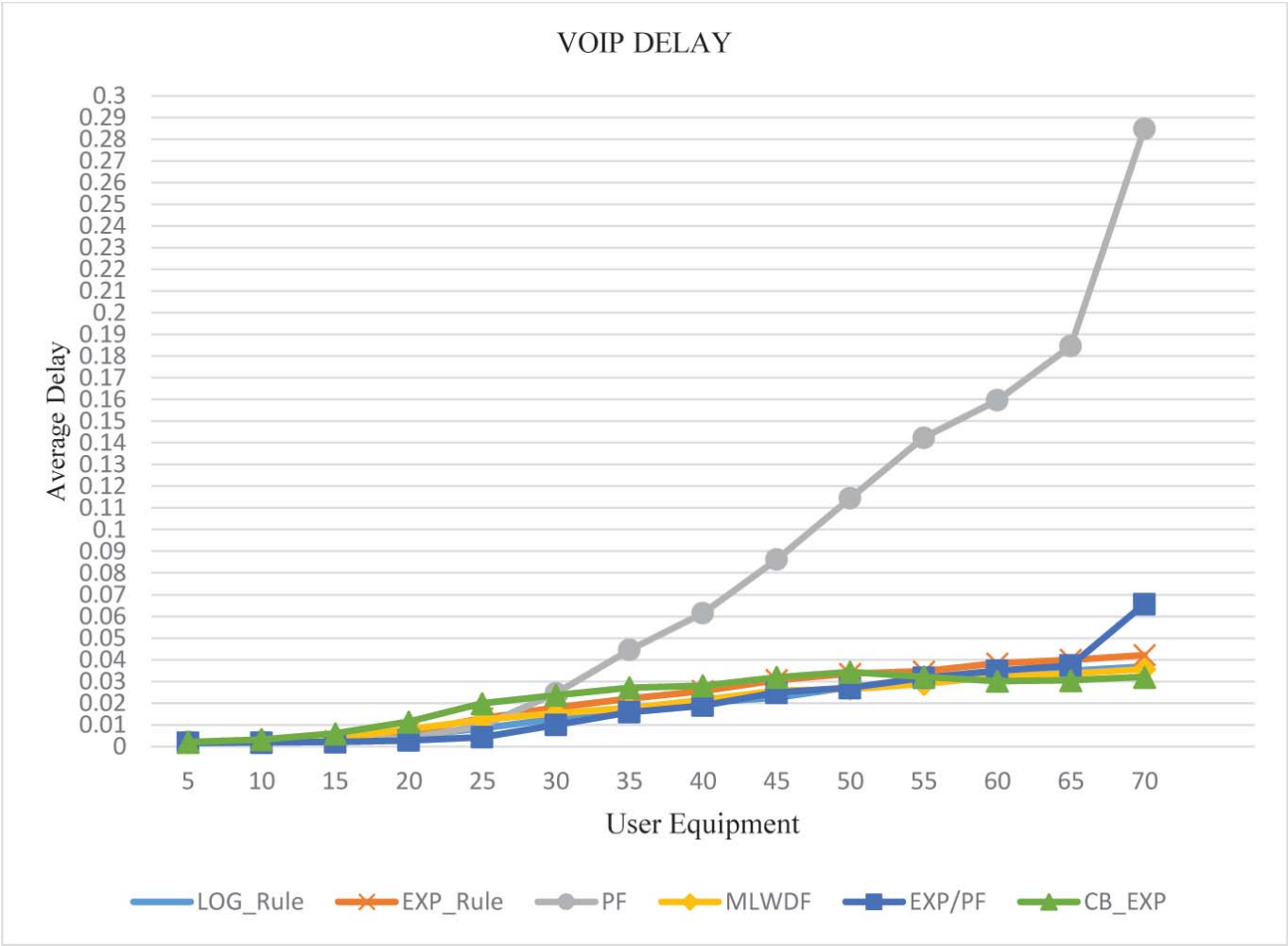


Fig. 11 Comparison of VOIP packets delay

CONCLUSION AND SUGGESTION

Due to the increasing number of cellular telecommunication networks users as well as limited availability of physical resources such as bandwidth, the need for efficient and high performance networks forces network designers to define effective standards for LTE. In this IP based network, many constraints exist for resource management and allocation policies. One of these most important policies is scheduling the service to various user packets. The new and specific form of LTE radio access network requires its own scheduling algorithms. Unlike networks with time-invariant channel, such as optical fiber-based networks, the time-varying feature of LTE channel, should be considered in scheduling. On the other hand, it is also necessary to consider the QoS requirements. Therefore, a suitable metric for LTE scheduling, should consider both simultaneously. Most of the existing metrics, are proposed based on focusing on one parameter for a particular traffic. Given that parameters such as delay and packet loss rate are usually in opposite performance direction, blind focus on improving one parameter may cause another parameter to degrade. On the other hand, according to the cell state in terms of interference, there was no specific classification for using a particular algorithm and scenario.

Based on these shortcomings, to improve the quality parameters, especially for real time video and VoIP, a scheduling metric is proposed in this paper, considering traffic type and channel conditions. This metric, gives higher priority to delayed video packets before expiring. Also, this metric performs reasonably well in the interference scenario by keeping the delay of the VoIP packets in an acceptable range.

Suggestions for future research are as follows: Presenting and classifying different suitable metrics for specific applications, improving scheduling metrics considering client buffer, switching between different metrics in different condition, comparing scheduling metrics performance results for different user speeds.

REFERENCES

1. Capozzi, F., et al., *Downlink packet scheduling in LTE cellular networks: Key design issues and a survey*. IEEE communications surveys & tutorials, 2012. 15(2): p. 678-700.
2. Bhat, J.R. and S.A. Kamath, *User Satisfaction-Based Resource Allocation in LTE-A, in Advances in Communication, Signal Processing, VLSI, and Embedded Systems.* 2020, Springer. p. 247-261.
3. Damnjanovic, A., et al., *A survey on 3GPP heterogeneous networks.* IEEE Wireless communications, 2011. 18(3): p. 10-21.
4. Chen, S., et al., *Technical innovations promoting standard evolution: From TD-SCDMA to TD-LTE and beyond.* IEEE Wireless Communications, 2012. 19(1): p. 60-66.
5. Uyan, O.G. and V.C. Gungor, *QoS-aware LTE-A downlink scheduling algorithm: A case study on edge users.* International Journal of Communication Systems, 2019. 32(15): p. e4066.
6. Liu, D. and Y.-H. Lee, *An efficient scheduling discipline for packet switching networks using earliest deadline first round robin.* Telecommunication Systems, 2005. 28(3-4): p. 453-474.
7. Stolyar, A.L. and K. Ramanan, *Largest weighted delay first scheduling: Large deviations and optimality.* Annals of Applied Probability, 2001: p. 1-48.
8. Andrews, M., *Instability of the proportional fair scheduling algorithm for HDR.* IEEE Transactions on Wireless Communications, 2004. 3(5): p. 1422-1426.
9. Kim, H. and Y. Han, *A proportional fair scheduling for multicarrier transmission systems.* IEEE Communications letters, 2005. 9(3): p. 210-212.
10. Schwarz, S., C. Mehlführer, and M. Rupp. *Low complexity approximate maximum throughput scheduling for LTE. in 2010 Conference Record of the Forty Fourth Asilomar Conference on Signals, Systems and Computers.* 2010. IEEE.
11. Kountouris, M., et al. *QoS-based user scheduling for multiuser MIMO systems. in 2005 IEEE 61st Vehicular Technology Conference.* 2005. IEEE.
12. Monikandan, B.S., et al., *Channel aware optimized proportional fair scheduler for LTE downlink.* Peer-to-Peer Networking and Applications, 2020: p. 1-10.
13. Ramli, H.A.M., et al. *Performance of well known packet scheduling algorithms in the downlink 3GPP LTE system. in 2009 IEEE 9th Malaysia international conference on communications (MICC).* 2009. IEEE.
14. Basukala, R., H.M. Ramli, and K. Sandrasegaran. *Performance analysis of EXP/PF and M-LWDF in downlink 3GPP LTE system. in 2009 First Asian Himalayas International Conference on Internet.* 2009. IEEE.
15. Ramesh, T. *A Survey on scheduling algorithm for downlink in LTE cellular network. in 2019 International Conference on Smart Systems and Inventive Technology (ICSSIT).* 2019. IEEE.
16. Elhadad, M.I., M. Abd-Elnaby, and E.-S.M. El-Rabaie, *Optimized delay threshold scheduler for multimedia traffic over LTE downlink network.* Multimedia Tools and Applications, 2019. 78(11): p. 15507-15525.
17. Elsayed, K.M. and A.K. Khattab, *Channel-aware earliest deadline due fair scheduling for wireless multimedia networks.* Wireless Personal Communications, 2006. 38(2): p. 233-252.
18. Piro, G., et al., *Two-level downlink scheduling for real-time multimedia services in LTE networks.* IEEE Transactions on Multimedia, 2011. 13(5): p. 1052-1065.
19. Priya, L. and K.R. Soundar, *LTE: An enhanced hybrid domain downlink scheduling.* Cognitive Systems Research, 2018. 52: p. 550-555.
20. Na, S. and S. Yoo. *Allowable propagation delay for VoIP calls of acceptable quality. in International Workshop on Advanced Internet Services and Applications.* 2002. Springer.
21. Andrews, M., et al., *Providing quality of service over a shared wireless link.* IEEE Communications magazine, 2001. 39(2): p. 150-154.
22. Shakkottai, S. and A.L. Stolyar, *Scheduling for multiple flows sharing a time-varying channel: The exponential rule.* Translations of the American Mathematical Society-Series 2, 2002. 207: p. 185-202.
23. Ghalut, T., H. Larijani, and A. Shahrabi, *QoE-aware optimization of video stream downlink scheduling over LTE networks using RNNs and genetic algorithm.* Procedia Computer Science, 2016. 94: p. 232-239.
24. Asadollahi, F. and R. Dehdasht-Heydari, *Introduction of a novel hybrid weighted exponential logarithm-maximum throughput (HWEL-MT) scheduler for QoS improvement of LTE/4G cellular networks.* Wireless Personal Communications, 2018. 98(1): p. 91-104.
25. Technologies, A. and M. Rumney, *LTE and the Evolution to 4G Wireless: Design and Measurement Challenges.* 2013, Wiley Publishing.
26. Dahlman, E., S. Parkvall, and J. Skold, *4G: LTE/LTE-advanced for mobile broadband.* 2013: Academic press.
27. Li, S., L. Da Xu, and S. Zhao, *5G Internet of Things: A survey.* Journal of Industrial Information Integration, 2018. 10: p. 1-9.
28. Piro, G., et al., *Simulating LTE cellular systems: An open-source framework.* IEEE transactions on vehicular technology, 2010. 60(2): p. 498-513.
29. Huang, X., et al. *Resource Scheduling for LTE in Unlicensed Bands with Delay Priority. in 2019 IEEE 30th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC).* 2019. IEEE.
30. Nasralla, M.M., *A Hybrid Downlink Scheduling Approach for Multi-Traffic Classes in LTE Wireless Systems.* IEEE Access, 2020.

AUTHORS

Javad Mardanpour Bogar was born in Iran in August 1990. He received his B.Sc. from the University of Birjand in 2014 and his M.Sc. from IRIB University in 2017. He is currently working as an audio and video engineer at IRIB. His research interests include topics such as mobile telecommunications, fifth and sixth-generation mobile, sending video on various telecommunication networks, and designing audio and video equipment for Broadcasters.

Mohammad Reza Noorifard was born in 1965 in Iran. Since 1994, he has been a member of the faculty at IRIB University. His research interests include software-defined networking, information-centric networking, and the assessment of QoS/ QoE in multimedia networks.

Mohammad Behdadfar
Faculty of Engineering, IRIB University, Tehran, Iran
behdadfar@iribu.ac.ir

Mohammad Behdadfar was born in Iran in September 1977. He received his B.Sc., M.Sc., and Ph.D. degrees in Electrical Engineering from Isfahan University of Technology (IUT) in 1999, 2002, and 2010, respectively. He is currently an Assistant Professor in the Faculty of Engineering at IRIB University. His current research interests include high-speed networking, switch/router design, SDN/NFV, audio and video networking, networking algorithms, QoS, and QoE. ■

CALL FOR NOMINATIONS

2022

ABU Broadcast Engineering Excellence Award

ABU Engineering Industry Excellence Award

ABU Developing Broadcasters' Excellence Award

ABU Broadcast Engineering Award on SDGs Implementation

https://www.abu.org.my/engineering-awards

ABU
ENGINEERING AWARDS
2022

LINEAR TELEVISION BROADCASTING OVER 5G NETWORKS, PART 2: REGULATORY AND BUSINESS CONSIDERATIONS

ABSTRACT

This article addresses having a supporting regulatory and licensing framework, as well as having a viable business case for 5G based broadcasting.

It is important to note that this article focusses on the terrestrial delivery of *linear television services* over 5G networks. These linear television services are typically delivered by High-Power High-Tower (HPHT) networks, commonly referred to as terrestrial broadcasting networks, and are often Free-To-Air (FTA). The delivery of Video-On-Demand (VOD) services are not addressed in this article.

In an associated article of both authors, titled *Linear Television Broadcasting over 5G Networks, Part 1: Spectrum Considerations*, the spectrum demands for carrying linear TV services over 5G are addressed separately.

INTRODUCTION

Renewed efforts from the telecom and broadcasting industry to deliver linear television services using mobile cellular technology networks have recently gained traction again. Dating back as far as the early 2000s, technologies such as DVB-H, MediaFlow, T-DMB and ATSC-M/H had limited business success. The capability to deliver linear television services over FeMBMS enabled LTE/5G networks, as defined in 3GPP releases 14/16 and labelled 5G Broadcast (5G BC), may be more promising. The definition of FeMBMS now includes additional 5G numerologies and significantly larger OFDM Guard Intervals to allow networks to operate in Single Frequency Network (SFN) modes.

Current activities within the Release 17 specifications include some new system features which can operate in parallel with 5G BC features. One prominent new feature is the Multicast and Broadcast Service (MBS). MBS provides switching the available carrier capacity automatically from unicast to broadcast or multicast mode. MBS minimizes the required capacity for serving users who are simultaneously streaming the same video or rich media content, including linear television services.

Preparations for the World Radio Conference of 2023 (WRC-23) are now well underway as the industry currently debates the possibility of migrating large parts of terrestrial television services to 5G networks. WRC-23 Agenda Item 1.5 addresses possible changes to the use of the 470 - 694 MHz band in ITU Region 1 to allow 5G service operation. The USA, in ITU Region 2, has cleared 84 MHz of digital television (DTV) spectrum in the UHF 600 MHz band for mobile use. It is noted that for ITU Region 3, the 600 MHz band is not being considered in the forthcoming WRC-23.

Given this background of new 5G technology developments and the global spectrum management agenda of WRC-23, this article addresses having a supporting regulatory and licensing framework, as well as having a viable business case for 5G based broadcasting.

REGULATIONS FOR TV OVER 5G NETWORKS

Traditionally regulations of telecommunication markets address technical and market-related issues. Content carried over telecommunications networks has been considered a private matter: operators are supposed (also by their customers) to only carry traffic. In regulatory terms, this is known as *"mere conduit"* principle. Consequently, MNOs are unfamiliar with content requirements in their licensing and regulatory framework.

With the convergence trend of telecommunication networks, also carrying broadcasting services, additional FTA regulations will have to be included in the licensing and regulations of MNOs. This would especially apply under a scenario where the traditional broadcasting networks would be (partly) replaced by 5G networks.

It is important to note that we stress that regulations for FTA services are additional from the perspective of the MNO. MNOs will primarily deploy 5G networks for facilitating the unicast traffic growth as well as new Internet-of-Things applications. These additional regulations would have to address protecting the *distribution* of FTA services.

FTA services are often defined in a Broadcasting or Media Act (and Code of Conducts), stipulating the number of national/regional services, editorial content requirements per service, and advertising limits. Depending on the applied licensing framework, such content requirements are enforced through the terms and conditions of the

broadcasting or *service* licence for the broadcaster or service provider.

However, FTA services are also regulated in terms of their *distribution*, including must-carry rules, their population coverage, service availability, picture quality and transmission/encoding/ encryption standards. These FTA network requirements are not common for MNOs.

MUST-CARRY OF FTA

In its day-to-day operations the MNO is constantly balancing its traffic over its networks and available spectrum. MNOs also having 5G BC will also balance their traffic between unicast and broadcasting mode. Regardless of whether this rebalancing between unicast and broadcast traffic is automated (MBS), for broadcasting mode the MNO will allocate a part of the available capacity to the broadcasting service. Consequently, the MNO will have less capacity available for unicast traffic.

Unregulated, such traffic balancing will be driven by the profitability of both services. However, for FTA services, which must be carried on a 24/7 basis, such capacity allocation to broadcasting mode would be permanent.

In addition, MNOs offer access to their services through their customer management system and SIM card. Although FTA services can be made available without payment through any customer management system, it should be checked if such system solutions legally comply with the definition of FTA in the relevant Act.

As mentioned in the Introduction, in the past MNOs have experimented with the delivery of linear television services over their mobile networks (for example LTE/eMBMS). These broadcasting services were primarily intended for delivery at handheld devices with relatively small screens. As demonstrated in the authors' associated Part 1 article [*see ABU Technical Review, Issue 289, pp. 7-10, https://www.abu.org.my/TR289MAR2022*] , the delivery of UHD services to large screens over 5G unicast is not feasible. Hence, any FTA must-carry rule including (U)HD services, will need to be delivered over 5G BC, again limiting the MNO's traffic management options.

Hence, National Regulatory Authorities (NRAs) considering 5G based FTA broadcasting, will have to take these must-carry and FTA requirements into account and arrange for it. Clearly such regulatory interventions are intrusive on the current MNO's business operations, especially when licences are already running.

FTA SERVICE AVAILABILITY

FTA services delivered over 5G networks need extra safeguards for having these services available in time of national emergencies or disasters. As the 2011 tsunami in Japan demonstrated, during these times of national distress, the mobile network services were not available, mainly due to traffic overloading.

Consequently, the NRA should regulate how the FTA services, needed to disseminate critical news and information, are facilitated in 5G networks. A 5G network balancing traffic between unicast and broadcasting mode will not suffice as the whole system would still be exposed to traffic overloading. Hence, the FTA services should be permanently allocated to broadcasting mode and traffic balancing between unicast and broadcasting mode should be excluded.

Whether such a permanent allocation of FTA services to broadcasting mode is sufficient to warrant enough services availability during national disasters, needs to be technically investigated.

FTA PICTURE QUALITY

For the different picture resolutions, a minimum bitrate is required. FTA services carried over 5G networks will need to meet these minimum bitrates. It is important to note that when FTA services are carried over 5G networks (or any other broadband network) in unicast mode, two market roles or parties are involved: the broadcaster/service provider and the network operator. The broadcaster may deliver its services in UHD quality to the network operator. However, the network operator may not guarantee sufficient network capacity for delivering this UHD quality at the viewer's premises or device.

Managing the Quality-of-Service (QoS) for video services is more challenging, considering that several parties are involved, such as international Tier-1 network operators, Content Delivery Network (CDN) providers and local Internet Service Providers (ISPs). ISPs tend to guarantee the availability of a defined transport capacity, shared between the different services carried over the 'data pipe', but they do not guarantee this QoS per service.

Recent developments show however that video service providers agree with ISPs that their services have priority over other traffic, so as to ensure a minimum broadband speed is made available to their subscribers.

In many countries, prioritising internet traffic, including over mobile networks, is regulated under *net neutrality* rules. Under these regulations network operators should manage all data-streams according to the same rules. Deliberate blocking or throttling of (audiovisual) streams of third parties is not acceptable.

Hence, MNOs carrying FTA services over 5G unicast, will have to comply with net neutrality regulations, as this FTA traffic would be defined as internet traffic. MNOs managing traffic in such a way that HD or UHD quality would be guaranteed, for example by throttling other traffic, may well conflict with the net neutrality rules in their jurisdiction.

MNOs carrying FTA services over 5G BC seem to be exempt from these net neutrality regulations. However, (automatic) traffic balancing between unicast and broadcasting mode (MBS), may need to be restricted as this traffic balancing would constantly change the traffic type between broadcasting and internet traffic. Alternatively, the net neutrality regulations should be adjusted to facilitate 5G MBS.

FTA TRANSMISSION AND ENCRYPTION

Viewers can access FTA services without a service charge as these services are commonly financed by advertising income. Under such a business model viewers are also able to purchase receivers independently from the service or network provider. To protect consumers from purchasing non-compatible receivers, both the transmission and receiver side are regulated.

The broadcasting network operator needs to deploy a network in compliance with a stipulated transmission standard, like DVB-T2 or ATSC 3.0, and encoding method, like AVC (H.264) or HEVC (H.265). By means of equipment type approval, possibly in combination with import regulations, the NRA facilitates that standard-compliant receivers are sold in the various retail channels.

For FTA services delivered over 5G unicast the transmission standards are IP-based standards. A wide range of IP-based streaming solutions are applied in the market, like HLS ABR (Apple) and MPEG-DASH, which can be combined with various encoding methods such AVC, HEVC and proprietary encoding methods. These different streaming solutions tend to lock-in the viewer to specific receiver devices (such as Apple TV) and/or service providers (such as downloadable software applications from Netflix or Spotify).

IP-based viewing of audio-visual content is mostly paid-for or subscription-based by which the service provider ensures that the correct app and drivers are installed on the viewing device. In this way, the viewer is protected from having a non-compatible device.

Delivering FTA services over IP-based systems may still need additional regulations for protecting the viewer from device/service provider lock-in. For example, smart-TV manufacturers tend to limit the apps that can run on their sets. Stipulating standardisation and having an open platform for TV-apps will reduce the risk of customer lock-in.

From a regulatory stance, FTA services delivered over 5G BC is no different from having these services delivered over a DTTB platform. Consequently, the 5G BC standard and video coding should be stipulated for TV manufacturers to incorporate in the TV set. In addition, the NRA needs to decide if it would stipulate the 5G BC as an additional standard to any incumbent transmission standards (such as DVB-T2 or ATSC 3.0) in the market. Obviously, 5G BC, as an additional standard, would increase the cost of any television receiver.

Finally, the NRA should consider the situation of delivering Pay-TV services next to FTA services over 5G BC. Like for DTTB enabled smart-TV sets the regulator often stipulates that the Conditional Access (CA) system cannot be embedded in the smart-TV set as to prevent the situation where the smart-TV set is dependent on the applied CA system and hence the service provider. Similarly, the NRA should avoid the situation for 5G based broadcasting, that the smart-TV set will be MNO dependent.

BUSINESS CASE FOR TV OVER 5G NETWORKS

The advantage of a global standard (5G) for both unicast and broadcasting services, would be of having cheaper networks and receivers due to larger economies of scale. However, as MNOs and device manufacturers are free to select what part of the 3GPP standards they will implement, it is not a given that 5G BC (and MBS) will be implemented. Hence the marginal costs of having 5G BC (and MBS) in mobile networks and devices should be considered, against the added value of having an FTA service bundle. It should also be considered if a 5G based implementation would result in cheaper TV sets and STBs as compared to DTTB sets and STBs.

5G BC FOR CONNECTED DEVICES

For delivering 5G BC to mobile devices, several studies have been conducted for the optimal network topology. These studies have shown that broadcasting networks (with their main sites being HPHT sites) are important to reduce the overall number of sites that are needed. The mobile network sites (LPLT sites) are important to cover urban areas. In other words, any 5G BC deployment would result in a mixed deployment of broadcasting and MNO sites.

For the broadcasting sites a 5G BC introduction would result in a replacement of some broadcasting equipment, mainly the exciter part of the transmitter. Such replacement costs are considered minimal. Hence, the number of MNO sites needed in the urban areas is critical in establishing the marginal costs. Every cell (gNB) will need to include equipment that can transmit the appropriate 5G BC signals. This will require CAPEX to implement at both the gNB and core network levels. However, many of the required functions will be software based and should not require significant additional costs over non-BC capable systems.

We assess that the key CAPEX driver will be number of additional transmitters to generate the 5G BC signals. As this 5G BC transmitter equipment is also OFDM based equipment, it can be assumed that 5G equipment will be comparable to low power DTTB transmitter equipment. CAPEX for low power OFDM DTTB transmitters range between USD 10k to 30k. Assuming the USD 30k figure and having a redundant transmitter, this would result in additional CAPEX for 1,000 cells (for covering a large city of 5m people) of approximately USD 60 million. Assuming a 10-year linear depreciation method and cost of capital (WACC) of 15% this would result a required annual revenue above USD 12m for a single MNO.

These required additional revenues should be generated by offering linear television services, including FTA and any pay-tv services, next to VOD unicast services. Market surveys show that most content consumed with internet connected devices is short-form video content. Longer form content, such as linear FTA content, is relatively small. **Table 1** shows the share of video views by length when consumed on internet connected devices.

Hence, without a fundamental change of viewing behaviour, the additional revenues to be expected from offering linear FTA services is expected to be small. If the various television broadcasters would select different MNOs

Table 1: Share of video views by length (Q4 2020). *Source: Brightcove*

Content type	0-5 min	6-20 min	21-40 min	41+ min
Corporate Communications	71%	22%	4%	3%
Entertainment	71%	7%	8%	15%
Marketing and Sales	82%	8%	4%	6%
News	90%	3%	2%	4%
Retail	97%	2%	1%	1%
Sports	89%	4%	1%	6%

to carry their services and with 3 MNOs in a market, at least USD 36 additional revenues from linear FTA services would need to be generated. Given the current viewing behaviour this seems doubtful for a city of 5m people.

At this point, we have not even considered the additional costs of having 5G BC (and MBS) enabled handsets. Experiences in the past with DVB-H, MediaFlow and (F) eMBMS have shown this to be extremely challenging, even with a marginal cost of only a few dollars per device. In other words, given that current video viewing on mobile devices is all unicast delivered and that any future growth can still be facilitated with additional spectrum, there seems to be little business incentive for MNOs to introduce 5G based broadcasting at a large scale.

5G BC FOR TV SETS AND STBS

The markets for smart TV sets and STBs are very mature and global markets, with highly efficient production lines, delivering cost effective implementations of DTTB standards. 5G BC is not fundamentally different from 2nd generation DTTB standards and therefore their implementation in smart TV sets and STBs will be at best similar in cost terms. A 5G BC implementation in smart TV sets and STBs is likely to require system changes as the 5G unicast traffic is absent or managed differently as compared to a mobile device.

As with any migration to a new transmission standard, such was the case from analogue TV to DTTB and from 1st to 2nd generation DTTB, a 5G BC introduction would require a transition period in which both the DTTB and 5G BC standards are supported in smart TV sets. This seems unlikely as there is no technical gain for having the new 5G transmission standard, in contrast with the migration from analogue TV to DTTB and from 1st to 2nd generation DTTB.

CONCLUSIONS

Having 5G based broadcasting as an alternative to DTTB for delivery of FTA services, would require NRAs to impose additional regulations on MNOs, requiring MNOs to permanently allocate a part of their network capacity to 5G BC. In addition, other regulatory measures would be required to protect viewers from customer lock-in and purchasing non-compatible receivers. The business case for delivering FTA services over 5G BC, as an additional business to delivering VOD services over 5G unicast, seems feeble because the additional FTA revenues for MNOs are deemed to be relatively small as most video consumption on connected devices is viewing of short-form video content (delivered over unicast). This viewing behaviour has not changed since the introduction of LTE based MBMS services and therefore there is little reason to assume 5G based broadcasting would prove a better business case this time.

Hence, 5G based broadcasting should not be viewed as a DTTB replacement. A better model would be to combine DTTB broadcasting with 5G network services, whereby DTTB would focus on FTA service delivery, albeit with a smaller number of services in UHD quality. 5G networks would continue to deliver VOD services, whereby 5G BC/MBS can be deployed as an advanced traffic management tool to further increase the capacity of mobile networks.

AUTHORS

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

Les has over 30 years of experience in communications systems, including broadcast digital radio (DAB/DAB+ and DRM), mobile communications, wireless broadband and satellite communications. Les founded S-Comm Technologies Pty. Ltd. in 2008 to work with the radio industry on DAB+ digital radio. S-Comm provides independent engineering consultancy to WorldDAB, the ITU and broadcasters, regulators, network operators and equipment suppliers in Australia, South East Asia and around the globe.

Peter Walop
Executive Partner, Convergence Consultant Company

Peter Walop has over 25 years of working experience in the broadcasting and telecommunications markets. As a consultant, Peter assisted telecom operators, broadcasters, and regulators with the introduction of telecom and digital broadcasting services in a wide range of countries, including Angola, Belgium, Bhutan, Burundi, Cambodia, Denmark, Ethiopia, France, the Gambia, Germany, India, Jamaica, Japan, Luxembourg, Malaysia, The Netherlands, Norway, Rwanda, Serbia, Spain, Sweden, Switzerland, Thailand, Uganda, and Vietnam. ■

CYBERSECURITY: A RISING CONCERN WITHIN BROADCAST AND MEDIA ORGANISATIONS

Cybersecurity is a widely known and well understood concept within most industries with many companies having huge investments to safeguard their infrastructure and data from prying eyes and unauthorised access. These kinds of systems and approaches used to be normally associated with organisations which manage sensitive information and high security environments like banks and national security agencies. But with more and more organisations getting connected and providing online services this has now become a norm regardless of the industry and size of the organisation. Many broadcasters and media organisations are also providing content online and streaming services to its audiences now, and with the approach towards IP-based infrastructures and connected systems within broadcast facilities the need to safeguard these systems from cyber-attacks have risen.

In the past few years there have been many reported cases of cyberattacks to media centric entities with these organisations incurring huge losses financially as well as credibility. Some of these attacks are directed at hindering running operations, disrupting services, some completely hijacking on-air channels and asking for ransom or propagating unauthorised messages, while others just steal valuable content and data. Although most of reported cases of major attacks have been within Europe and Americas, recent studies suggests that the Asia-Pacific region is now becoming a target. A recent study published by IBM noted that Asia is now the #1 target for cyberattacks representing 26% of attacks analysed in 2021. This data showed a significant regional shift compared to the past decade and signals the growing need for security investments within organizations in the region.

It is paramount that organisations understand that cyber threats are real, it is not a hoax or thinking that it would not affect your network, or your devices is to be very naive. Understanding the accepting that this is a real threat is the first step to move forward. There is a huge need to educate broadcasters and media organisations about cybersecurity and its dangers. Noting this, the ABU Technical Committee has setup a study group that has taken up the task of following developments in this area and to educate and update the members on these developments. In addition to these reports the ABU has supported and issued three recommendations related to Cybersecurity and Media. These are the result of collaboration with the World Broadcasting Union's Technical Committee (WBU-TC) where the studies and work conducted by our sister unions NABA (the North American Broadcasters Association) and the EBU (European Broadcasting Union) has been very beneficial.

These recommendations are part of the ongoing efforts to inform and educate member broadcasters and to help them with the steps that needs to be taken in order to strengthen and safeguard their systems from potential cyberattacks. All these recommendations are widely available to all our members from the WBU and the ABU websites.

In addition to these recommendations ABU Technology have addressed the topic of cybersecurity within its workshops, conferences and symposia in recent years. These have seen growing interest from members and the recently organised Virtual Forum on Cybersecurity and Media was one of the most attended webinar series early this year. This shows the importance broadcasters and media organisations are giving to learn about this growing threat. Following is a quick look and the topics and discussions from the aforementioned forum.

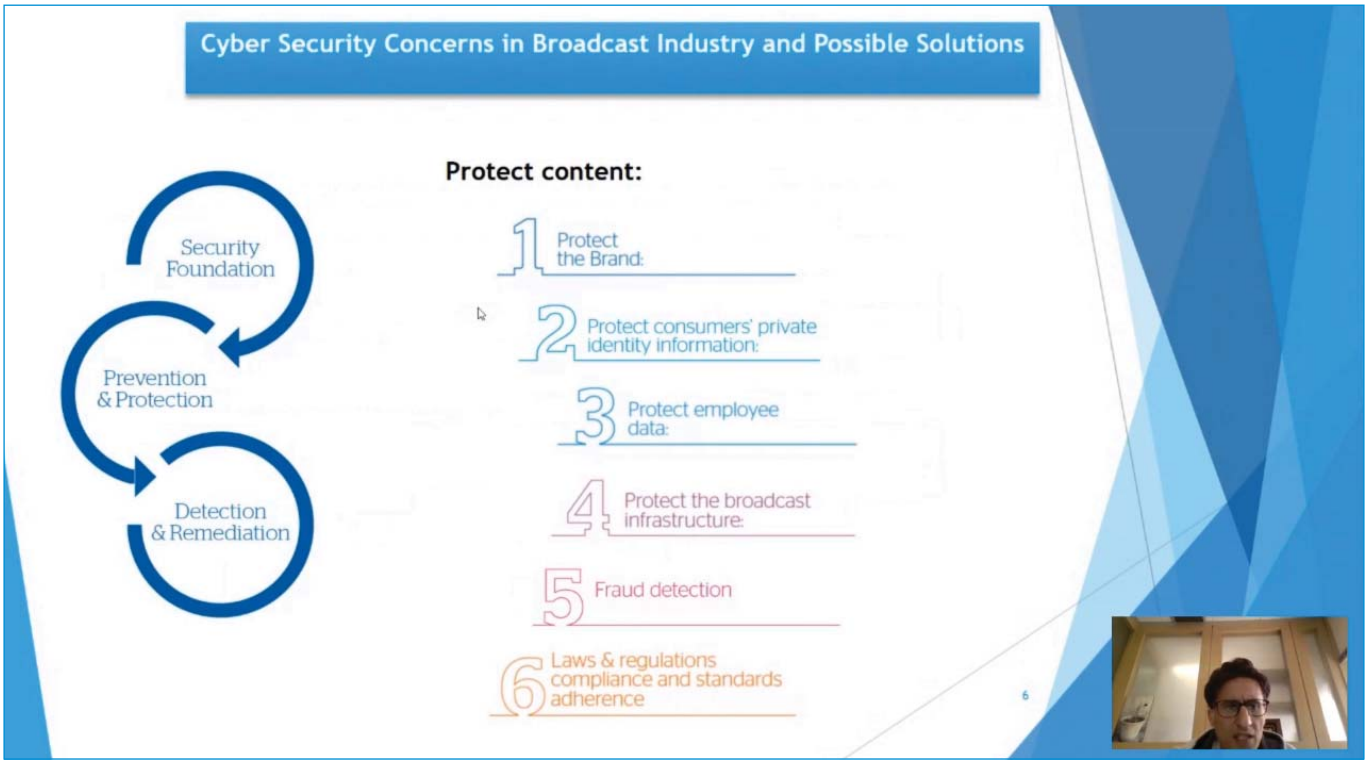
ABU VIRTUAL FORUM ON CYBERSECURITY AND MEDIA – 24-25 MAY 2022

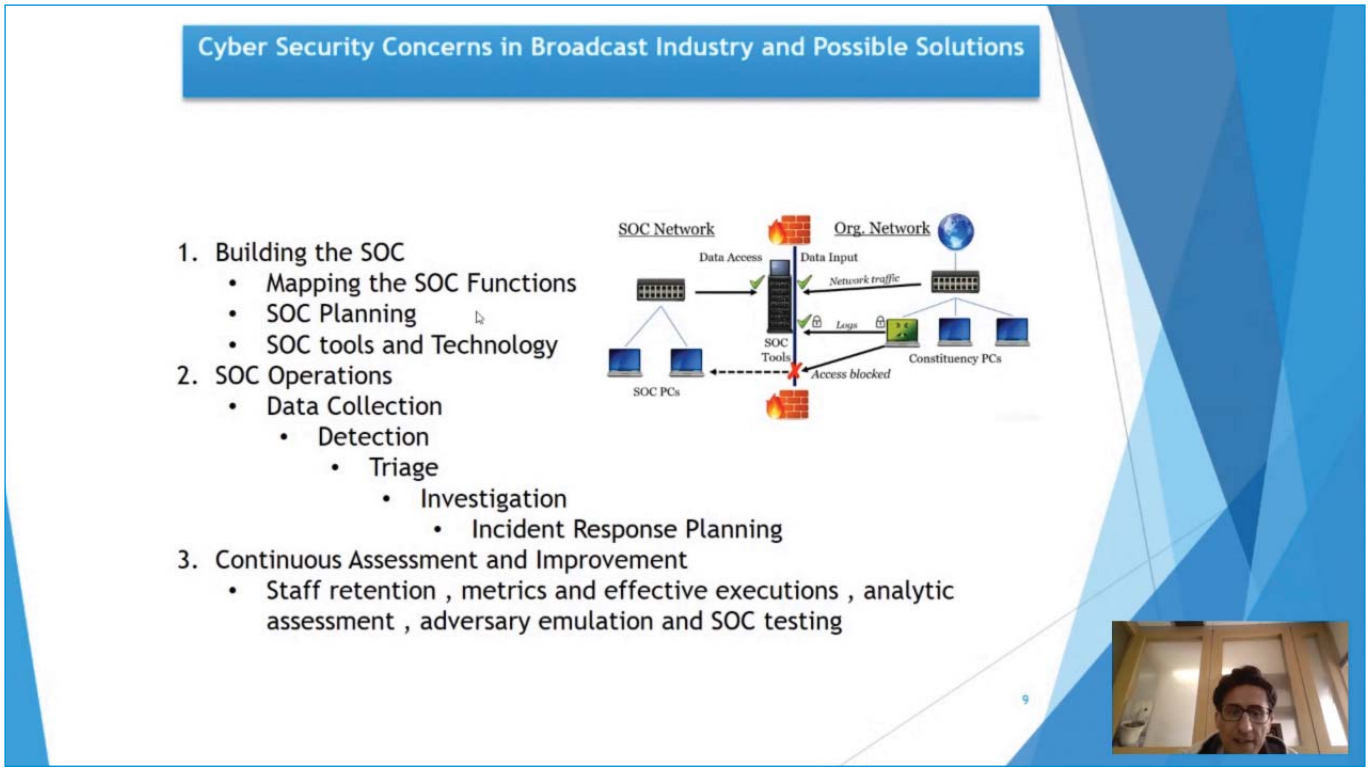
ABU Technology hosted a Virtual Forum on Cybersecurity and Media from 24 to 25 May 2022. The Forum discussed the latest tools, technologies, and best practices to mitigate cyber related risks in the media industry. Experts from IRIB in Iran and Skyline Communications in Germany and a Senior Broadcast Engineer in Australia shared their recommendations and experiences to further strengthen and safeguard broadcasters' networks from potential attacks. More than 600 registrations were received to join the multi-topic sessions and close to 250 participants, representing 40 countries from Asia, Europe, and Africa, attended the Forum over the 2 days.

CYBER SECURITY CONCERNS IN THE BROADCAST INDUSTRY AND POSSIBLE SOLUTIONS – EMAD NASEREDDIN, IRIB-IRAN

The traditional media value chain has been disrupted, enabled by the Internet and mobile connectivity. Content is now expected to be delivered anytime, anywhere and on any platform. Likewise, broadcasters are switching from SDI to IP and broadcasting and IT domains are converging. This sounds simple but, in fact, may be deceptive security-wise. As the content flows through the broadcast chain, it is essential to overcome the challenges for broadcast media in terms of security concerns. For this, the standard IT processes and architectures must be properly adapted. Furthermore, these should be deployed to meet the specific requirements of broadcast applications and operations in terms of service levels, reliability, business continuity and security.

To start with, where and how to secure the broadcast





media sector, the first and foremost step is to set up a solid security foundation covering the end-to-end broadcast media production chain. There is no need to reinvent the wheel, but just to follow best practices coming from the IT world. Examples of such practices are CIS TOP20, NIST, COBIT, ISO-27000, DPP, CDSA, MPAA, EBU Cyber security policies etc.

Three levels of protection envisaged are, security foundation, prevention and protection, detection and remediation. Security foundation ensures protecting content, brands, consumer information, and infrastructure along with fraud detection by keeping compliance with, and adherence to, laws and regulations. Prevention and protection is meant to build a cybersecurity culture and develop end to end cybersecurity strategy. Likewise, digital surveillance, proactive detection, 24/7 monitoring etc. are the measures taken for detection and remediation.

To help with such protection issues, building the security operation centre (SOC) will be another important step. It takes account of mapping the required functions, planning, and using proper tools and technology. SOC operations include works for data collection, triage and incident response planning with continuous assessment and improvement. SOC operates in different tiers for security analysis, incident response, support and threat intelligence.

Attackers will use different tactics to get what they want, such as phishing, supply chain attacks, site cloning, ransomware, wiper malware, rootkits, worms, DDOS, scripting, credential theft etc. SOC identifies, minimises and remediates incidents with the use of detection, triage and incident response tools based on the threat level and environment data from network and endpoint events. Network and endpoint collection and detection technologies are available that may be event or alert focused.

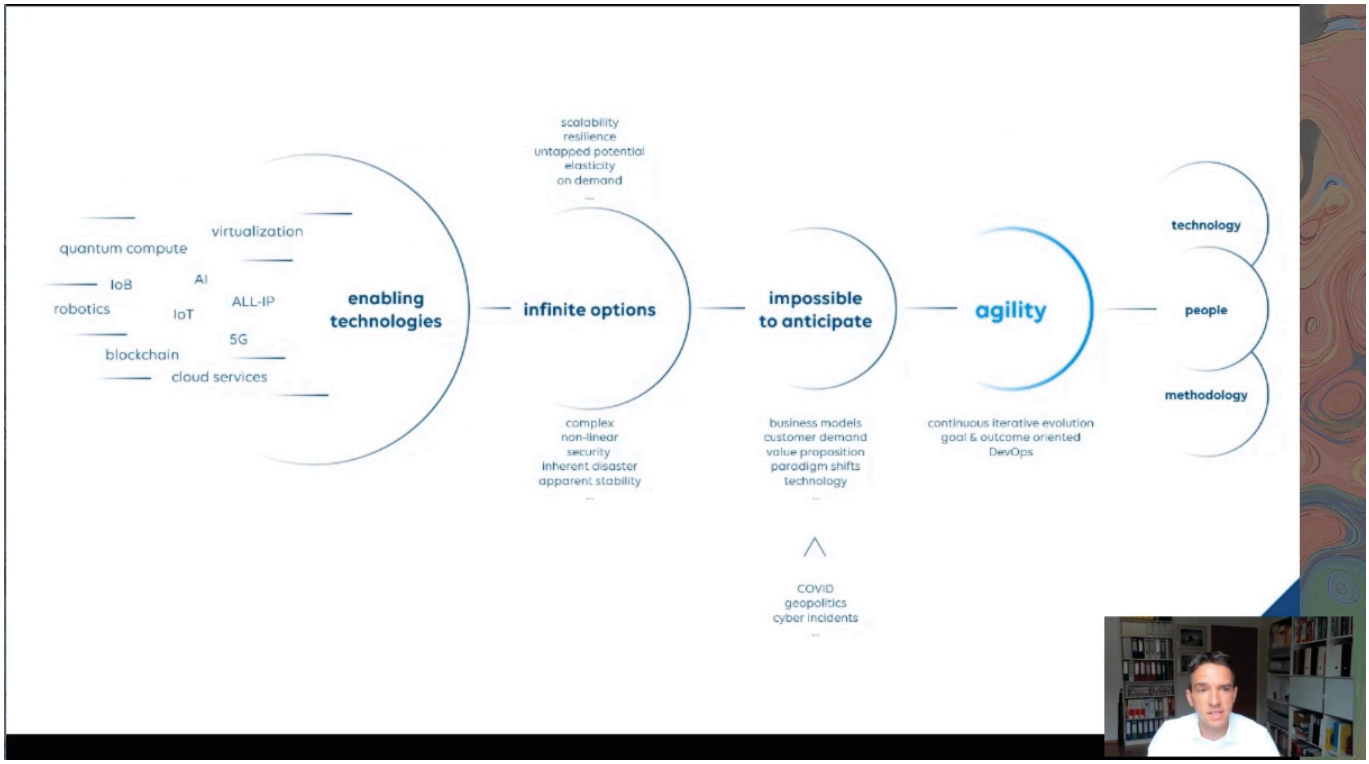
Security information and event management (SIEM) is another most important SOC tool for centralised log search, data correlation and alerting, visualisation and reporting for any cyber security incidents. Open source host and network data collection tools are available in the market. Network data monitoring takes place at different OSI layers using diverse service logs or tools. Host data monitors who is logged in, what is running, what tasks are presented etc. using security tools.

A 'blue team' in the SOC work to protect the organization's critical assets against any kind of threat with standardization of attack descriptions. Common tools and standard for attack techniques and protection practices are MITRE ATTandCK, Yara, Sigma, Jupyter etc.

DIGITAL TRANSFORMATION IN THE MEDIA BUSINESS-EVOLVING TOWARDS AN AGILE-DRIVEN OPERATION – THOMAS GUNKEL, SKYLINE COMMUNICATIONS

For transforming a company into digital, cybersecurity component has to be embedded upfront. Technologies are evolving, industry is moving to all-IP and adopting other enabling technologies. DevOps help to run such digital transformations and allow to operate diverse workflows and agile operation. Scalability, resilience, elasticity and on-demand operations are the benefits on one hand; non-linearity of behaviour, apparent instability, security issues etc. are to be looked into on the other hand. Becoming agile and continuing business with security is a must.

DevOps is the combination of cultural philosophies, practices, and tools that increases an organization's ability to deliver applications and services at high velocity. It enhances evolving and improving products at a faster pace than organizations using traditional software development and infrastructure management processes.



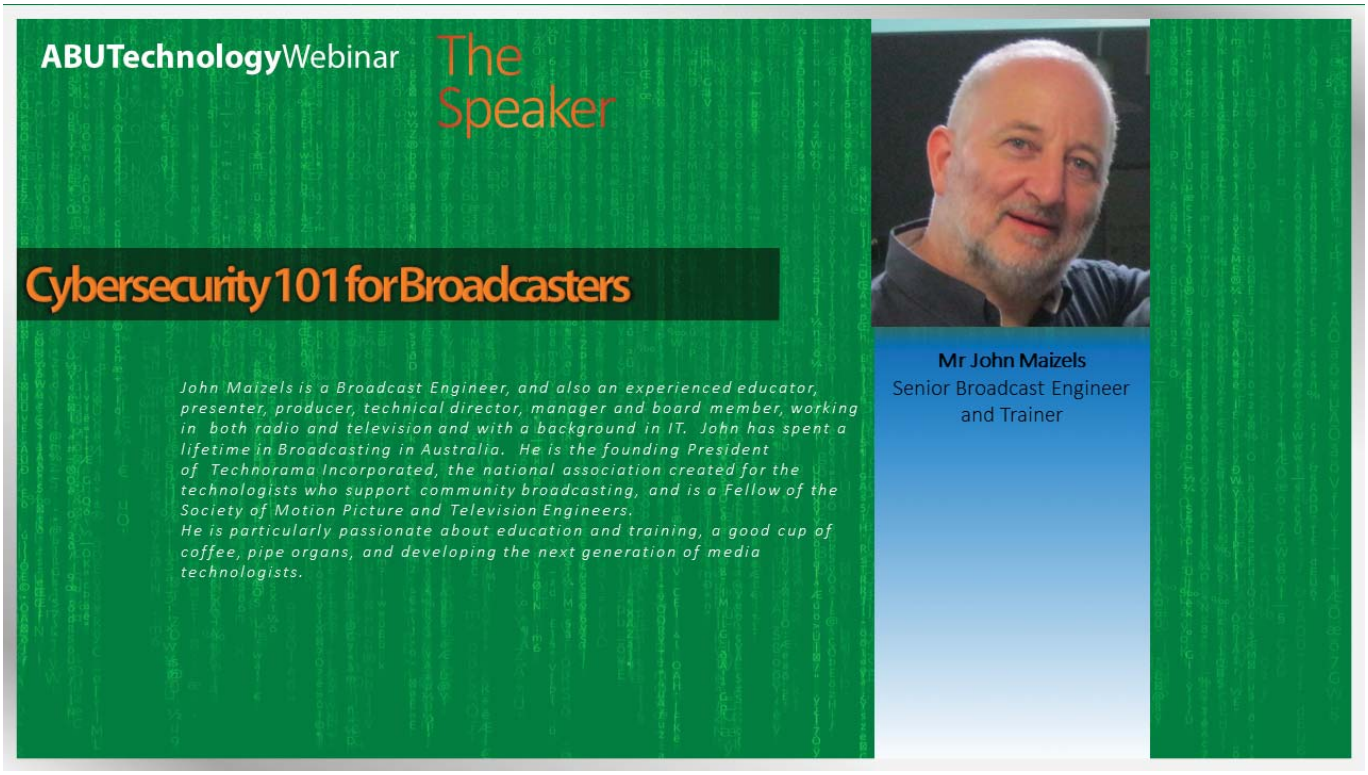
This is the key to success in a data-driven future.

DevOps is an absolute must in the new emerging ICT media and broadband segment. It enables you to continuously deliver incremental value to your business in the most efficient manner. It multiplies your return on the existing infrastructure investments. Requirements for agile transition are transformational technology, flexible architecture and agile culture/mindset. In concise, you need people with right technology and agile mindset. Broadcasters need to position them to evolve easily, safely securely and continuously.

An instance of DevOps solution, DataMiner, has three components. Data collection and control plane at the foundation layer collects files and data from anywhere agnostic to any technology. The digital twin function supports reading and controls. On top is the data consumption in the form of visualization, monitoring, automation, or orchestration. Third party tools as well may be employed here. Its stack functions incorporate multiple components including security and cloud service functions. This solution represents powerful out of the box utilisation of data and unified secured interfacing with Third party consumers or controllers. With open architecture, it allows customising connectors, automation and orchestration for interfacing customer dashboards with visual overview.

Skyline delivers the technology, people and methodology, in a consolidated and highly integrated ecosystem. The ultimate goal is to make digital transformation a success, and to establish an agile operation ready for a data-driven future, enabling a company to evolve continuously. DataMiner Dojo Community is a community for ICT media and broadband transformation for sharing knowledge and expertise.

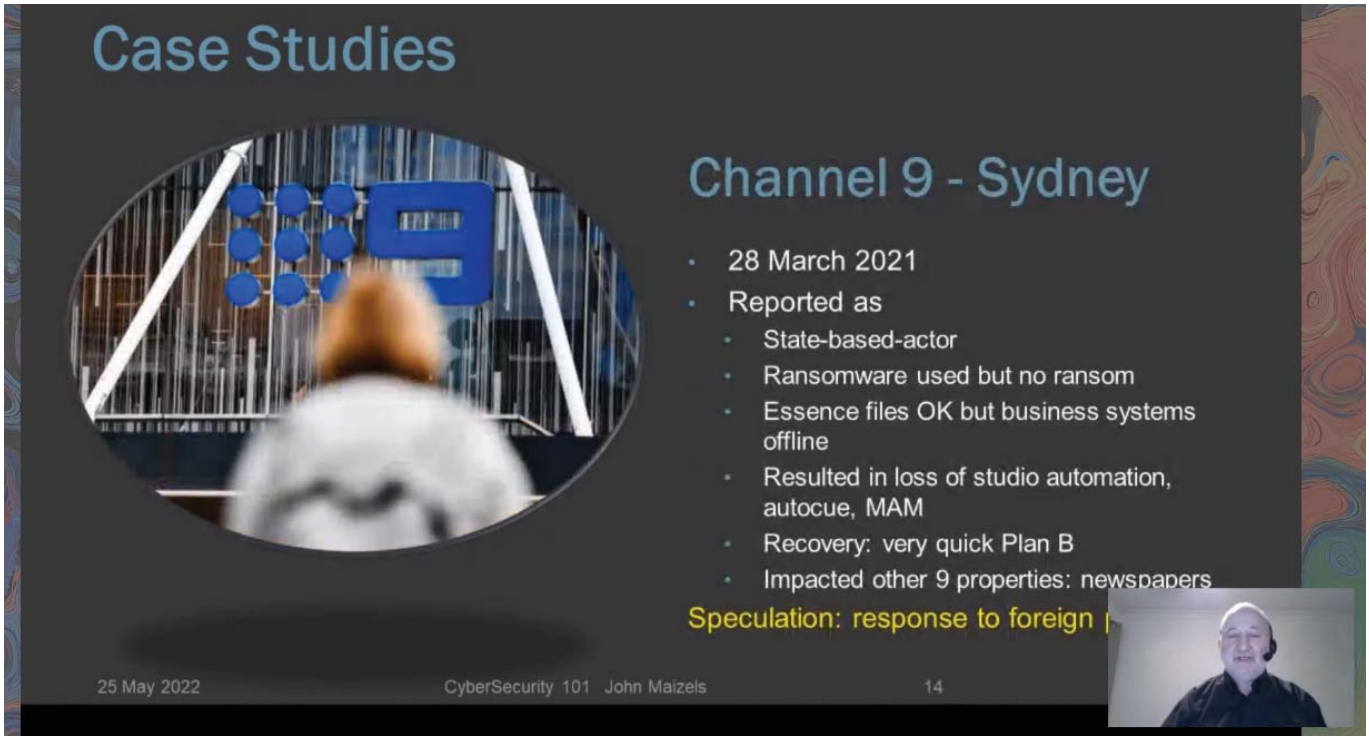
CYBERSECURITY 101 FOR BROADCASTERS – JOHN MAIZELS, SENIOR BROADCAST ENGINEER AND TRAINER



Cyber Security has recently become a fact of today's life in the connected world. It is not going away, and can't be disregarded, at least by broadcasters, media industry and regulatory agencies. So, we have to learn to live with it.

Getting caught in a cybersecurity storm or being attacked can have extensive consequences. For public organisations like broadcasters, losses in business and credibility, or warrants for proactive and reactive behaviours if one is not prepared in advance. And it may happen that these lessons are not learned, and mistakes are repeated. Cybersecurity shouldn't be seen as a business cost, but as a business investment with top priority. There are different reasons for attacks, not always obvious, be they for ransomware, opportunism or just for recreational mischief. Some hackers have criminal motives, for profit and theft and other unseen reasons.

A few case studies are worth mention. The attacks on TV5 Monde, Channel 9, for example. TV5 Monde in

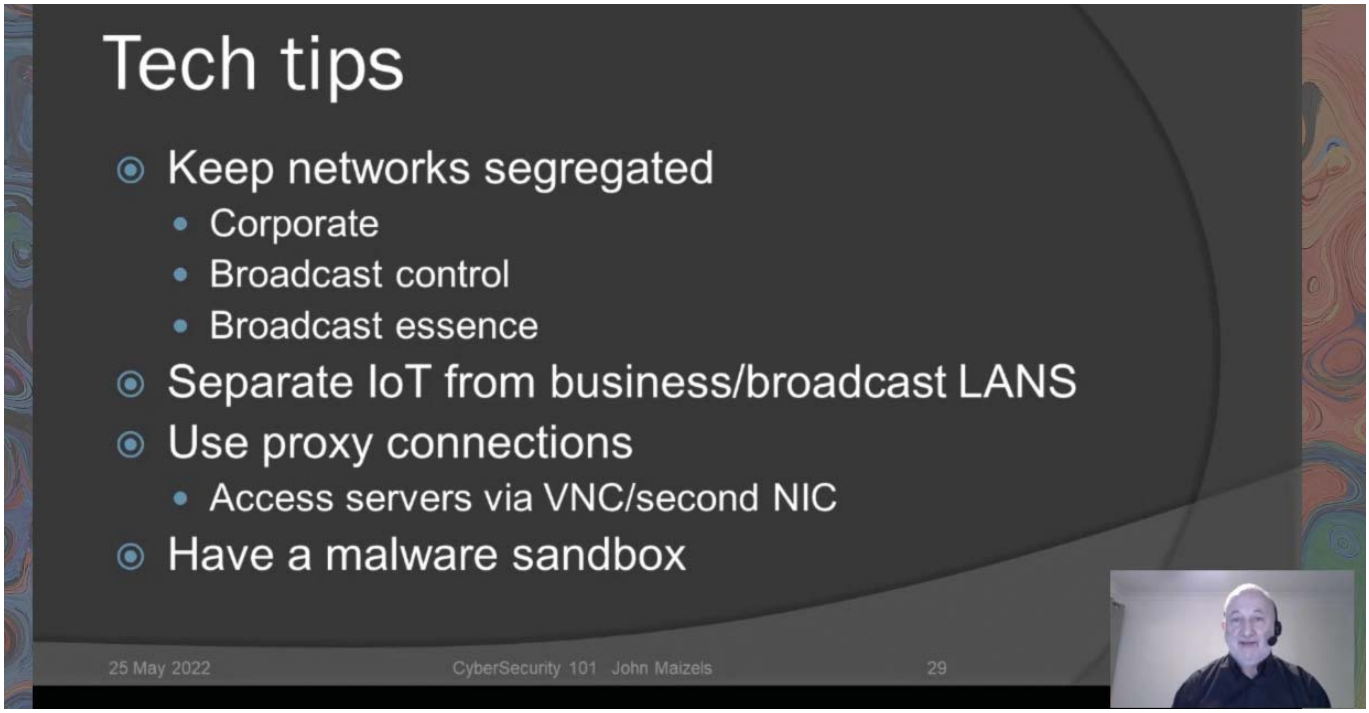


France was attacked in 2015 and service disrupted across 21 channels for 18 hours. The goal apparently seemed to be sabotage and resulted in significant business impact for months, with huge cost over the four years it took to fully recover. Likewise, a recent attack occurred in March 2021 on Channel 9 in Sydney.

This resulted in the loss of its studio automation and MAM system, and also impacted its other 9 properties, including newspapers. The station recovered with a quick 'Plan B' resuming service from a station in another state on a different IT network. Other instances of cyber-attacks occurred to KQED station and an FM station in the US, and to Marketron, an advertising provider.

Attack vectors will take different forms, like steganography, i.e., hiding messages inside other objects, fake emails with social manipulation, and products of false trust.

Suggested approaches for recovery from such attacks may include having a solid 'Plan B', assembling a CIRT team, having mitigation strategies, building a security operations centre (SOC) with different colour coded teams etc. Keeping corporate and broadcast networks segregated, separating IoT devices from business/broadcast LANs, using proxy connections will indeed augment broadcaster's network. Revisiting and reviewing these approaches often and testing or triaging will keep stations less exposed to attack. ■



Technical Bureau Mid-Year Meeting
28 & 29 July 2022 | Kuala Lumpur

ABU Technology organised the Mid-year meeting of the Technical Bureau as a two-day hybrid event on 28-29 July 2022.

A few of the Technical Bureau Members attending the in-person mid-year meeting in Kuala Lumpur.

Kuala Lumpur served as the location for the hybrid meeting, where some members who were able to make it to the meeting joined physically and others participated virtually via Zoom.

The meeting was chaired by ABU Technical Committee Chairman, **Mr Hamid D Nayeri** of IRIB-Iran, and was joined by the Vice-Chairmen, **Mr Sunil** of DD-India, **Mr Masashi Kamei** of NHK-Japan and **Mr Kazim Pektas** of TRT-Türkiye.

Also, in attendance were colleagues from NHK-Japan, KBS-Korea, DD-India, Mediacorp-Singapore, NBT-Thailand, TRT-Türkiye, TVB-Hong Kong, Phoenix TV-Hong Kong, RTM-Malaysia, PTNI-Philippines, Walesi-Fiji, NRTA-China, VTV-Vietnam, RRI-Indonesia, NTV-Nepal, and VOV-Vietnam.

The meeting began with the introduction of the Technical Bureau's newest members from VOV-Vietnam, NTV-Nepal, PTNI-Philippines, and Walesi-Fiji. Followed by updates from all members on the current situation, measures taken during the pandemic, and organization-wide projects. This presented an excellent opportunity for members to learn from one another on the various approaches that had been taken in light of the ongoing pandemic with the strategies being adopted getting back to the new normal.

This information sharing exercise proved beneficial to members, allowing them to learn from experiences by others and appreciate the situation of other members.

The bureau was presented with the activity report from the Secretariat since the online TC2021 meeting last November. This included updates on different activities, one of which was the DBS2022. Despite the fact that it was held virtually the event received an incredible amount of support from participants, industry partners, and sponsors who were interested in the programme.

The majority of the report's other activities were online webinar sessions on various topics of technology implementation and applications. These include webinars covering 22 sessions/topics. Aside from these, the level 2 of the Engineering Fundamentals training programme was delivered online.

From left: Mr Do Anh Duc (VOV-Vietnam), Mr Karim Sadiran (RTM-Malaysia), Mr Ahmed Nadeem (ABU Technology), Mr Masashi Kamei, Vice Chairman (NHK-Japan), Mr Kenichiro Nagano (NHK-Japan), Mr Peh Beng Yeow (Mediacorp-Singapore) and Mr Brijesh Kumar Singh (DD-India).

The report also provided an update on other activities that were managed by the Technology department including the recent launch of the ABU Technology Webinars Archive Web portal, which is a video on-demand platform that gives members access to recorded webinar sessions whenever they want. These include all of the webinar sessions that have been organised by ABU Technology ever since the pandemic first started in April of 2020. The APV cloud application that is run by the ABU provides the platform to store and stream content that is available on demand.

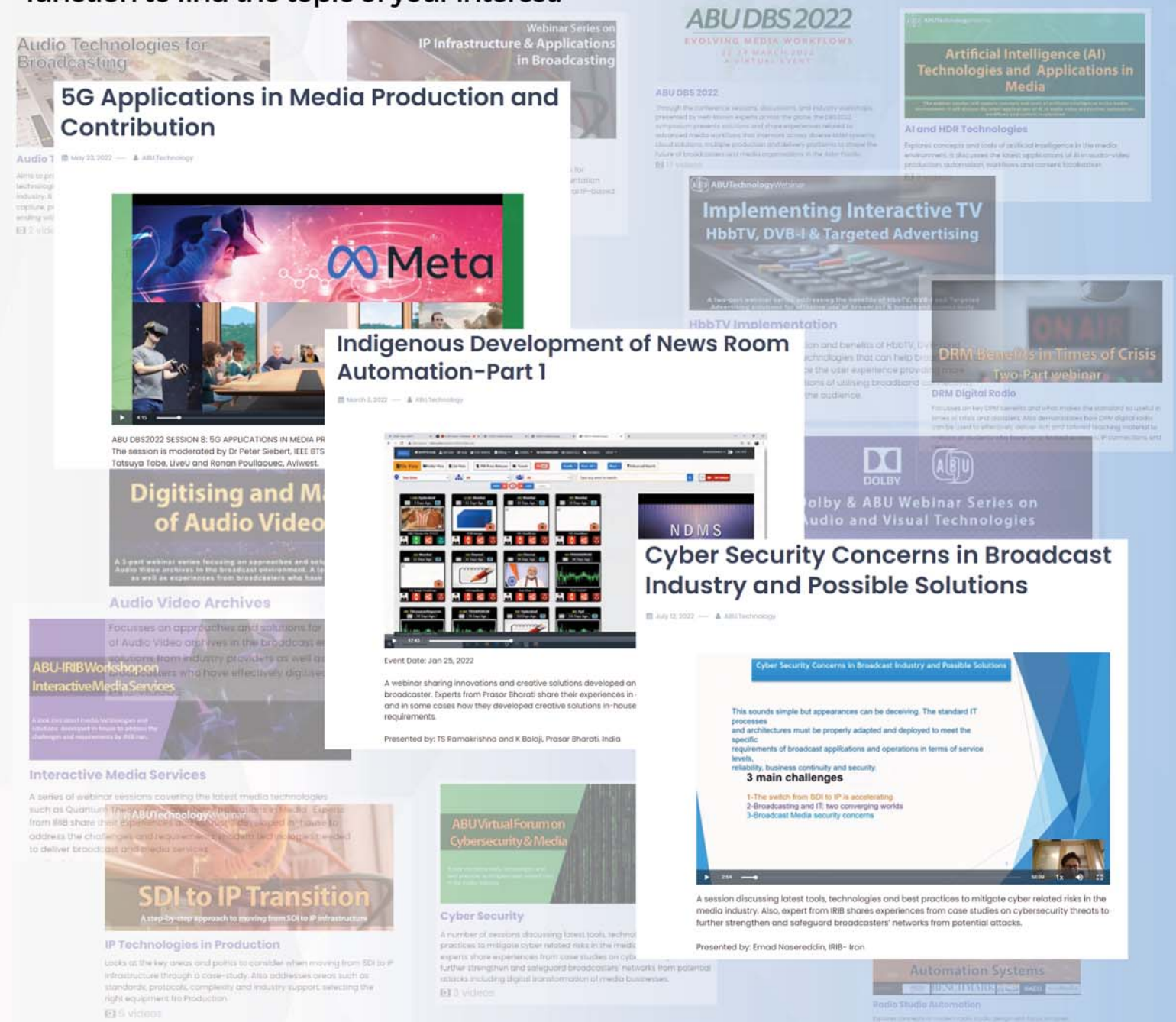
The Bureau also approved the suggested scope of work for the recently setup task group to review the existing Engineering Awards and its guidelines. It was agreed that the task group will report its findings and recommendations before the annual Technical Bureau meeting in November. The members also agreed to setup up a new task group to review the study projects under the four Study Topic Areas, including their terms of reference. The secretariat is now in the process of putting together the work scope for this task. The work of this new task group will also be completed by the annual meetings in November.

Among other things, the bureau conducted a thorough review of the tasks and action items assigned since the last meeting. The Secretariat proposed a new title and guidelines for the ABU Broadcast Engineering Award on SDGs Implementation, which would replace the previous ABU Green Broadcast Engineering Award. The bureau also reviewed the schedule for this year's annual Technical Bureau and Technical Committee meetings which will be held in Delhi, India in November.

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

ABUTechnologyWebinar *Archives*

ABU Technology Webinar and Events recordings are available to access via ABU web portal. This new web portal will provide a collection of all the webinars we have organised in the past two years for your on-demand viewing. You may use the search function to find the topic of your interest.



REGISTER YOUR ACCOUNT SOON

The access to this web portal, at the moment, is restricted to members only.
Go to the Archive Portal at **http://vod.abu.org.my/** and register.

Enjoy watching!

CHOOSING THE RIGHT TECHNOLOGY PARTNER FOR FUTURE PROOF GROWTH

ABSTRACT

Transformation of broadcasting and its migration to the cloud stratosphere is a challenge that many broadcasters are experiencing in today's day and age. Multiple workflows on hybrid infrastructure models, applications and change management are just some factors that seek to challenge the evolution of the Online Video and Audio Platform (OVAP) industry.

However, despite these challenges, the recent pandemic has become the major driver of this migration. Technologies like cloud are key to successful direct-to-consumer models for broadcasters. It enables workflows to be conducted remotely and with real-time scalability due to greater demand for entertainment flexibility.

IPSB Technology, with its partners Amazon Web Services (AWS), Axle AI and Arista Networks provide turnkey open hybrid cloud-based solutions including the right tools, infrastructure sizing and bandwidth optimisation amongst others, to cater for the needs and demands of broadcasters to serve global content delivery. When the right solutions are in place, it means each department is operating in the most efficient way. Adapting state-of-the-art technologies makes businesses flexible, relevant, and competitive in the market. This transition will not happen overnight. It is a complex process. It is most likely that many broadcasters will not return to status quo once they have made the transition to virtual operations and experienced the benefits of cloud-based infrastructure, applications, and workflows.

There is no one size fits all approach to technological evolution and adoption. However, when in place, the infrastructure is custom-created to make things easier by designing it to maximise organisational resources. Broadcasters can choose to manage and operate the cloud, utilise third-party provider access, and purchase that access based on storage, bandwidth or other required metrics. Choosing the right partners to help achieve the necessary infrastructure will reduce operating expenses. An effective technological partner will strive to provide you with cost-effective solutions without cutting corners. When you reduce operating costs, you can put that money towards content growth instead. The saying of "Content is King" continues to apply in today's digital broadcasting world.

TRENDS IN THE ONLINE VIDEO AND AUDIO PLATFORM (OVAP) WITHIN THE BROADCASTING INDUSTRY

A fast-growing industry, the Online Video and Audio Platform (OVAP) or more commonly known in the media and broadcast industry as the Over-The-Top (OTT) platform is one of the many services offered and managed by IPSB Technology and partners. OVAP is essentially a media distribution method that delivers content outside the closed networks used by traditional cable and satellite television providers. By utilising the internet and bypassing the traditional gatekeepers of broadcasting media the Direct-to-Consumer strategy of these platforms allows for streaming of content to any compatible device with a stable internet connection. This in turn, allows for the delivery of both video and audio content directly over the web without the hassle, frustrations, or high costs associated with traditional broadcasting. The market for OVAP services is expected to reach over $156.9 billion by 2024 *(Over The Top (OTT) Services Market Size, Share and Global Market Forecast to 2024, n.d. Stoll, n.d.)*.

This ongoing and upward trend is due to several benefits of the OVAP platform, one of which is its ability to allow audiences to stream the content on demand. In the beginning, Video on Demand (VOD), as offered by providers since the mid-90s, was limited and costly. However, the introduction of OVAP, encouraged the removal of several restrictions, such as dependency on proprietary hardware and software or predetermined programme scheduling from traditional and conventional satellite broadcasting methods. By tapping into the power of the internet, broadcasters can override these limitations. When equipped with a compatible device, such as a SmartTV or SmartSpeakers, the OVAP broadcasting platform simplifies and improves the content delivery process. With a stable internet connection, the audience can access the content regardless of location, time of day, or network provider.

As consumers continue to embrace over-the-top streaming, the lines between it and traditional broadcasting will eventually blur. Many users have begun the adoption

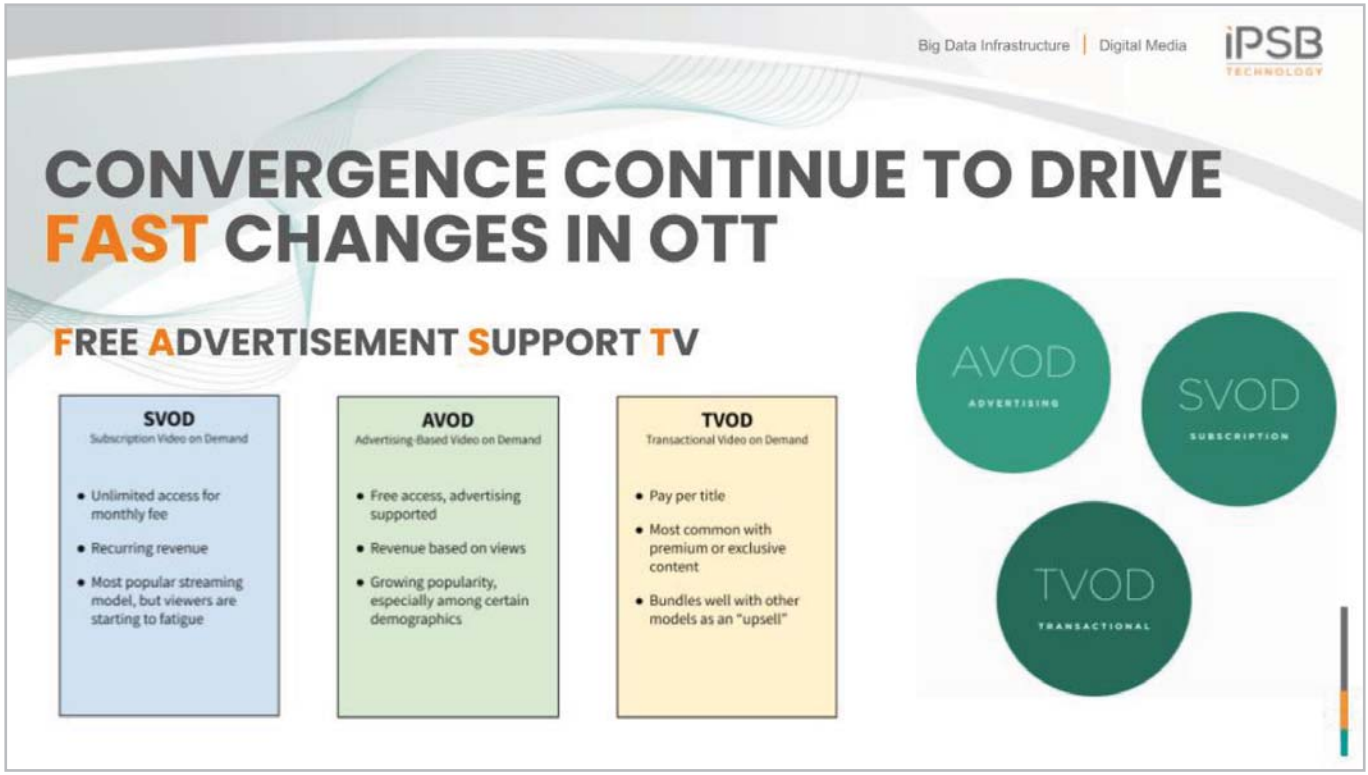


Image 1: F.A.S.T changes in the Over the Top Platforms

of hybrid combinations of the two, with others utilising OVAP as their only source of programming and content.

In today's fast-paced and ever evolving digital era, convergence has continued to drive free advertisement support television changes in the OVAP industry. The convergence of hybrid models in OVAP, which incidentally ranges from Subscription Video on Demand (SVOD). Transactional Video on Demand (TVOD) and Advertisement Video on Demand (AVOD), has proven to be the way forward for the broadcast industry. These models have accelerated the approach to free advertisement support television (FAST) changes to the online video and audio platforms (refer to *image 1*).

Another factor that has driven many broadcasters to adopt this convergence is the rampant spread of illegal content, which cost the industry an estimated $60 billion in 2020 alone. The demand for free and available content has created a need for the adoption of the hybrid model or assimilation into the online video and audio platforms. Taking Malaysia as a sample, the anti-piracy advocacy stand taken by the government has led to a 64% decrease in illegal pirated content consumption and a 20% increase in paying customers who subscribe to VOD and OVAP platforms available in the market, whereas the rest have switched to advertisement supported services.

***"The anti-piracy advocacy stand taken by the government has led to a 64% decrease in illegal pirated content consumption and a 20% increase in paying customers who subscribe to VOD and OVAP platforms available in the market, whereas the rest have switched to advertisement supported services."* – Mardhiah Nasir, Executive Director, IPSB Technology.**

As players in the broadcasting industry, providers will need to understand that changes in the Over the Top platform landscape are inevitable. Factors such as dependency on consumer devices and technological advancements, consumer demands and behaviours, as well as actions taken by OVAP providers, play an integral role in the development and demand of OVAP. Understanding the causal effect of these factors will allow for broadcasters to keep up to date with the needs of their audiences.

THE IMPORTANCE OF OPEN STANDARD ARCHITECTURE AND WEB-BASED SYSTEMS

Open Standard is a system architecture where commonly accepted standards are also considered as non-proprietary. Web-based is described as an application running via http or in a web browser. It enables a faster rate of overall innovation by allowing for stacks of systems. An ecosystem of different providers can all contribute to the solution. This shortens development time and time to market. The scalability of Open Standard System allows the ability to grow and interlink hardware and software to accommodate increased loads. To create competitive edge in the marketplace, interoperability in the system architecture is a critical factor to ensure the ability of computerised systems to connect and communicate with one another readily.

Benefits of an Open Architecture System are:

- Lower development and ownership costs
- Easy installation and maintenance
- Instant and constant accessibility
- Easy data sharing and collaboration
- Centralised security
- Reduced hardware cost
- Increased efficiency and scalability
- Adaptability to changing workloads

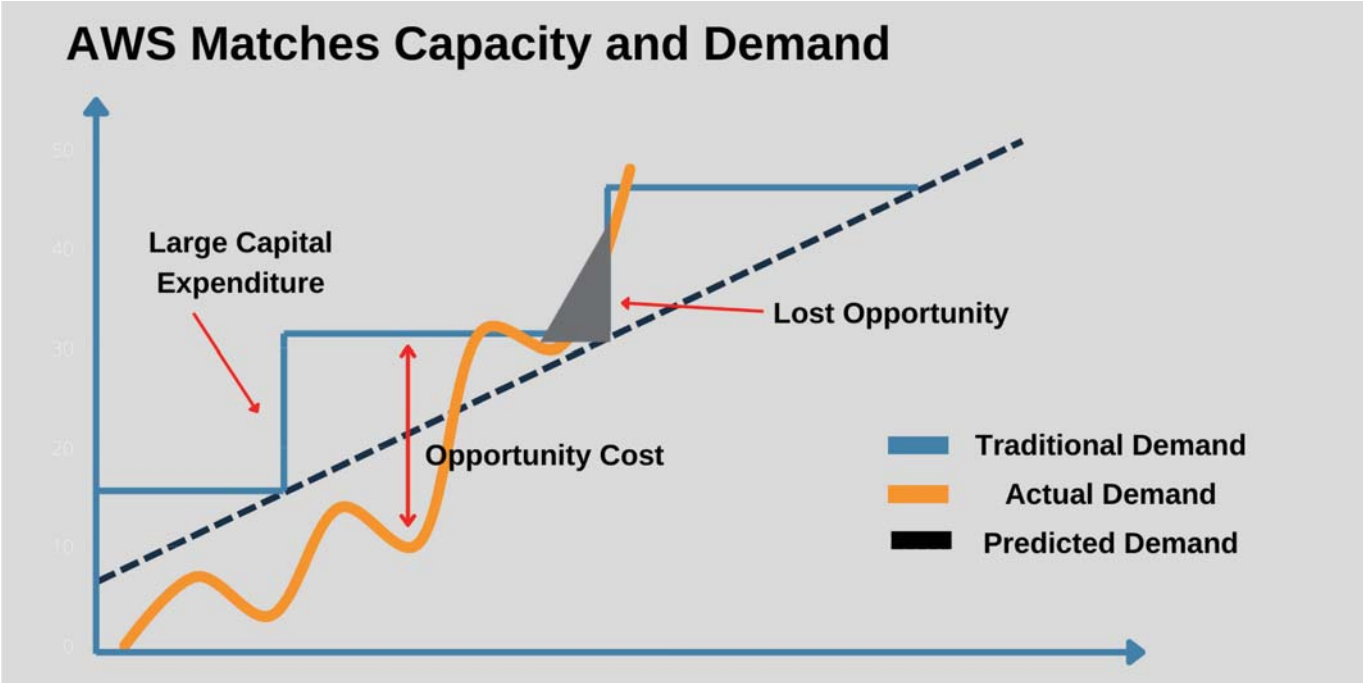


Image 2: Amazon Web Services matches capacities and demands

- Greater access to information
- Interoperability

IPSB Technology, along with its partners at the Asia Pacific Broadcasting Union Symposium 2022, Amazon Web Services (AWS), axle ai and Arista Networks understands the benefits of such an ecosystem and the requirements demanded from broadcasters in the industry.

AMAZON WEB SERVICE: EXPERTS IN RELIABLE, SCALABLE AND EFFICIENT INFRASTRUCTURES

Media and entertainment customers face industry-wide transformation, with companies reinventing how they create content, optimise media supply chains, and compete for audience attention across streaming, broadcast, and direct-to-consumer platforms. Amazon Web Services (AWS) aligns the most purpose-built media and entertainment capabilities of any cloud to five solution areas to help customers transform the industry. The five solutions offered range from Content Production; Media Supply Chain and Archive; Broadcast; Direct-to-Consumer and Streaming; and Data Science and Analytics. With AWS, selecting the right tools and partners for workloads is made more convenient, with the end goal of accelerating production launches, and achieving faster time to value *(AWS for Media & Entertainment (1:37), n.d.)*.

AWS aligns the most purpose-built media and entertainment capabilities of any cloud – including nine AWS Services, 11 Solutions, dedicated appliances, and over 400 AWS Partners, including Glue MPS, Arista, Axle Ai; as well as dedicated AWS industry specialists and AWS Professional Services teams.

With over 15 years of experience in supporting transformation for leading industry customers such as Comcast, Discovery Inc., Disney, FORMULA 1, FOX, HBO Max, Hulu, Method Studios, MGM, The National Football League, and many others, AWS offers unmatched media and entertainment experience and solutions.

Amongst many of the customers that have benefited from the AWS solutions and workflows is Netflix. The over the top online video and audio platform (OTT OVAP) is the world's leading internet television network, with over 200 million members in over 190 countries enjoying 125 million hours of TV shows and movies each day. Netflix uses AWS for nearly all its computing and storage needs, including databases, analytics, recommendation engines, video transcoding, and more – hundreds of functions that in total use over 100,000 server instances on AWS *(Netflix on AWS: Case Studies, Videos, Innovator Stories, n.d.)*

alongside our very own region OTT OVAP provider like RTMKLIK from Radio Televisyen Malaysia and RTBGo from Radio Television Brunei.

Case Study 1:
IPSB Technology Accelerates Time-to-Market of Streaming Video and Mobile Applications for Radio Television Brunei

Case Study 2:
RTMKlik Digital Media Delivery Platform

Shad Hashmi, AWS Media and Entertainment Partner Lead, APAC, explains how AWS can help organisations improve cost efficiency. The question that is posed by many broadcast and media organisations is "What happens when capacity does not meet demand?". According to Mr Hashmi, there is a loss of opportunity. At AWS, the aim is to move away from the original and old model of production and workflow economics (refer to *image 2*) where OPEX and CAPEX are still applied and make sure that capacities and hence, spending, match the demand. This is what cloud economics looks like and what AWS can help with by purchasing for peak (refer to *image 3*).

He adds, "A study that we have conducted basically says that data centres are at average 50% under-utilised, which means you have

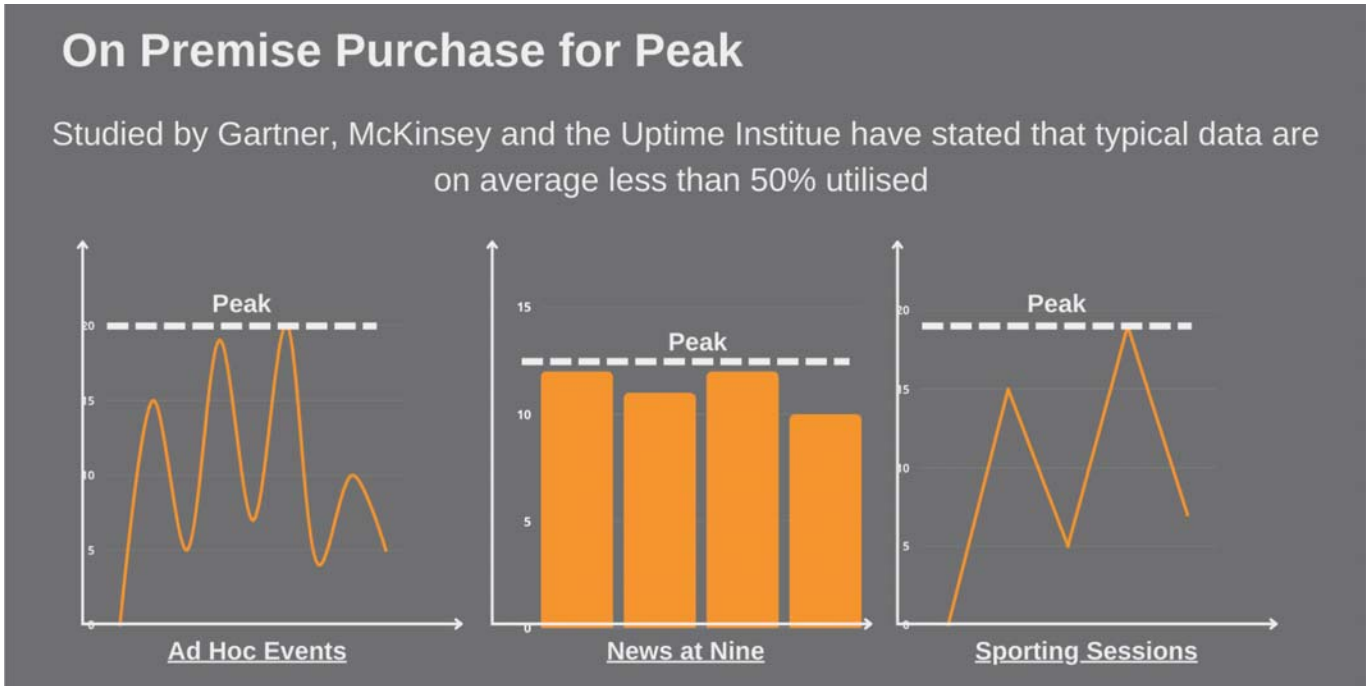


Image 3: On Premise purchase for peak

bought it but do not use it." AWS Elemental and its partners can take entire broadcasting and workflows to the cloud via solutions such as virtualised productions, virtualised studios, and fibre optic distributions." This knowledge allows publishers or content owners to scale up their infrastructure, deliver live multimedia content to consumers faster.

AXLE AI: DELIVERING A COMPLETE SOLUTION FOR STORAGE, MANAGEMENT AND AUTOMATION SEARCH CONTENT

Axle AI, a company whose slogan is "Making Media Smarter" uses browser-based hybrid cloud software that helps teams access, search and collaborate with locally stored or cloud media, and handle a mix of local and remote workflow seamlessly. The product's AI-driven features include automated speech transcription and face recognition, with other capabilities under development. Custom tags are also supported so that tagging by editors, producers and assistants can complement the automated AI-based tagging.

Axle AI, which has been around since 2012, bridges the gap between on-premise workflows and cloud workflows, which both have significant roles to play in the broadcasting infrastructure. With over 800 sites worldwide and BBC and NBCU amongst some of its most notable media and broadcasting clients, the range of axle ai products have helped its customers in cost optimisation by deploying both cost effective and easy-to-use software, unlike traditional MAM. The development of this AI platform aims to answer two key problems faced by many broadcasters. They are, the uploading of content onto other cloud platforms for analysis, and cost efficiency.

Sam Bogoch Chief Executive Officer, axle ai and Neil Blake, Business Development Manager, axle ai during the recent ABU Digital Broadcasting Symposium 2022 shared BBC's Nature Watch Workflow and further reiterates the importance of ensuring a competent and seamless end-to-end platform. According to Neil, "Nature Watch is one of the most popular nature programmes in the UK. All content is remote. The camera operation team uploads content to the server where axle processes it. It later allows producers, directors and team members to log in remotely, access the content and create shortlists for editors. Although it is a remote styled production system, it maintains its seamlessness and smoothness for users due to the nature of axle and the ability to access media anywhere'. Neil adds that BBC Nature Watch had a metadata set where axle ai could import and integrate the old workflows with new ones, allowing for programmes to be broadcast to consumers smoother and faster.

ARISTA EOS NETWORK: FOR HIGH INTENSIVE THROUGHPUT HUNGRY WORKFLOWS & UNIFIED ZERO TRUST SECURE NETWORK

Arista Networks is an industry leader in data-driven, client to cloud networking for large data centres, campus and routing environments. Arista's award-winning platforms deliver availability, agility, automation, analytics and security through its advanced network operating system *(About Arista Networks, n.d.)*.

As more and more assets migrate to cloud, there is an increase in prevalent threats and most of the time, these threats are large scale. A survey conducted suggests that over 50% of devices are unprotected and malware bridge attacks occur 51% of the time. Even if 70% of traffic is encrypted, this vulnerability still occurs.

The Arista Extensible Operating System (EOS) is the core of Arista cloud networking solutions for next-generation data centres and cloud networks. Cloud architectures built with Arista EOS scale to hundreds of thousands of computer and storage nodes with management and provisioning capabilities that work at scale. Through its programmability, EOS enables a set of software applications that deliver workflow

automation, high availability, unprecedented network visibility and analytics and rapid integration with a wide range of third-party applications for virtualisation, management, automation and orchestration services.

Arista EOS is a fully programmable and highly modular, Linux-based network operating system, using familiar industry standard CLI and runs a single binary software image across the Arista switching family. Designed for resiliency and programmability, EOS has a unique multi-process state sharing architecture that separates state information and packet forwarding from protocol processing and application logic.

Most issues that deter users from applying a sound security system include high costs, high attacker dwell time and a high risk of missed attacks. Apart from worry free endpoint application downloading, Arista's AI Security system, coined Awake Security, allows for high fidelity threat hunting (adversarial modelling to uncover complex threats with low false positive and negatives), situational analysis called EntityIQ discovers, profiles and tricks devices, users and applications using AI fingerprinting and autonomous security called AVA, an AI based export system to automate triage, investigation and response skills. Arista says, "AVA allows for intention, anomaly and intent detection and behaviour analysis."

IPSB TECHNOLOGY: MAKING TECHNOLOGY WORK FOR YOU

Changes in the broadcast industry, experienced by broadcasters, are something that can be assured. The transformation and migration from traditional and conventional broadcasting methods to the application of cloud workflows is unquestionable and the importance of providing end-to-end service is becoming more and more apparent. Multiple workflows, convergence of hybrid models and change management are just some of the many factors that add a constant variable to the ever-growing industry.

By sharing our expertise of 14 years within the industry with the support of notable key players, IPSB Technology will help increase business agility and reduce the need to manage IT systems, scale and manage any type of unstructured data that lives and created On-Premise, Edge, Core or Cloud and manage Digital Media Assets by leveraging on IPSB Technology's content production, delivery platforms and monetisation solutions.

In a world where consumer demands are increasing daily, more and more channels are retiring and slowly diminishing in relevancy when they cannot keep up the pace. More and more platforms are decentralising in this ever-evolving landscape. Broadcasters need to understand that 'content is king, and the platform is queen' and with the right strategy and tools, these demands can be met.

Some info from slides:
https://docs.google.com/presentation/d/1l7zvuXm1EntfVBRtwXyrYGMzh9fQ81nLNIQFLqeIELU/edit?usp=sharing

Advert video:
https://drive.google.com/file/d/1A0R4HoqWlMtDpjTXYCcxaRabWJnpNi7p/view?usp=sharing

Article references:
https://www.exponential-e.com/blog/why-technology-is-vital-for-future-proofing-the-broadcast-and-media-industry

AUTHORS

Mardhiah Nasir is on a mission to empower clients with their digital transformation. She has a unique 11- year background in project management on various industries projects, in-depth knowledge of Big Data Infrastructure & Digital Media, strategic planning, market analysis and business development which provides clients with unique advantages. She is the Executive Director and Vice President of Sales for IPSB Technology whereby she manages and engages with local and international clients to be ahead of the curve with latest solutions, partners and technology. Her visionary perspective has earned her opportunities to speak at Broadcast Asia & ABU DBS and has written articles that were featured in global publications. IPSB has a wide based clientele including the no. 1 OTT platform in Brunei RTBGo, managing petabytes for Media Prima, Astro, RTM and many others clientele include both public sector and enterprise customers in Malaysia, Brunei and Indonesia with plans of expansion in the APAC region. IPSB's Specialising in Managed Services for Big Data Infrastructure and Digital Media, Mardhiah leads the team in Making Technology Work For You.

Farikh Ikram has over 14 years of experience in the Broadcast and Media industry and is currently the Head of Technology for IPSB Technology. In IPSB Technology, he manages all forward technology of the company's products and services, which focuses on Big Data Infrastructure and Digital Media. Previously, he was a part of the team that led Media Prima Television Network's tonton, Malaysia's pioneer OTT service and his passion also led him and other teammates to win the Gold Award in the Marketing Events Awards for "Best Online Drive Category" for Anugerah Juara Lagu Ke-26 (AJL26)'s website. He has gained the skill sets to meet and transform our client's digital journey, which includes Radio Television Brunei – RTBgo, the no. 1 OTT platform in Brunei, Media Prima Berhad, Radio Television Malaysia and many others. ■

World Broadcasting Unions

WBU-Technical Committee Meeting June 2022

The World Broadcasting Union's Technical Committee (WBU-TC) organised its first face-to-face meeting since the pandemic on 8-June in conjunction with the EBU-TA event, as has been the regular practice before the pandemic began. The meeting was hosted by France Television in Montpelier, France as part of the EBU's Technical Committee and Technical Assembly. The meeting was chaired by Mr John Lee, Chairman of WBU-TC. Technical representatives from ABU, ASBU, EBU and NABA were physically represented at the meeting with CBU joining virtually.

Some of the important points from the agenda included the joined work by the unions in preparations for the WRC-23 conference next year. The idea of issuing a collective declaration by the WBU on behalf of all unions to support the ongoing efforts to safeguard the spectrum allocated for broadcasting services was discussed and agreed at the meeting. Another key area of discussion was on the importance of educating members on Cybersecurity. The meeting was briefed on the updated version of the recommendation on "Cyber Security Recommendations for Media Suppliers' Systems, Software and Services" which has been approved and circulated recently. Two other recommendations on the area of "Social Engineering" and "Employee Cybersecurity Training/ Awareness" are currently being drafted and will hopefully be finalised and circulated towards end of this year.

One of the highlights of the meeting were the presentations on UHDTV broadcasting technologies updates from the digital broadcasting standards perspective including current developments. The presentations were made by representatives from DVB, ATSC and from ISDB-T. The updates on the developments of ISDB-T were presented by Mr Masashi Kamei, ABU TC Vice-Chairman and Senior Researcher at NHK STRL. The presentation showcased the ongoing work and advanced research within by NHK-STRL on both ISDB-T Advanced and Satellite broadcasting systems. Other notable discussions included 5G, 6G and the use of RLANs and Wireless Power transfer interference issues. The meeting concluded with the agreement to host the next during the IBC2022 event in Amsterdam in September. ■

How to contribute to the Technical Review

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

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

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

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

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

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

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

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

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

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

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

News from the ABU Region

PRASAR BHARATI HOLDS CONCLAVE ON DIRECT TO MOBILE TECHNOLOGY

India's public broadcaster Prasar Bharati has held a conclave on 'Direct to Mobile – 5G Broadband Convergence Roadmap', in collaboration with India's premier Technology Institute, the Indian Institute of Technology in Kanpur, and the Telecommunications Standards Development Society, India (TSDSI).

The conclave in New Delhi demonstrated for the first time NextGen Broadcast technology on smart phones and other smart devices, apart from releasing a joint white paper on Direct to Mobile Broadcasting by IIT Kanpur, TSDSI and Prasar Bharati.

Prasar Bharati CEO Shashi Shekhar Vempati spoke of the need for global cooperation and global adoption of D2M, citing the example of how WIFI became a ubiquitous experience after a consortium and industry bodies got together to achieve it.

There is a need to create similar ubiquity of experience and standards for Direct to Mobile broadcasting, he said. The white paper released at the conclave envisions realising Direct to Mobile Broadcasting capabilities by convergence of Direct to Mobile and 5G Broadband and makes recommendations for various stakeholders to act on to achieve this.

The Principal Researcher at the Electronics and Telecommunications Research Institute (ETRI) Sung-Ik Park mentioned how earlier this year, Korean broadcasters and the Korean government got together and discussed how to implement Direct to Mobile broadcasting in Korea. He also listed the reasons why Advanced Television Systems Committee (ATSC) 3.0 technology is most suitable for Direct-to-Mobile broadcasting. [ABU News]

SINGAPORE CONCLUDES LARGEST TECH EVENT SINCE BORDER REOPENING

Asia Tech x Singapore (ATxSG) concluded after four successful days of events at the Singapore Expo and The Ritz-Carlton Millenia Singapore from 31 May – 3 June. As Singapore's largest technology event since the reopening of its borders, ATxSG brought together 16,600 hybrid attendees from 93 countries and regions and 26,000 event visits. The Singapore Expo also hosted 600 exhibitors showcasing the latest tech products and services and more than 350 speakers who shared expert insights across 200 conference sessions.

ATxSG presented attendees with insights from top-notch thought-leaders from the public and private sectors, covering the latest technology trends, challenges, and opportunities arising from the ongoing digitalisation of the economy.

Notable speakers for the exclusive by invitation-only ATxSummit included Mr. Heng Swee Keat, Singapore's Deputy Prime Minister and Coordinating Minister for Economic Policies, Mrs. Josephine Teo, Singapore's Minister for Communications & Information, and senior executives from the world's biggest and fastest-growing technology companies such as Amazon Web Services, Carousell, Epic Games, Grab, Google, IBM, Lazada, Microsoft, Ping An Group, Samsung Electronics, Sea Group and The Ant Group.

Tony Blair, former Prime Minister of Great Britain and Northern Ireland, and Executive Chairman of the Tony Blair Institute for Global Change, also made an appearance on-site at the ATxEnterprise Headliners to discuss the ongoing technology revolution and how governments and industries can best leverage technology to aid global change.

Attendees at ATxEnterprise were also treated to technology showcases from exhibitors from Singapore and across the world, many of whom launched innovative products during the event, designed to meet the unique needs of Asia's enterprises. Participating exhibitors also inked several memoranda of understanding (MOU) and made announcements that reaffirmed Singapore and Asia's continued attractiveness to global digital-first disruptors, being a region home to some of the world's largest and fastest growing digital economies. [asiatechxsg.com]

NHK STRL DEVELOPS LIGHT FIELD HEAD-MOUNTED DISPLAY FOR COMFORTABLE VR VIEWING

NHK Science & Technology Research Laboratories (STRL) has developed a head-mounted display (HMD) enabling users to view natural 3D images and reduce visual fatigue. Using light field technology makes it possible real-world-like reproduction of the light reaching the eye from an object.

NHK STRL has conducted research on HMDs and other virtual reality (VR) viewing devices as a future media technology. Conventional HMDs provide a stereoscopic effect by projecting parallax images to the left and right eyes; however, because the focus of the eyes is fixed on the display, the perception is unnatural and is thought to cause visual fatigue.

In the light field HMD developed in this study, a lens array with many micro lenses is placed in front of a display, and the display shows small images of subjects (elemental images) corresponding to each lens. In this method, the eyes unconsciously adjust the focus position according to the depth position of the subject as in the real world, and natural 3D viewing can be achieved, which is expected to reduce visual fatigue.

Additionally, in light field HMDs, the 3D image generated between the lens array and eyepiece can be magnified by the eyepiece, but the problem is that the depth is large. Here, by forming the 3D image as a virtual image outside the display, we successfully reduce the distance between the lens array and eyepiece,

making it possible to reduce the size to that of a conventional HMD.

In the future, NHK STRL will improve the quality of 3D images by optimizing optical systems such as lens arrays, and verify display characteristics through evaluation experiments, aiming to realize a device that enables more comfortable VR viewing. [NHK STRL]

NZ GOVERNMENT BOOSTS RNZ PACIFIC CAPABILITIES

New Zealand's government has announced an NZ$4.4 million capital grant for RNZ Pacific. The grant is to provide capital funding for a new shortwave transmitter for New Zealand's international broadcasts to the Pacific. RNZ Chief Executive and Editor-in-Chief Paul Thompson has welcomed the budget investment in RNZ Pacific shortwave transmitters.

RNZ Pacific broadcasts into the wider Pacific on shortwave 24 hours a day, collaborating with 22 broadcasting partners across the region. Its current primary transmitter is nearing end of life, and its other transmitter has in effect already been retired.

RNZ Pacific broadcasts enhance the Government's Pacific strategy as we share our history, culture, politics and demographics. The strategy is underpinned by the building of deeper, more mature partnerships with Pacific Island countries, and by supporting their independence and sustainable social and economic resilience.

Since the ABC ceased its shortwave broadcasting the only other shortwave broadcaster in the region is China Radio International. Thompson says RNZ can now start work on its infrastructure development with a new transmitter likely to take approximately 12 months to get in place, subject to further project planning.

The current primary transmitter is a 100kW DRM-capable shortwave transmitter, operating from the Rangitaiki transmitting station on New Zealand's North Island. The transmitter, manufactured by Thomson Broadcast, was installed in 2005. The site is fed by a digital link from the Wellington headquarters of RNZ, 400km south of the transmitting site. The site has antennae manufactured by TCI. [aib.org.uk]

FBC REVAMPS WEBSITE AMIDST CELEBRATION

The Fijian Broadcasting Corporation has launched its redesigned FBC News website. Chief Executive, Riyaz Sayed-Khaiyum says the website will place greater emphasis on sports this year as thousands of fans converge in stadiums after the pandemic lockdowns.

Sayed-Khaiyum adds the unique design allows both news and sports enthusiasts to easily navigate the website and access information of their choice side by side. For April, the FBC News website had nine million page views and 26 million in the first three months of 2022.

The CEO says with increased dynamic and animated advertising spots, businesses will see tangible benefits from advertising on the home page and all story pages. The FBC App which was launched last year and is the country's highest rating App, now has 48,000 installations.

FBC has also embarked on the refurbishment of its FM transmission sites. FBC's Director of Technical Operation, Nitendra Prasad says with double the power, radio stations now sound much better.

FBC News also celebrates a milestone completing a decade as the highest-rated TV news service in Fiji. Sayed-Khaiyum adds to cater for the increased outside broadcast, FBC is now offering live OBs on social media. Meanwhile, the 2022 FIFA World Cup in Qatar will also air LIVE and EXCLUSIVE on FBC Sports channel. [fbcnews.com.fj]

MEASAT-3D TO BRING HIGH-SPEED BROADBAND TO RURAL MALAYSIA

Malaysia's premier satellite operator, MEASAT Global Berhad, has announced that it is launching MEASAT-3d, the most advanced satellite in its fleet. The satellite will close the digital gap in rural areas of Malaysia, helping bring high-speed broadband to large numbers of people living in remote parts.

MEASAT's CONNECTme NOW will connect 10,000 sites in the next three years to serve more than two million people in remote areas that currently have no or limited access to high-speed broadband internet. To date, MEASAT has rolled out more than 3,000 CONNECTme NOW sites nationwide, most in remote areas of Sabah and Sarawak.

In addition, other telecommunications providers can tap into the new satellite to offer data, voice and video services to the last 3 to 5 percent of the population not yet covered by fibre connectivity or wireless broadband.

The MEASAT-3d satellite, costing around US$273 million, uses the Eurostar 3000 built by Airbus. It is scheduled to be launched on an Ariane 5 rocket from the European Spaceport in Kourou, French Guiana. It will complement the co-located MEASAT-3a and MEASAT-3b satellites at the 91.5° East orbital hotslot, replacing old capacity and building resiliency for MEASAT's fleet. [ABU News]

REDTECH SUMMIT SHIFTS BROADCAST STRATEGIES

The inaugural RedTech Summit took place in Paris, June 2–3, against the backdrop of fundamental change in the audio broadcast industry. The close-knit meeting of business and technical leaders agreed the time had come to put aside competitive differences and forge collaborations and partnerships that would secure the industry's future. Furthermore, such partnerships should extend beyond the familiar and comfortable. Streaming platforms are shifting their offering – they're gunning for live radio's intimate, connective appeal.

The Summit, held simultaneously with the Paris Radio Show, cemented what the leaders suspected: they were not alone in their take. CEOs and CTOs from Germany, India, Belgium, Canada, Morocco, Uganda, Poland, the Czech Republic, Germany, France, Sweden, Turkey, Dubai, Namibia, Austria, Switzerland and the United States found commonality not only in challenges, but in purpose.

For this reason, they openly exchanged ideas on what they were doing in their respective markets, what had worked, what hadn't, and some of the lessons they had learned. They agreed it was now time to rethink radio's positioning and standard models of practice. Radio was not in decline; it was in transition. Linear radio and digital content production and distribution are not in competition; they're complementary. Creatives and tech should collaborate to define the direction of broadcast technology design, not compete for influence. And building a successful and sustainable broadcast culture within a station or group comes from the bottom up; it's not forged in boardrooms. [RedTech.Pro]

TVU ENABLES MEDIACORP REMOTE COMMENTARY FOR SE ASIAN GAMES

TVU Networks, the provider of cloud and IP-based live video solutions, has announced the first high-profile deployment of its TVU Remote Commentator cloud-based remote commentary platform in the Asia Pacific region. As the official sponsor of the 31st Southeast Asian Games and the technical partner of Mediacorp, Singapore's largest national media group, TVU provided the solution, TVU Remote Commentator, to enable live, remote commentary with announcers in different countries, synchronised to furnish a natural, conversational affect.

At the SEA Games, the TVU Remote Commentator proved the ideal cloud platform for collaboration of multiple commentators in multiple remote locations on a single production.

For the Philippines vs. Timor-Leste men's football match, for instance, Mediacorp created a live conversation between commentators at the IBC in Hanoi and at Mediacorp TV headquarters in Singapore. Using TVU Remote Commentator, each announcer was able to see the live game video, hear the others' commentaries, and hear audio from the stadium – all live and in sync. The result was a discussion that was as easy and natural as if they'd been together at the event. [Content+Technology]

TELSTRA BOOSTS CONNECTIVITY WITH SOUTHERN CROSS NEXT SUBSEA CABLE

Telstra announced that the first direct subsea cable to connect Australia with the US will be ready for service in July 2022. The Southern Cross NEXT cable (SX NEXT) will enhance connectivity between Australia and New Zealand and the US, with branching units to Fiji, Kiribati, and Tokelau. Telstra is a 25 per cent shareholder of the Southern Cross Cables Network (SCCN), the owner of SX NEXT.

SX NEXT will be the first single span express cable, and the first direct cable, to connect Australia to the US, making it the shortest subsea route. It is also the only cable that has landing stations in Tokelau and Kiribati in the Pacific Islands. SX NEXT has a four-fibre pair cable system capable of transporting 72Tbps, a remarkable addition to the current bandwidth and connectivity options linking Australia and the South Pacific Islands to the US. The cable is built using up to 400G Dense Wavelength Division Multiplexing (DWDM) technology and purpose-built landing stations, which will deliver high-speed connectivity and low latency between countries, as well as a resilient network infrastructure for the Pacific region.

There are 12 international submarine cables connecting Australia to the rest of the world, and the SX NEXT cable will be the third cable in the SCCN ecosystem. The SX NEXT cable is among the largest single submarine cable infrastructure projects in the world which spans approximately 15,857 kilometres along the sea floor. SX NEXT complements the existing Southern Cross and Endeavor-AAG cable systems in connecting Australia and the US. The redundancy of the Southern Cross cables with SCCN creates seamless, efficient paths from Australia into Asia-Pacific, the US, and beyond. [telstra.com.au]

IDEAL SYSTEMS AND MO-SYS PARTNER ACROSS ASIA AND THE MIDDLE EAST

Ideal Systems is working with Mo-Sys Engineering, the developer of virtual production (VP), remote production and image robotics solutions, to drive forward the adoption of virtual and augmented reality production in broadcast across Asia and the Middle East.

Ideal Systems has been a leader in media solutions for more than 30 years. From its head office in Hong Kong, it brings a wealth of experience together with a presence in 10 countries. It provides consultancy, design, integration, installation and continuing support for many major names in broadcasting, media production and technology.

Mo-Sys has driven forward the emerging technologies of virtual and augmented production for 25 years. Pioneers in camera tracking with its StarTracker system, and in camera robotics, the company can now deliver turnkey systems through its VP Pro graphics systems. Mo-Sys has been instrumental in the extensive use of realtime augmented reality and virtual studios in broadcast, and in the growing use of LED walls and LED volumes for movie production and for live events. [idealsys.com]

ASTRO PIONEERS INNOVATIVE ADDRESSABLE TV ADVERTISING

Malaysia's leading content and entertainment company, Astro Malaysia Holdings Bhd (Astro) is leading the way in innovative TV Advertising with its new Addressable Advertising service, the first in Southeast Asia. Ushering in digital-style targeting on TV by leveraging Astro's first-party data, advertisers and brands will be able to showcase different advertisements to different households who are watching the same programme.

To reach the right consumers and capture their attention against a vast landscape of evolving media, as consumption habits become increasingly sophisticated, Astro Addressable Advertising combines the unparalleled scale of attention and emotional engagement of TV with precise targeting and advanced campaign measurement focusing on the audience, delivered at scale in a premium brand-safe environment.

With this flexible and effective service, advertisers have a data-driven targeting and measurement capability to boost ad performance through audience data expansion, giving

brands the opportunity to access a richer set of audience descriptors, based on first party data. Meanwhile, viewers enjoy a more personalised and relevant experience as they see ads that reflect their local community and profile.

Astro's platform-agnostic strategy generates a rich and holistic view of its customers' video consumption habits across Linear TV, Video-on-Demand and Astro GO. [astro.com.my]

THAICOM SIGNS CLOUD VIDEO DEAL WITH AWS, LEO DEAL WITH GLOBALSTAR

Asian satellite operator Thaicom Public Company Limited has signed an agreement with Amazon Web Services, Inc. (AWS) which will allow Thaicom to produce high-quality video streams for distribution to its national and worldwide customers.

Under the agreement, Thaicom and AWS will collaborate on building and deploying Thaicom's first cloud-based satellite TV broadcast distribution platform for Asia Pacific. The broadcast platform will consist of cloud services providing software-defined encoding, transcoding, and statistical multiplexing capabilities leveraging AWS Elemental media services. Thaicom is using AWS Elemental media services to help scale its business, enhance customer experiences, and support development of Thailand's broadcast industry landscape.

Thaicom is also using AWS to help establish its earth observation data analytics platform and to support Thaicom's new space economy initiative. Using AWS to help power the Thaicom data analytics platform will also help diversify Thaicom's reach across new verticals including government and private sectors in agriculture, maritime, energy, healthcare, and education. By working together, Thaicom and AWS can help Thaicom's customers easily ingest data from space and provide analytics from satellite imagery for business owners to leverage and make fast business decisions.

The cloud deal comes hot on the heels of a partnership agreement between Thaicom and Globalstar, Inc., a global Low Earth Orbit (LEO) satellite operator and provider of satellite IoT solutions and mobile satellite services, to collaborate on the establishment and operation of Globalstar's LEO ground facilities in Thailand and regional commercial service deployment, with a focus on personnel safety and management solutions for Thailand's Tourism and Maritime industry. [Content+Technology]

NINETY PERCENT OF SOUTH KOREA'S POPULATION READY TO USE 5G

South Korea has established itself as the early market-leader for 5G technology deployment with 90% of the Korean population ready to use 5G, according to global technology and telecom analyst Omdia's 5G Market Progress Assessment. To date, 5G adoption in the country has grown to 4.67 million, which Omdia attributes to strong government support and a vibrant supplier ecosystem.

The three leading Korean service providers have all made available commercial 5G mass-market offerings, and mobile virtual network operator (MVNO) services have been launched in the country using 2680MHz of 5G spectrum across the 3.5GHz and 28GHz bands. Earlier this year, Korean TV and radio network SBS (Seoul Broadcasting System), using LiveU's integrated 5G technology, provided a live broadcast of the election day coverage in South Korea using Korea Telecom's network.

LiveU's devices were used to cover the polling stations, major candidates' offices and reactions to the election results under the strict safe distancing measures in place due to the Covid-19 pandemic. All the live feeds were streamed to a single server and completely synched, operating as part of a cost-effective, remote at-home production model.

Omdia's 5G report analysed 22 leading 5G countries' deployment of 5G technology, assessing the progress of 5G based on operator launches, network coverage and subscriber take-up, as well as 5G spectrum availability and the regulatory ecosystem. Data was collected during end-December period and was originally due for publication in mid-March, but was delayed till June due to Covid-19.

MALAYSIA'S RADIO IKIM UPGRADES TO DHD SX2 MIXING CONSOLE

Radio IKIM, Malaysia celebrates its 21st anniversary this year with a major upgrade to the audio production facilities at its studio headquarters in Kuala Lumpur. Launched on July 6th 2001, Radio IKIM is owned and operated by the Institute of Islamic Studies Malaysia. It was the first Islamic radio channel in Malaysia to broadcast 24 hours per day. Transmitted nationwide on FM, Radio IKIM also reaches listeners in Singapore, Indonesia, Brunei and southern Thailand.

The project centred on upgrades to the master control room and two live-to-air studios, connected via a DHD XC2 DSP core. Installation and commissioning were coordinated by DHD's Malaysia distribution partner Stagetec Asia in cooperation with local system integrator HD Solution.

A modular mixing console designed for radio and other broadcast applications, the DHD SX2 is is based on a central module with four faders plus a control section including monitoring and talkback. The SX2 series also includes a fader module with six motorised faders. The central control module gives access to the most important audio inputs and outputs. A microphone input and headphone output are also included. Loudspeakers can also be connected directly to this unit. The fader module allows the addition of a second layer accommodating up to 16 channels. Central and fader modules each incorporate a 10.1 inch multi-touch display showing relevant configuration and operating parameters. Each SX2 unit is a standalone table-top device which can be chained with others to create a single mixing desk. SX2 features can be extended simply by adding optional license codes to the DSP core. This allows extra faders, busses and clean-feeds. Functions such as loudness metering, profanity delay and talkback to other DHD mixers are also supported. [dhd.audio] ■

DIGITAL BROADCASTING Updates

WBU UPDATES CYBERSECURITY RECOMMENDATIONS FOR MEDIA VENDORS' SYSTEMS, SOFTWARE AND SERVICES

The World Broadcasting Unions (WBU) updated cybersecurity recommendations which reflect the performance aspirations of both organizations in media vendors' systems, software and services.

Based on the original work by the European Broadcasting Union (EBU) and North American Broadcasters Association (NABA), these recommendations are intended to create a dialogue with media vendors with the goal of their achieving more consistent and effective compliance with cybersecurity best practices.

The WBU has also identified cybersecurity recommendations considered as high priority with categorisation. This recommendation provides the minimal set of security requirements for broadcast equipment vendors. More specific requirements available in other regional specifications such as the EBU R143 or NABA's Cybersecurity requirements may augment these recommendations for regional compliance. [WBU News]

NHK STRL RESEARCHES SCREENS THAT CAN BE ROLLED UP

NHK Science & Technology Research Laboratories (STRL) are conducting research into flexible displays that can be carried around rolled up, attached like posters and installed with bends. There is a wide range of applications for the display, including, not only making it easy to transport, install and store large screens using thin and light flexible displays, but also enabling easy shape changing from a flat panel to an immersive curved panel display.

The display is intended for use when one or more people are watching TV on a large screen and as an immersive experience for games, online meetings and tours. The display used in the research has a panel size of 30 inches, a panel thickness of around 0.5mm, and a display-part weight of around 100g.

It was created by forming organic light-emitting diode (OLED) elements which glow red, green and blue when a current is passed through them with high precision on thin plastic film. The researchers note that although the OLED display used in the research makes it possible to enjoy high-quality video with high contrast levels, degradation such as burn-in tends to occur over the passage of time. [ABU News]

EBU ANNOUNCES WINNERS OF 2022 EBU TECHNOLOGY & INNOVATION AWARDS

Spanish EBU Member RTVE has won this year's EBU Technology & Innovation Award for their '5G and beyond' project, and Petri Karlsson from Finnish broadcaster YLE took the Young Technology Talent of the Year Award. The awards were presented at the EBU Technical Assembly, hosted by France Télévisions in Montpellier.

The Technology & Innovation Awards encourage outstanding technical solutions developed by EBU Member organizations. The Young Technology Talent of the Year Award honours innovations or new concepts in media technology proposed by individuals at student or junior employee level. Winners are decided in a blind vote by the EBU Technical Committee. The Awards are given annually.

RTVE's long-running '5G and beyond' project creatively leverages several key concepts and features of future mobile technology for a production and news gathering solution that can deliver many of the potential advantages of 5G with existing infrastructure.

CBC/Radio Canada came second with their project 'New Maison de Radio-Canada featuring end-to-end Media-over-IP', and SVT third with their project on 'Cloud and internet-based distributed production'. [EBU News]

WORLD TELECOMMUNICATION DEVELOPMENT CONFERENCE FORGES PATH TO MEANINGFUL GLOBAL CONNECTIVITY

The World Telecommunication Development Conference (WTDC) concluded with the adoption of a forward-looking agenda to address the global connectivity gap that has kept 2.9 billion people around the world from using the Internet.

Organized by the International Telecommunication Union (ITU) between 6 and 16 June, WTDC welcomed 2,152 participants in total, representing 150 Member States and 340 Sector members and partners, with 1,304 delegates present in the Rwandan capital, and another 848 joining the meeting remotely. The focus of the event was 'Connecting the unconnected to achieve sustainable development'.

The Kigali Action Plan agreed at the conference charts a course for digital development that aligns closely with the Sustainable Development Goals (SDGs) set out by the United Nations for 2030. It also defines the workplan of the ITU's Development Sector (ITU-D) until the next WTDC. [ITU News]

OFCOM URGES TECH FIRMS TO KEEP WOMEN SAFER ONLINE

Real-world concerns about women's safety and wellbeing are mirrored in the online world, according to figures from a major study into the UK's online lives.

Published by regulator Ofcom, the study reveals that women are less confident about their online safety than men, more negatively affected by discriminatory, hateful and trolling content, and feel less able to have a voice and share opinions online.

Ofcom is calling for technology firms, who build the sites and apps used by millions of people in the UK, to act to make the online world a safer space for women and girls. UK women are avid users of social media platforms, spending more than a quarter of their waking hours online). But for many women, life online is not always a

positive experience, said Ofcom. [IBC News]

beIN ASIA PACIFIC SELECTS GLOBECAST FOR MANAGED MEDIA SERVICES

Globecast, the global solutions provider for media and content management, has announced that renowned sports content provider beIN ASIA PACFIC has selected Globecast to provide multifaceted media processing and delivery services to the sports provider's Asia-Pacific division.

beIN ASIA PACIFIC operates in 11 countries across the Asia-Pacific region – Australia, New Zealand, Cambodia, Hong Kong, Indonesia, Laos, Malaysia, Philippines, Thailand, Timor-Leste and Singapore. beIN offers a comprehensive line-up of live sporting events through its channel, beIN SPORTS and live streaming app, beIN SPORTS CONNECT. With 15 unique channel feeds, beIN offers fans extensive live sports coverage in Thai, Bahasa, Cantonese and English. beIN SPORTS is available on major pay-TV platforms in the region.

Globecast will be providing a wide range of services including cloud and on-prem playout, sports contribution services and content management. The company is also supplying satellite, fibre and IP streaming distribution. Globecast will also host the sports provider's OTT platform for the region as well as providing the ability to create and distribute pop-up channels as and when required.

Globecast is very well set up for sports content and channel providers, with its Asian operation benefitting from breakout rooms specifically designed to integrate additional sports feeds into a live channel. Live commentary and editing capabilities, Live camera position, alongside AR advertising, are also available as services. [globecast.com]

TVU ENABLES GLOBAL LIVE LINK-UP FOR CHINA'S NINGBO TV

TVU Networks, the provider of cloud and IP-based live video solutions, has announced that Ningbo TV (NBTV), part of China Central Television (CCTV), used its solutions to host a live, large-scale media campaign delivered to over 1000 media organisations around the world.

Situated near the Hangzhou Bay in Zhejiang, China, the port city of Ningbo serves as the eastern port of the "Maritime Silk Road", playing a key role in China's cultural and commercial connection to the world.

To honour its deep ties to the ocean and affirm the city's ongoing role in global commerce, NBTV hosted "Ningbo: Setting Sail to Embrace the World", an interactive media event that linked 15 historic coastal cities from around the world. Dozens of overseas guests took part in high-level interviews, speeches, and presentations celebrating the importance of the ocean to people everywhere.

NBTV needed to ensure that audio/video transmissions from remote and overseas locations met the network's high standards. Production teams also wanted to guarantee guests from any location could interact and participate in discussions and presentations as if they were in the same room – without fluctuations in latency.

TVU One and TVU Partyline addressed both challenges. TVU One mobile transmitters allowed journalists to bring live, synchronised coverage of events from different locations around the world with virtually zero latency. For example, TVU One helped reporters gather and transmit footage from the event's opening ceremony, which was held simultaneously in multiple locations integral to Ningbo's historic and coastal roots. With TVU One, journalists seamlessly transmitted live footage and commentary from the opening ceremony to NBTV stations and other media organizations around the globe. [Content+Technology]

VIETNAM'S MYTV MAKES MOVE TO PRIVATE CLOUD WITH ATEME

Ateme, the provider of video compression and delivery solutions with innovation, has announced it has virtualised the headend of MyTV, a subsidiary of VNPT, the second biggest telecommunications operator in Vietnam.

To enable the virtualised headend, Ateme used its native cloud-based TITAN software suite, composed of its multiscreen linear encoders and linear multiplexers with scrambling capabilities. The virtualisation of the headend is a first step in the migration of all MyTV's IPTV and OTT services to a private cloud, to reach more than 2.5 million subscribers with a simpler workflow.

The virtualised headend delivered by Ateme includes future-proof technologies such as the CMAF standard to enable low latency, SDI over IP, and Dynamic Ad Insertion capabilities for better monetization with targeted advertising. These technologies also make it a flexible headend that can expand easily. Based on containerised software orchestrated by Kubernetes, the headend runs on a private cloud. [Content+Technology]

MBC, KOREA TO USE THE LG U+ NETWORK AND MEDIA LINKS SOLUTIONS

Media Links, the manufacturer of media over IP transport technology, has announced a new agreement with South Korean telecommunications operation, LG U+. Media Links will provide the hardware and software for LG U+ to build out its new nationwide 4K/2K/HD/UHD media network backbone that will provide media transport services to one of Korea's largest broadcasters, MBC-Munhwa Broadcasting Corporation.

The Media Links MD8000 Media over IP Transport Platform and ProMD EMS Enhanced Management Software will ensure that LG U+ can deliver high-quality, low-latency video and media content to its broadcast customers within an infrastructure designed for better performance and efficiency. MBC, Korea will use the LG U+ network and Media Links solutions to transport broadcast content to and from its nationwide network of regional stations.

The MD8000 media transport platform offers both equipment and network redundancy with seamless protection switching, error correction, low-latency, and bi-directional operation. The MD8000 suite of products is an adaptable solution for transporting uncompressed or

compressed 4K, 2K, 3G, HD, SD-SDI video and audio, as well as data. ProMD EMS software provides the ability to provision and monitor media services, manage network activity as well as detect and isolate equipment problems. [medialinks.com]

COMMERCIAL RADIO CALLS FOR URGENCY IN REGULATING BIG TECH

Moves to curb the influence of tech giants have taken a step forward, with commercial radio's peak industry body calling for mandatory codes to regulate the business behaviour of the big four – Google, Meta, Amazon and Apple. It is warning of irreparable damage to Australian media businesses due to the expansion and market dominance of tech giants.

In a submission to the ACCC, Commercial Radio Australia has called for urgent regulations to stem the anti-competitive behaviour of big tech. CRA chief executive officer Ford Ennals says the need for rapid reform can't be overstated. CRA's submission is in response to the ACCC's discussion paper on updating competition and consumer law for digital platform services. The ACCC is due to make recommendations to Government in September.

In its submission, CRA has proposed that a new part of the Competition and Consumer Act should be introduced to mandate codes for Google, Meta, Apple and Amazon. Maintaining free access to radio on smart speakers is of particular concern to the industry and the CRA has urged the ACCC to look at digital platform dominance within that market sector.

The CRA is advocating for mandated codes for tech companies to create more interoperability with their platforms. This would enhance market competition and also offer choice for consumers who are often locked into specific digital ecosystems. [radiotoday.com.au]

ASTRO WINS ANALYTICS AWARD FOR BROADCASTING

Astro Malaysia Holdings Berhad (Astro) won the Analytics - Broadcasting award in the Analytical Capabilities for Personalising Digital Advertising & Content category at the Malaysia Technology Excellence Awards 2022.

In its pursuit to enhance users' experience, Astro seeks to understand and identify customers' preferences leveraging technology and its first-party data to create a more relevant context for advertisers and personalised content for customers across Astro's TV, radio and digital platforms.

In its fourth year, Malaysia Technology Excellence Awards recognises exceptional companies who are riding the disruption wave and leading the technological revolution and digital journeys of their respective industries. [astro.com.my]

LIVEU ACQUIRES ITS OCEANIA CHANNEL PARTNER, PACIFIC LIVE MEDIA

LiveU has announced the acquisition of its longstanding channel partner, Pacific Live Media (PLM) as part of its strategy to get closer to its customers in key markets. Chris Dredge, PLM's Managing Director, has been representing LiveU and its solutions for many years, supporting leading broadcasters, sports organisations, production companies and online media in Australia, New Zealand and the Pacific Islands.

The announcement follows last year's successful acquisition of LiveU UK partner Garland Partners Limited as the Company increases its direct presence in specific regions. Over the last couple of years, LiveU has seen strong growth in the APAC region, especially in Australia, with increasing demand for LiveU cloud-based and hybrid live video solutions for news, sports and other live productions. [liveu.tv]

WORLD SUMMIT ON THE INFORMATION SOCIETY PUTS TECHNOLOGY AT FOREFRONT OF SUSTAINABLE DEVELOPMENT

Leaders and decision-makers in the rapidly evolving digital sphere have affirmed their commitment to harness new and emerging technological solutions for the good of all of humanity. This year's World Summit on the Information Society (WSIS) Forum, building on a wide-ranging international policy discussion process started in 2003, reasserted the vital link between digital technologies and global action to ensure sustainable development.

Information and communication technology (ICT) experts and implementers fostered ground-breaking partnerships, showcased the latest innovations, exchanged best practices, and announced new tools and initiatives in Geneva, Switzerland.

This year's programme aligned internationally agreed WSIS Action Lines more closely than ever before with the Sustainable Development Goals (SDGs) set by the United Nations for 2030. Key linkages include digital solutions to protect and advance indigenous languages, support older persons, and create employment, as well as step up climate and environmental action, promote inclusion for youth and older persons, and ensure gender equality and accessibility for all. [ITU News]

CRA AND TRITON DIGITAL SIGN THREE-YEAR PODCAST RANKER DEAL

Industry body Commercial Radio Australia has signed a three-year agreement with Triton Digital to continue publication of the Australian Podcast Ranker through to March 2024.

The partnership will see Triton Digital continue to publish the monthly report on the top 100 podcasts in Australia, provide data on listener numbers and monthly downloads, and further develop the australianpodcastranker.com website.

The ranker is produced in accordance with IAB Tech Lab's Podcast Measurement Guidelines and reports on the most popular Australian and international podcasts in the country among participating publishers across radio, TV, print and independent producers. [Content+Technology] ■

Equipment Trends

FOR-A MFR-3100EX

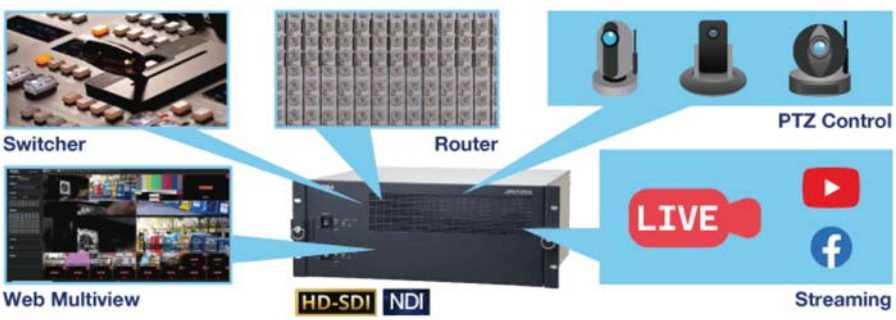
MFR-3100EX is 4RU-sized all-in-one production processor and FOR-A's new IP workhorse. Optionally includes all the functions of: switcher, multi-view, PTZ camera control, NDI® support and streaming (RTMP and SRT support).

The MFR-3100EX configures a matrix of up to 64x72, with up to 4 inputs/4 outputs for 8K signals or 16 inputs/18 outputs for 4K UHD. Multiple units can be used together, enabling matrix expansion and redundancy. All input channels may be monitored via web browser, and optional functionality like frame synchronization, AVDL, and audio MUX/DEMUX is a simple matter of adding an expansion card to an input or output slot.

Support for 3G/HD/SD-SDI and DVB-ASI input and output. No need to worry about signal formats, there is an auto signal detection. Add up to 8 inputs cards and up to 9 outputs card, with 8 channels per card. Can mix and match non-SDI modules as needed. Optimizes the system to install frame synchronizer function for input, and ADVL function and SRC function for outputs. Audio MUX and DEMUX functions also offer greater video and audio compatibility.

Up to 2 outputs/16 split-windows are available with an optional MFR-16MV installed. Unlike conventional systems that require allocation of 1 output per window displayed by an external multi viewer, this functionality reduces multi viewer output allocation to 1 output per monitor. Up to 16 split-windows and 2 types of clock display are supported.

https://www.for-a.com/



EVS CEREBRUM BROADCAST CONTROL & MONITORING SYSTEM

As a complete Broadcast Control System (BCS), Cerebrum gives you control over your most critical broadcast operations. Accessible via one application, the system's powerful and highly customizable interfaces allow you to control, configure and monitor any broadcast environment the way you want. Cerebrum is designed to be robust in both small to large infrastructures and adapted for SDI and IP, offering you a scalable solution that is ready for today's and tomorrow's operations.

Users are free to modify the interfaces' default templates or design their own for a highly customizable experience, both on a live system as well as offline at home using snapshots of the system. Built on a database system, Cerebrum can handle many operational commands in milliseconds. It lets you access all of the configuration information from one place, making it especially advantageous for larger systems with many devices and clients. Manage simple to complex workflows, both for SDI and IP environments.

An extensive list of APIs and protocols ensures compatibility with almost any third-party broadcast device. You don't buy device specific drivers or licenses. Instead you buy a number of device points which you can use for any device, using any of the more than 180 included protocols. Besides controlling conventional SDI environments, Cerebrum is fully capable of

managing IP infrastructures. With the IP Core license, it even becomes your infrastructure's SDN.

https://evs.com/

VIZ VECTAR PLUS

Viz Vectar Plus provides anywhere-access to software-based enterprise-grade 4K switching in the cloud that helps national and regional broadcasters produce better content and more of it, reduce production costs and environmental impact, and quickly react and adapt to changing production needs.

With built-in media players, recording, streaming, audio, and graphics control, Viz Vectar Plus effortlessly masters the art of reaching more audiences with aspect ratio, resolution, and frame rate independence, providing simultaneous delivery for distribution to multiple destinations supporting various screen types. A re-entry function makes delivering different versions of programs with alternative, additional, or modified elements to different outputs easy. Viz Vectar Plus employs a software model, integrating standard computing and network infrastructures with NDI® IP integration and optional SMPTE 2110 connectivity.

Deployable on-premises, in the cloud, or as a hybrid solution, Viz Vectar Plus improves production quality by letting you use your best team for each production and incorporate millions of NDI® sources for the most engaging content, reduce travel costs and CO2 emissions, and easily spin up new production capacity to meet temporary and permanent changes in demand.

As an NDI-native system, Viz Vectar Plus uncomplicates the ability to create engaging content from anywhere by incorporating millions of audio and video sources, while integration with NDI® Remote turns any mobile device into a live production camera for unparalleled production flexibility.

Supporting 44 video and 44 audio channel inputs, Viz Vectar Plus offers the largest input scale for cloud-ready vision mixing available on the market. Dynamic and powerful macros capabilities also allow operators to deliver complex productions effortlessly, NDI Genlock guarantees consistent timing between cameras, and Alpha Channels can be sent through MIX outs, bringing post-production closer to live.

Powerful built-in web streaming capabilities support a choice of connection types, resolutions, and providers, while simultaneous encoding of up to three channels in anything from HD to UHD offers greater flexibility. Bring in remote contributors easily with Live Call Connect, integrating with popular video communication applications.

Viz Vectar Plus supports 44 audio channels and extends audio workflows though an NDI plug-in that interconnects with audio mixing and processing applications that can be entirely virtualized and interoperates with Dante/AES 67 formats.

Mitigate the risk of poor remote audio quality with Viz Vectar Plus's Neural Voice Isolation. Powered by Viz AI, Neural Voice Isolation uses artificial intelligence to automatically detect voices and clean the audio so that remote callers can be clearly heard in loud environments.

Viz Vectar Plus includes unique program re-entry functionality making it simple to output multiple versions of the same program with differences in graphics presentations, aspect ratios, and resolutions.

Viz Vectar Plus offers agile control options with software and hardware control panels operating across various networks.

https://www.vizrt.com/

CANON CN-E20-50MM T2.4 L F / FP

Introducing the new standard. Breath-taking image quality that is perfect for 4K productions. Available in EF and PL mount and designed for use on large-format 35mm and Super35mm cameras, this premium high-end full frame cinema lens offers a constant maximum T-stop value of 2.4 across the entire zoom range. Advanced Lens Metadata Support includes Cooke / i Technology™ and Zeiss eXtended Data™ protocols.

The lens produces superb colour rendition and detail, with sharp images from the centre to the outer edges, perfect for 4K HDR capture. 11 aperture blades create soft beautiful light rays and stunning depth of field falloff, whilst an internal focusing system delivers minimised focus breathing and excellent parfocal performance. The lenses render the beautiful and warm colour tones synonymous with Canon's cinema lens family.

With a consistent light transmission of T2.4 throughout the zoom range, the Flex Zoom series offers a broad focal range from the wide-angle CN-E20-50mm T2.4 L F / FP, to the mid-focal range of the CN-E45-135mm T2.4 L F / FP. These lenses are the ideal pairing to cover a wide range of shooting situations. The CN-E20-50MM T2.4 L F / FP is available in either EF or PL mount, to give greater flexibility and versatility for your production requirements. The lens is also interchangeable between EF & PL mount* providing even greater value and flexibility.

https://sg.canon/en

DJI MINI 3 PRO

The mini-sized, mega-capable DJI Mini 3 Pro is just as powerful as it is portable. Weighing less than 249 g and with upgraded safety features, it's not only regulation-friendly, it's also the safest in its series. With a 1/1.3-inch sensor and top-tier features, it redefines what it means to fly Mini.

Mini 3 Pro sports a completely new look that is optimized to get more out of every flight. With larger propellers, an aerodynamic body tilt, and a powerful obstacle sensing system, the streamlined design allows for increased flight time and safety.

The reimagined gimbal offers a wider rotation range for low-angle shots and True Vertical Shooting, allowing endless creative opportunities.

Every aspect of this facelift has been carefully considered to take Mini to never-before-seen heights. Capture and explore more of your surroundings with an extended flight time of up to 34 minutes.

DJI Mini 3 Pro's Intelligent Flight Battery is ultra-lightweight and has enough power to cover your aerial photography needs. The 1/1.3-inch CMOS sensor features dual native ISO and supports the direct output of HDR footage. Every image is enriched with a higher dynamic range to reveal more detail in highlights and shadows. Take your content to the next level with stunning 4K HDR video and 48MP RAW photos. Marvel at the rich clarity of every image, even as you zoom in. Or slow things down as the world gets hectic with dramatic 1080p/120fps slow-motion video.

DJI Mini 3 Pro is safest Mini from DJI to date. Equipped with forward, backward, and downward dual-vision sensors and an all-new aircraft design, it offers a broader sensing range and enhanced safety. Advanced Pilot Assistance Systems (APAS 4.0) detects objects in the aircraft's flight path in real-time. This allows DJI Mini 3 Pro to avoid obstacles, even in complicated environments.

https://www.dji.com ■

Personalities & Posts

Mr Shashi Shekhar Vempati steps down as ABU Vice President

Following the conclusion of his tenure as Chief Executive Officer of India's public broadcaster, Prasar Bharati, **Mr. Shashi Shekhar Vempati** has resigned from his position as Vice President of the ABU. After winning election to the position at that year's General Assembly, Mr. Vempati assumed the role of Vice President on December 16, 2020. Since June of 2017, he had served as Prasar Bharati's Chief Executive Officer.

Mr. Vempati spent a significant amount of time working for Infosys Technologies and later managed a digital news media start-up company called Niti Digital before becoming the CEO of Prasar Bharati. He has written numerous articles on a variety of topics, including politics, public policy, and emerging fields of technology, such as artificial intelligence and the convergence of broadcast and broadband. ■

NEW Member

Additional Full Member:

Special Broadcasting Service (SBS)

The Special Broadcasting Service (SBS) has joined the ABU again as an Additional Full Member. SBS was founded in 1973 and is headquartered in Sydney, Australia. SBS is a modern, multiplatform media organisation with a free-to-air TV portfolio spanning six distinct channels in SBS, NITV, SBS VICELAND, SBS Food, SBS World Movies, and SBS WorldWatch; an extensive radio network providing services in their own language to over 60 communities; and an innovative digital offering, including SBS On Demand, available to audiences anytime and anywhere. SBS is one of the five major free-to-air networks that are available in Australia. ■

IBC 2022 is back for another year, and it will be physically held this year between 9-12 September.

During this time, they will be releasing new solutions, showcasing exclusive feature improvements, sharing best practices, and more. RAI in Amsterdam will serve as the venue for this yearly gathering.

Register yourself here:
https://show.ibc.org/registration

Khabar Agency new Technical Liaison Officer

Ms. Erkezhan Bekenova has been appointed to the position of ABU Technical Liaison Offer for Kazakhstan's JSC "Khabar Agency".

Ms. Erkezhan currently holds the position of Senior Manager at the International Cooperation and Distribution Department. She attended the Moscow State Institute of International Relations, where she earned both her Bachelor's and Master's degrees in International Relations (MGIMO University).

She had extensive experience serving in diplomatic missions prior to beginning her employment with Khabar's distribution division in March 2022. Since she started working for the Khabar Agency, she has overseen the organisation's international cooperation, distribution, and broadcasting operations. ■

Wendy Everett ends her stint in ABU

In June, **Wendy Everett** came to the end of her tenure as Director of the News Department. She spent the previous 29 years working for the Australia Broadcasting Corporation before beginning her stint at ABU in 2018.

While serving as the News Director, Wendy placed a significant amount of importance on providing members with educational opportunities, particularly in the fields of mobile journalism, digital and social media skills, script writing, and fact checking. During the same time, she expertly navigated Asiavision through the COVID-19 pandemic, moving the majority of its activities online and ensuring that it served its members more effectively than ever before.

We will miss her vivacious spirit, boundless enthusiasm, unwavering support, and invaluable contributions to the ABU. We wish Wendy great success in her new adventure. ■

New Director of ABU News

Deborah Steele has taken up the position as News Director at ABU. Deborah was a member of the ABU News Group in the past, and chair the ABU Radio Working Party and the deputy chair of the ABU Programme Committee. She has spoken at a number of events and conferences hosted by the ABU.

Deborah served on the ABC News Executive for a period of five years, during which she made significant contributions to the strategic direction and policy development of the division. In addition to this, she conducted an analysis of the syndication of news, which led to the creation of new goods and services.

She oversaw Asia Pacific news and current affairs for the ABC's international services, the ABC's television news channel, and abc.net.au while serving as the head of the Asia-Pacific news team at the ABC from 2009 until 2017.

The first of July marked the beginning of her official tenure in this position. ■

MEASAT appoints a new Chief Commercial Officer and Associate Vice President

Ganendra Selvaraj
Chief Commercial Officer

Ganendra joined MEASAT for the first time in 2004 and graduated from the University of Kansas with a Bachelor of Science degree in Aerospace Engineering. Ganendra, who has worked in the field of telecommunications for close to 20 years, has held a variety of technical and commercial roles within MEASAT before being promoted to his current position.

In his new role, Ganendra will oversee MEASAT's Sales, Customer Engineering, Business Development and Corporate Communications functions. As a member of the Executive Committee of the MEASAT, he will concentrate on growing the MEASAT's customer base and expanding its commercial activities in order to provide support for the long-term strategy of the MEASAT Group.

Jeevan Rao
Associate Vice President - Network Engineering & Operations

Jeevan has been with MEASAT since 2008. He has a Bachelor of Engineering in Electrical Engineering (Mechatronics) from the University of Technology Malaysia and a Master of Science in Communications and Network Engineering from the University Putra Malaysia.

With nearly 25 years of experience in satellite communications, broadcasting, and telecommunications, he brings expertise in both space and ground segments; video broadcasting and DTH; and VSAT and cellular backhaul networks.

As part of his new responsibilities at MEASAT, Jeevan will be in charge of overseeing the Service Delivery, Network Management Centre, Remote Site Support, System Development, and Information Technology departments.

For more information, please visit www.measat.com ■

ABU TECHNOLOGY CALENDAR *of Events* 2022

11 APRIL — **ONLINE**
Training Course on Engineering Fundamentals for Broadcasters Online (Level 2)

29 APRIL — **ONLINE**
Webinar Series on Member Innovations

24-25 MAY — **ONLINE**
ABU Virtual Forum on Cybersecurity & Media

1-3 JUNE — **SINGAPORE/HYBRID**
Broadcast Asia 2022

25-27 JULY — **PHYSICAL**
Workshop on Cloud Applications for Broadcasters

28-29 JULY — **HYBRID**
ABU Technical Bureau mid-year Meeting

9-12 SEPTEMBER — **RAI, AMSTERDAM**
IBC 2022

20-22 SEPTEMBER — **ONLINE**
Webinar on IP Workflows and Remote Production for Broadcasters

10-12 OCTOBER — **ONLINE**
Webinar on Satellite Systems and Solutions for Broadcasters

25-27 OCTOBER — **PHYSICAL**
Workshop on Archiving and Media Management

25 NOVEMBER — **NEW DELHI, INDIA**
ABU Technical Bureau Annual Meeting

26-27 NOVEMBER — **NEW DELHI, INDIA**
ABU Technical Committee Meeting

29-30 NOVEMBER — **NEW DELHI, INDIA**
ABU General Assembly

NOVEMBER — **MAKUHARI MESSE**
Inter BEE 2022

ANNOUNCING THE NEXT

ABU Digital Broadcasting Symposium 2023

ABU DBS 2023

6-9 MARCH 2023
KUALA LUMPUR

Be a sponsor for DBS 2023

For more information, contact **dbs@abu.org.my**

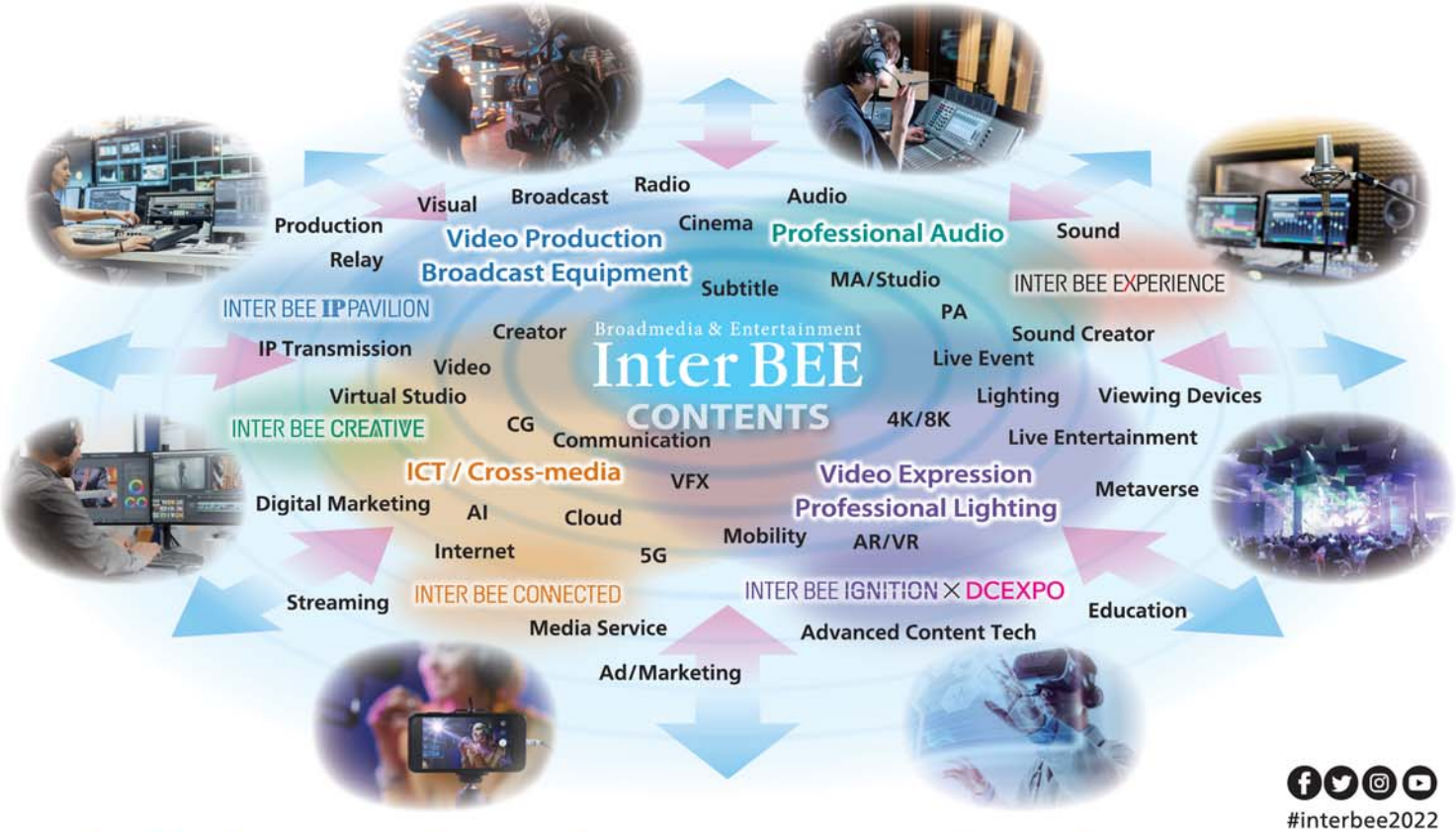
www.abu.org.my/dbsymposium

Broadmedia & Entertainment

Inter BEE 2022

Makuhari Messe, Tokyo: 11.16 ⋙ 18
Online Venue: 11.1 ⋙ 12.23

Japan's foremost comprehensive media event that brings together the latest innovations and solutions in the content business.



#interbee2022

Admission registration starts on October 4.

www.inter-bee.com

Inquiries : Japan Electronics Show Association E-mail: contact2022@nter-bee.com

VX Series

150 W to 5 kW FM Analog Transmitters

Best of Show 2022 WINNER

10 NEW Nautel Transmitters

- More power choices to fit your needs
- AUI: Secure, HTML5 Tx Control
- Instrumentation, RDS, SNMP, Presets
- PhoneHome for enhanced service
- Modular 3-5 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