



ENGINEERING THE FUTURE OF BROADCASTING IN A DIGITAL-FIRST WORLD



INSIDE THIS ISSUE:

Daily Context-Adaptive Presentation

HFCC A26 Global Coordination Conference

Engineering an End-to-End Broadcast Management Platform



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Cover: Engineering the Future of Broadcasting in a Digital-First World

from the Editor

Welcome to the first quarter edition of the Technical Review for 2026, where we explore the innovations defining the next chapter of our industry.

The broadcasting landscape is transforming profoundly. It moves beyond traditional boundaries into an interconnected and increasingly “synthetic” era. This issue builds on our flagship Digital Broadcasting Symposium (DBS) 2026. The theme, “*The Rising Synthetic Era*” urges us to embrace the intersection of artificial intelligence and creative technologies. In Kuala Lumpur, participants confirmed that AI now drives hyper-personalized content and streamlines workflows. It redefines audience engagement in a post-pandemic reality.

Our first featured article, “Daily Context-Adaptive Presentation Driven by Personal Data Store”, explores a groundbreaking approach to user engagement. This research proposes a flexible system architecture that lets broadcasters deliver context-aware information by leveraging IoT sensors and user-managed repositories. When the system detects a user’s movement – such as switching rooms – it automatically resumes content on another device without requiring manual intervention. This study plays a vital role in maintaining the relevance of public-interest information and ensures that content seamlessly follows the viewer.

While personalization enhances the viewer experience externally, it is equally crucial to consider the sophistication of internal infrastructure to support these advancements.

Our second featured article, “Engineering an End-to-End Broadcast Management Platform for International Television Operations”, provides a comprehensive look at the operational backbone supporting modern media. The paper details how engineers built the TRT Broadcast Management System (BMS). This system centralizes scheduling and metadata management, automates EPG generation, and unifies the architecture, eliminating the risks of fragmented tools. The study highlights how workflow automation boosts performance and offers a scalable blueprint for international operations.

As we look toward this synthetic future, we also recognize the resilience of foundational technologies. The recent Global Shortwave Coordination Conference (HFCC A26) showed that shortwave remains a critical lifeline for remote communities. At the same time, the growth of digital radio networks shows a continued appetite for efficient audio infrastructure.

As we bridge the gap between legacy reliability and AI-driven agility, our mission remains clear: to build a broadcasting ecosystem that is as intelligent as it is inclusive.

I invite you to dive into these pages and join us in shaping the future of global media.

Warm regards,
Dr Veyssel Binbay
veysel@abu.org.my

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

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Dr Veyssel Binbay

ABU Technology

The Asia-Pacific Broadcasting Union

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

For advertising inquiries, contact

Nur Aqilah Mohd Izam
email: aqilah@abu.org.my

Siti Balqis A Sudirman
email: balqis@abu.org.my

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

DAILY CONTEXT-ADAPTIVE PRESENTATION DRIVEN BY PERSONAL DATA STORE

Efforts to transform living environments, such as cities and homes, into smart system using AI and IoT are advancing worldwide. This research envisions future living spaces in which devices surrounding each user autonomously select and present the most appropriate content and presentation device based on the user's context (e.g., behaviors and environments). However, because actual homes incorporate a wide variety of software and hardware from different providers, building such a system solely by content providers such as broadcasters would entail prohibitive effort. Therefore, we designed a flexible system architecture that links heterogeneous software and devices from multiple service providers and manufacturers via a user-managed Personal Data Store (PDS). The PDS aggregates sensor logs and service usage records tied to individual behavior, enabling unified context estimation. Finally, we developed a prototype to demonstrate end-to-end operation and confirmed the validity of the proposed architecture.

1. INTRODUCTION

The rapid spread of Internet media has made it easy to select and consume information that aligns with individual interests from an immense pool of content. However, because the time each person can devote to accessing and consuming information in daily life is limited, increased focus on highly interesting content necessarily reduces opportunities to encounter less-favored information. Consequently, the chances of coming across socially important or public-interest information – ideally shared widely – vary greatly between individuals¹⁾. This divergence in information exposure is recognized as a social challenge that contributes to the fragmentation of public opinion. Broadcasters have traditionally disseminated diverse, high-public-interest content via television and radio. Yet as people's information-access patterns have diversified, it has become increasingly difficult to ensure that such content reaches everyone through broadcasting alone.

In response, technologies are being developed to extend the broadcast platform and integrate broadcasting with various services and devices. This approach aim to create new touchpoints between users and broadcast content – not only when they watch TV programs but also across multiple everyday scenarios^{2) 3)}.

One approach under consideration is the application of smart environment technologies – systems that leverage IoT devices and sensors to make living spaces context-aware. In recent years, efforts to develop smart cities and smart homes have advanced, laying the groundwork for these technologies⁴⁾. In a smart living environment, users will be able to access a variety of personalized services tailored to their immediate surroundings with minimal effort. Such an environment also promises broadcasters the opportunity to deliver content across a wider range of daily situations and to more diverse audiences than ever before. For example, if a user watching a TV program in the living room needs to move to another room and the viewing is interrupted, a smart environment could detect that movement and

automatically resume the program in the destination room – helping maintain the user motivation to continue watching. Smart environment technologies can also support everyday multitasking, where users perform two or more activities simultaneously. For instance, while a user is brushing their teeth, nearby devices such as a smart mirror could display the live broadcast or related content, allowing the delivery of information even during brief moments of daily routines⁵⁾. By providing content on various devices close to the user in this way, opportunities to access public-interest information are expected to increase.

To realize such information presentation, a system is required that can appropriately estimate each user's context under their own varied living environments. Constructing an entire system – composed of diverse devices and sensors – solely by information providers such as broadcasting stations would demand considerable effort; therefore, it is considered more efficient to integrate with the smart technologies expected to proliferate in living spaces.

Accordingly, a system architecture is proposed to enables service providers, such as broadcasters, to offer context-adaptive information presentation that takes user behavior into account.

2. ISSUE AND SYSTEM REQUIREMENT

This section outlines the challenges that service providers, such as broadcasters, must address to enable context-aware information presentation in smart environments, along with the system's functional requirements. This paper focuses on two key issues.

2.1 ISSUE 1: CONTEXT ESTIMATION BY SERVICE PROVIDERS

In a smart environment, achieving context-aware service provision generally requires the following processes:

- Estimate the user's context based on sensing data from various devices and sensors distributed throughout the living space.

- Based on the estimated context, determine which services to provide and how to deliver them (for content services, decide what information to present and in which format).
- Control the surrounding devices to execute the selected service.

If a service provider intends to deliver offerings that span every part of a user's living environment, installing and maintaining a wide array of sensors in each home would incur prohibitive costs. However, even when devices and sensors are already deployed by other entities, reliable context estimation depends on metadata – such as each device's installed location, its operational status, and its association with a specific user or space. Implementing and maintaining that metadata management separately for each service provider would also be highly inefficient.

For these reasons, it is desirable for service providers to obtain and leverage context estimation results from an external system or platform, without having to perform the estimation themselves. This capability is defined as Requirement ①.

2.2 ISSUE 2: UTILIZATION OF THE USAGE STATUS OF MULTIPLE CONTENT DELIVERY SERVICES

Users engage with multiple content delivery services in their daily lives. By combining usage logs from several services, it is possible to improve the accuracy of user behavior estimation – which is essential for context-adaptive information presentation. In practice, however, usage logs (such as viewing histories) are typically siloed within each individual service. As a result, it is difficult to reference or utilize those logs across different services.

Therefore, the ability to access and integrate usage logs from multiple content delivery services is defined as Requirement ②.

3. SYSTEM ARCHITECTURE

Based on the issues and requirements identified above, a system architecture for context-adaptive information presentation that takes user behavior into account is proposed.

3.1 PROPOSAL OVERVIEW

- In the proposed architecture, the core components are
- Sensing and display devices distributed throughout the living space, and
 - A Personal Data Store (PDS) and an ontology-based behavior estimation engine, both hosted in the cloud.

Here, the PDS is a user-managed repository for usage logs collected from multiple services. With the user's consent, these logs can be combined and shared with service providers or other authorized entities for downstream processing. The ontology defines and organizes relationships between concepts – when applied to behavior recognition, it enables seamless integration and interpretation of heterogeneous logs from different sensors and services^{6) 7)}.

Drawing on Egami et al.⁸⁾, we classify behaviors into two tiers:

- Low-level behaviors, which can be directly inferred from individual sensor readings (e.g., "walking," "turning on a coffee maker"), and
 - High-level behaviors, which consist of sequences or combinations of low-level actions (e.g., "taking a break").
- Behavior estimation proceeds by first detecting low-level behaviors and then aggregating them into high-level patterns.

The system's runtime operation consists of three main steps:

1. Detection of low-level behaviors from real-time sensor data,

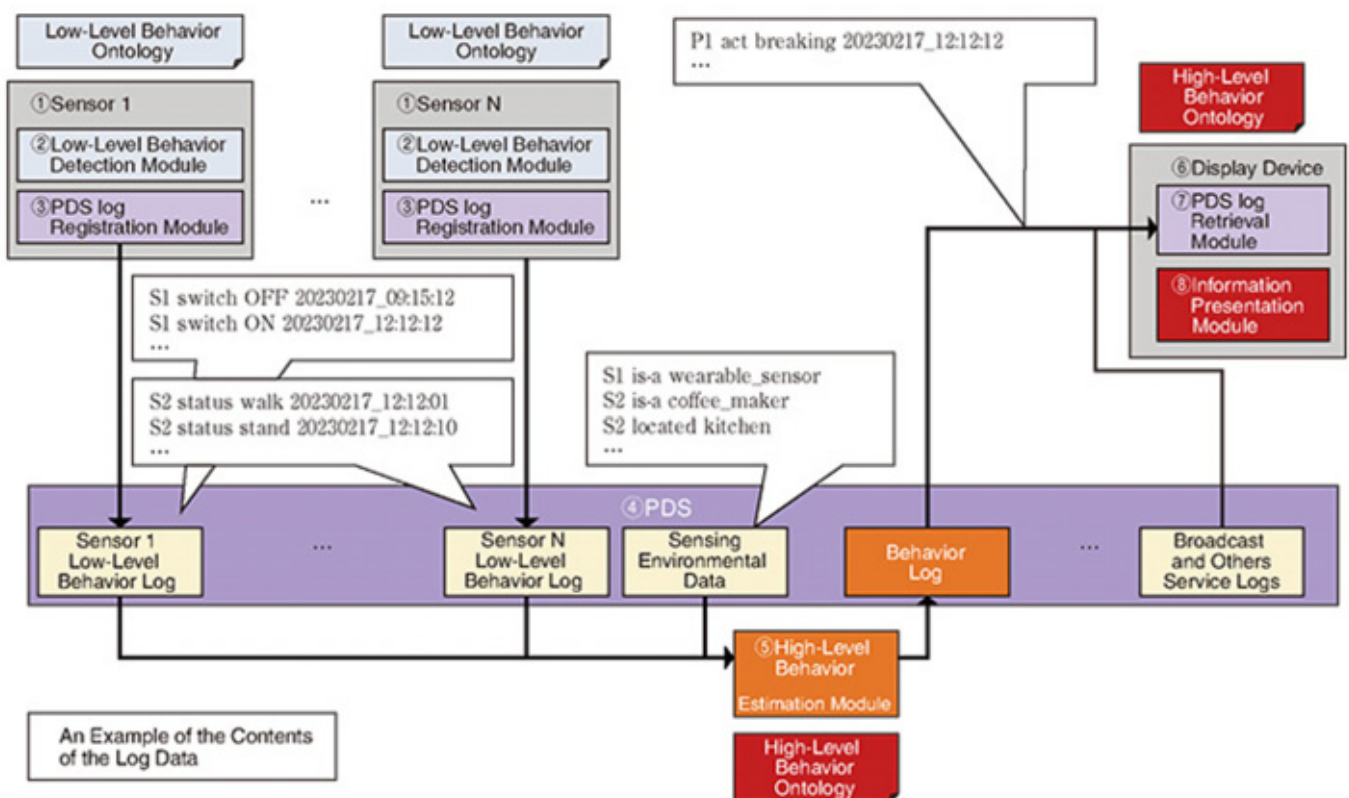


Figure 1: System Architecture

2. Inference of high-level behaviors via the ontology engine, and
3. Selection and execution of context-appropriate information presentation, which determines both the content to display and the target device(s) based on the inferred behavior and the user's service-usage history.

3.2 SYSTEM CONFIGURATION

The overall system configuration is illustrated in **Figure 1**. Each component is described below:

(1) Sensor (Figure 1 ①)

Detects the user's surrounding environment – including the user's actions – via various devices and sensors.

(2) Low-Level Behavior Detection Module (Figure 1 ②)

Maps raw sensor readings to the appropriate low-level behavior vocabulary defined in the ontology, thereby identifying discrete actions (e.g., "walking", "switching on a coffee maker").

(3) PDS Log Registration Module (Figure 1 ③)

Structures the detected low-level behaviors according to the ontology schema and registers them in the user's Personal Data Store.

(4) PDS (Figure 1 ④)

Maintains logs of low-level behaviors detected by sensors, high-level behaviors estimated downstream, and usage histories from various services. Each user has a dedicated PDS that aggregates all their sensor and service logs.

(5) High-Level Behavior Estimation Module (Figure 1 ⑤)

Collects low-level behavior logs and structured sensing-environment metadata (e.g., sensor types, installation locations), then infers the current high-level behavior by referencing the high-level behavior ontology. The resulting high-level behavior entries are then structured and stored in the PDS.

(6) Display Device (Figure 1 ⑥)

A web-capable device (e.g., tablet, smart display) that runs web applications to present information to the user.

(7) PDS Log Retrieval Module (Figure 1 ⑦)

Periodically polls the PDS for updates to low- and high-level behavior logs, as well as pre-specified service usage logs, retrieving them in structured form whenever changes are detected.

(8) Information Presentation Module (Figure 1 ⑧)

Determines which content to present and how to present it – based on the retrieved behavior and usage logs – and then executes the presentation. It also consults the high-level behavior ontology to interpret low-level actions in context.

3.3 RESPONSE TO FUNCTIONAL REQUIREMENTS

(1) Response to Requirement ①

As described in Section 3.2, a two-tier behavior model – low-level and high-level – is employed, with their

relationships defined in an external ontology⁸. The end-to-end workflow from sensing to information presentation is divided into three stages:

- Low-Level Behavior Detection Module: identifies low-level actions from raw sensor data.
- High-Level Behavior Estimation Module: infers high-level behaviors by aggregating sequences of low-level actions with reference to the high-level behavior ontology.
- Information Presentation Module: selects and executes the appropriate information delivery method, using both high-level behavior results and usage logs from multiple services.

Each module's inputs and outputs conform to the ontology schema, enabling loose coupling – the Information Presentation Module can operate solely on the estimated behaviors without needing insight into the internal workings of the Behavior Estimation Modules. For real-world deployment, we assume that service providers (e.g., broadcasters) operate the Information Presentation Module, while platform operators (e.g., smart-home or smart-city infrastructure providers) manage the High-Level Behavior Estimation Module.

(2) Response to Requirement ②

Also per Section 3.2, all behavior logs and multi-service usage logs are aggregated in the user's PDS as structured data. The PDS Log Retrieval Module continuously monitors the PDS and, upon detecting updates, fetches both behavior logs and the user-authorized service usage logs. These structured data feed into the Information Presentation Module, which then determines the most context-appropriate presentation strategy. Because behavior logs adhere to the high-level behavior ontology, this architecture seamlessly supports information-presentation decisions that account for both the user's activity and their cross-service usage history.

4. PROTOTYPE IMPLEMENTATION AND VERIFICATION

To validate the proposed architecture, a partial prototype was developed and its end-to-end operation was tested using a representative service scenario.

4.1 VERIFICATION SCENARIO

Figure 2 illustrates the verification scenario. It is assumed that Users A and B are each at home. In User A's residence, a TV is installed in the living room, and a coffee maker plus a smart display are in the kitchen. The TV logs viewing behavior and content metadata to the acting user's PDS; the coffee maker likewise logs its on/off operations. The smart display is a web-browser-capable device for running applications. User A also wears an IoT sensor that can identify low-level behaviors (e.g., standing, walking). In User B's home, a TV is likewise present, and User B has granted User A permission to read their viewing logs. The detailed sequence of interactions and required system processes is shown in **Figure 2**; it is omitted here for brevity.

4.2 CONFIGURATION OF THE PROTOTYPE SYSTEM

The core data-exchange flows between modules were implemented via the PDS. (see **Figure 3**). The Information

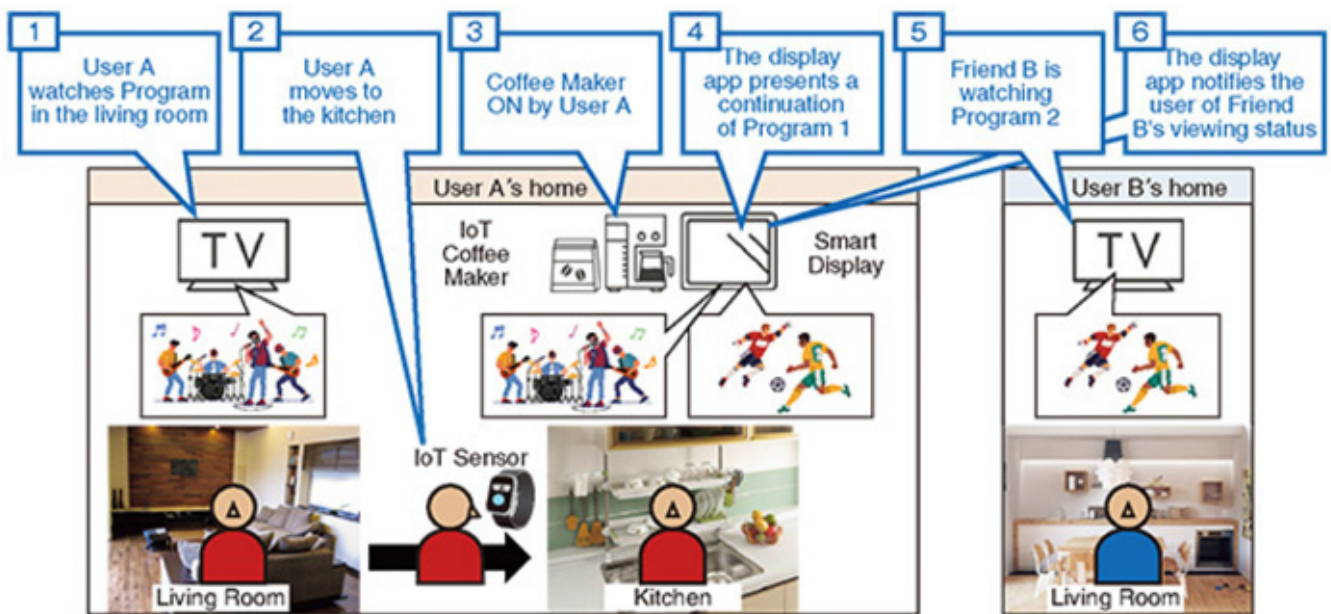


Figure 2: Verification Scenario

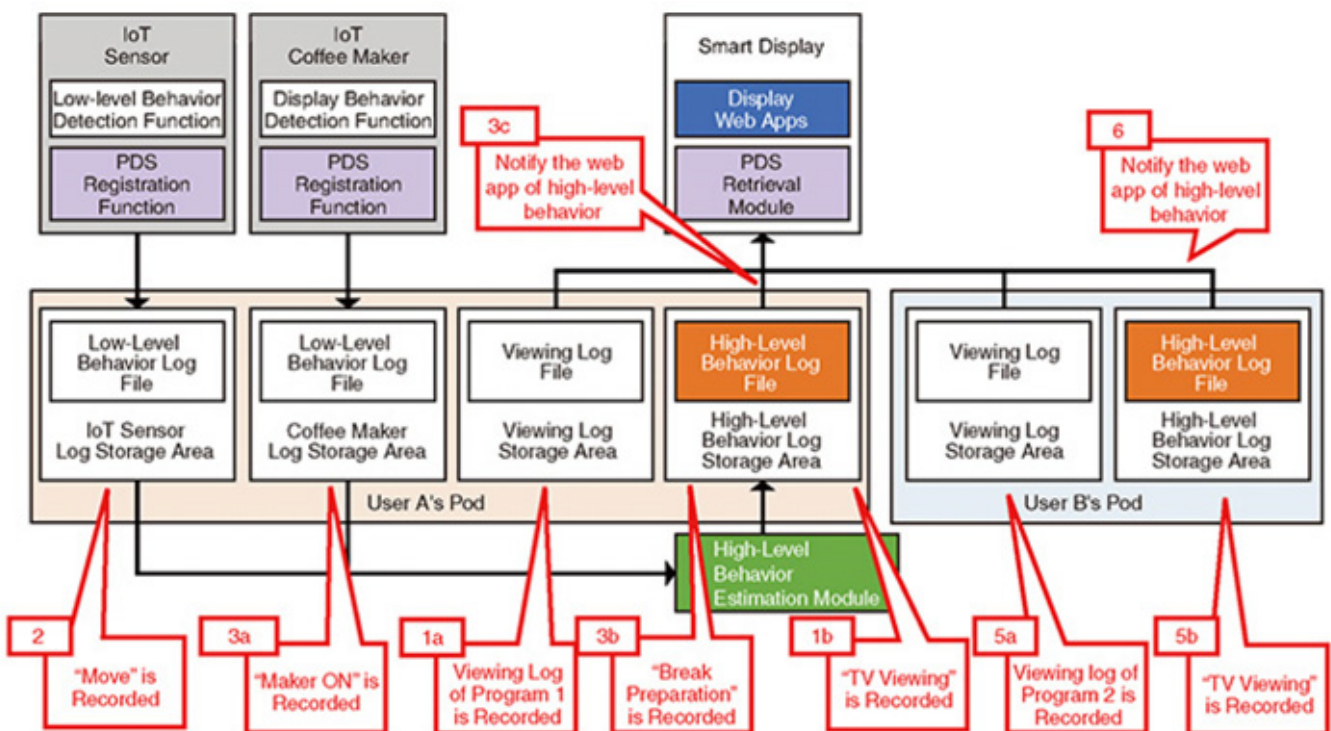


Figure 3: Configuration of the Prototype System¹¹

¹¹ The numbers, such as "1," shown in Figure 3 correspond to those used in Figure 2.

Presentation Module runs as a web application in a PC browser. The IoT sensor and coffee-maker interfaces are each realized as web applications that register structured behavior logs into the PDS. PDS functionality follows the W3C Solid⁹ specification; the PDS server was implemented using the software listed in¹⁰, and the PDS Log Registration/Retrieval Module was implemented using the software described in¹¹.

4.3 RESULTS

It is confirmed that the prototype (Figure 3) executed the scenario (Figure 2) as intended. The full pipeline – collecting sensor logs in the PDS, detecting low- and high-level contexts, selecting the appropriate presentation strategy based on those inferences, and executing content delivery – ran smoothly, demonstrating the architecture's validity.

In this prototype, the ontology from Egami et al.⁸ **was reused**; further ontology refinement **should be carried out** to support an even broader range of contexts. In addition, clarifying the mapping between inferred context and users' preferred presentation modes – and embedding that mapping into the Information Presentation Module – should further enhance user satisfaction.

5. CONCLUSIONS

To increase opportunities for users to encounter diverse information, an architecture for a context-adaptive information-presentation system has been proposed, in which content delivery is tailored to user behavior in smart environments. A subset of this architecture was prototyped and validated against a realistic scenario. Future work will focus on advancing the Behavior Estimation and Information Presentation modules and on the detailed design of both low- and high-level behavior ontologies.

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AUTHORS



OGAWA Hiromu joined NHK in 2014. After working at the Osaka Broadcasting Station, he joined Science & Technology Research Laboratories (STRL) in 2016. His research includes broadcast service applications of IoT, personal data utilization technologies, and the metaverse. He is currently affiliated with the Internet Service Systems Research Division at STRL.



MATSUMURA Kinji joined NHK in 1996. He has been with Science & Technology Research Laboratories (STRL) since 1998, before which he was working at the Program Transmission Control Center of the Broadcast Engineering Department. His research includes data broadcast encoding, integrated broadcast-broadband services, and personal data utilization technology. He currently serves as Head of the Internet Service Systems Research Division at STRL.



FUJISAWA Hiroshi joined NHK in 1995. After working at the Matsue Broadcasting Station, he joined Science & Technology Research Laboratories (STRL) in 1998, where he has been conducting research on digital terrestrial broadcasting (DTB), the Internet, and integrated broadcast-broadband services. After working at the Media Planning Office and Science & Technology Research Laboratories (STRL), he now serves as Deputy Head of the Digital Center of the General Media Administration. ■

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from May 28 (Thu) to 31 (Sun)



DIGITAL BROADCASTING SYMPOSIUM 2026

The 2026 ABU Digital Broadcasting Symposium was held from 30 March to 2 April at Berjaya Times Square Hotel, Kuala Lumpur. Organised by the ABU, this 22nd edition featured the theme “*The Rising Synthetic Era*”. Prior to the main conference, four workshops were conducted on 30 March. Across the event, the conference, multiple workshops, and exhibition booths provided attendees with valuable insights into broadcasting and artificial intelligence.





Session 1 | Synthetic Intelligence & Creative Transformation



The first session, moderated by **Masashi Kamei** (NHK-Japan), featured panellists **Tim Xu** (MediaCorp-Singapore), **Boris Gorlov** (RT-Russia), **Tsang Hoi Wang Patrick**, **Chang Ching Anita** (RTHK-Hong Kong, China), and **Jay Ganesan** (Amagi). The panel reviewed recent advances in personalisation and artificial intelligence (AI), highlighting major progress in recent years.

RTHK presented its implementation of Augmented Reality (AR) and

Extended Reality (XR) technologies for sports broadcasting, particularly in preparation for the 15th National Games of the People's Republic of China, the National Games for Persons with Disabilities, and the Special Olympic Games scheduled for 2025.

The RTHK team demonstrated how AR and XR technologies redefine sports broadcasting by enabling immersive environments and interactive storytelling. Their approach aimed to deepen audience

engagement and create compelling sports content.

A major focus was on the technical implementation of XR and AR production. The setup featured large LED curved walls and LED floors with high-resolution displays. This created immersive virtual studio environments. The team used Novastar LED processors, Disguise VX4+ XR players, and Disguise PX+ AR object players. These systems managed real-time graphics, extended virtual scenes, and





augmented objects. Camera tracking systems, such as Redspy, were implemented on both pedestals and jib cameras. This ensured accurate synchronization between camera movements and virtual content.

The presentation explained the importance of calibration, control systems, and infrastructure to maintain smooth XR/AR operations. Dedicated 4K production panels and XR/AR control panels managed live productions efficiently. For reliability in live broadcasting, separate UPS systems and backup XR/AR players were deployed. These measures reduced the risk of technical failure during live events.

The presentation addressed multiple operational and maintenance challenges. Challenges included LED floor alignment, safety concerns with equipment access, and maintenance needs such as safety harnesses and warning systems. The team also identified future enhancements. These include using 3D scanning and AI technologies to further improve production capabilities.

Overall, the presentation demonstrates how AR and XR

technologies are reshaping sports broadcasting by creating immersive, visually enhanced, and interactive viewing experiences. Through advanced studio infrastructure, real-time graphics systems, and innovative storytelling approaches, the project showcases the future direction of sports media production while highlighting the importance of technical preparation, collaboration, and continuous learning.

Meanwhile, Mediacorp presented its journey from early AI experimentation to large-scale AI adoption across content creation, newsroom operations, and audience engagement. The presentation outlined the company's AI development timeline, beginning with predictive AI applications such as live transcription, subtitling, and recommendation systems, before expanding into generative AI, AI assistants, and agentic orchestration.

Mediacorp implements AI across many media production processes. These include automatic speech transcription, sports highlight clip generation, automated graphics production, multilingual translation, AI-generated audio, and newsroom

optimisation tools. The presentation highlighted how AI improves creative workflows, not replaces human creativity. AI supports brainstorming, script development, visual pre-production, subtitling, translation, workflow automation, and social media optimisation. According to the presentation, AI enables creative teams to work more efficiently, experiment more rapidly, and scale production while maintaining human editorial judgment and storytelling quality.

The presentation also emphasised responsible AI practices. Mediacorp maintains that human teams remain fully accountable for all published content, while AI serves only as an assistive tool. To ensure ethical and trustworthy implementation, the organisation has established guidelines covering transparency, content disclosure, copyright protection, data privacy, and stricter editorial controls for news and current affairs content.



The moderator was **Aale Raza**, Director, Whiteways Systems-Singapore, with the panellists comprising **Hayao Araki**, NHK-Japan; **Ufuk Yalcin**, TRT-Türkiye; and **Mehmet Günes**, TRT-Türkiye. Japan has long been a pioneer in digital broadcasting technologies, most notably through the development of Integrated Services Digital Broadcasting (ISDB). Building upon earlier standards such as ISDB-T and

ISDB-S, the evolution toward ISDB-T3 represents a major advancement in terrestrial digital broadcasting.

ISDB-T3 is designed to meet the growing demands for ultra-high-definition (UHD) content, improved spectrum efficiency, robust mobile reception, and enhanced interactivity. Developed under the guidance of organizations such as the Association of Radio Industries and Businesses,

ISDB-T3 reflects Japan's continued leadership in broadcast innovation.

The original ISDB-T standard, introduced in the early 2000s, became widely adopted not only in Japan but also in several countries across Latin America and Asia. It offered key features such as segmented transmission (allowing simultaneous mobile and fixed reception) and robust signal



resilience. However, with the rise of 4K and 8K broadcasting, as well as increasing competition from internet-based streaming platforms, a more advanced system was required.

ISDB-T3 is the next-generation terrestrial broadcasting system. It includes lessons from earlier standards and cutting-edge technologies. Sometimes, it is associated with Japan's push for "Super Hi-Vision" broadcasting. This was particularly evident during events such as the Tokyo 2020 Olympics, where 8K transmission was shown.

ISDB-T3 supports UHD formats, including 4K and 8K resolution. It uses improved video compression technologies, such as HEVC (High Efficiency Video Coding). HEVC is a compression standard that enables higher-quality content without excessive bandwidth consumption.

ISDB-T3 employs advanced modulation schemes that adjust how signals are formed, as well as forward error correction techniques that help correct transmission errors. These improvements increase spectral efficiency (the amount of data transmitted per frequency) and signal robustness (the ability to maintain reception despite interference). Broadcasters can transmit more data within the same frequency band and maintain reliable reception, even in challenging environments.

Like its predecessor, ISDB-T3 continues to support mobile and portable devices. It significantly improves performance by enhancing signal resilience (making signals less vulnerable to interference) and enabling adaptive transmission (adjusting how signals are sent based on device or conditions). This ensures seamless viewing on smartphones, tablets, and in-vehicle systems.

ISDB-T3 supports hybrid broadcast-broadband services, integrating internet-based content delivery. Viewers can access on-demand services (content that can be watched anytime), interactive applications (programs responding to user input), and personalized content alongside traditional broadcast programming. Japan's broadcasting systems have always emphasized disaster preparedness. ISDB-T3 enhances emergency alert capabilities and ensures rapid, reliable dissemination of critical information during natural disasters such as earthquakes and tsunamis.

Compared to ISDB-T, ISDB-T3 offers higher data throughput, better compression efficiency, and improved support for next-generation content formats. ISDB-T was optimized for standard and high-definition broadcasting. ISDB-T3 is designed for UHD and hybrid services. Other global standards include DVB-T2 in Europe and ATSC 3.0 in North

America. ISDB-T3 emphasizes backward compatibility and mobile reception. This is a key advantage in regions with high mobile device usage. Segmented transmission remains a distinguishing feature.

Japan leads the testing and deployment of ISDB-T3 technologies. This includes preparations for large-scale events and the expansion of 4K/8K broadcasting services. A full nationwide rollout is gradual, but the standard is expected to influence global broadcasting trends. Despite many advantages, ISDB-T3 faces several challenges.

- **Infrastructure Costs:** Upgrading transmission systems and consumer receivers requires significant investment.
- **Device Compatibility:** Consumers need new receivers or compatible televisions to access ISDB-T3 services.
- **Competition from Streaming:** The rapid growth of internet streaming platforms poses a challenge to traditional broadcasting systems.
- **Global Adoption:** While ISDB-T was widely adopted internationally, ISDB-T3 must compete with established standards like DVB-T2 and ATSC 3.0 for global acceptance.

Session 3 | Intelligent Media Systems: From Archives to OTT Platforms

The moderator was **Mehmet Günes** (TRT-Türkiye), with panellists **Bhavik Vyas** (Disk Archive Corporation), **Amiruddin Bin Jemaat** (RTM-Malaysia), and **Nusrat Akter Lovely** (Axle AI). Between 2022 and 2025, Malaysia has witnessed a dramatic transition from traditional broadcasting to digital media consumption. The OTT market has expanded significantly, fuelled by increased internet penetration, mobile usage, and improved infrastructure. Linear broadcasting continues to decline, creating a gap

increasingly filled by subscription- and ad-supported video-on-demand (VOD) services.

A key enabler of this growth is Malaysia's digital infrastructure development under the JENDELA initiative. With 4G coverage reaching nearly the entire population and strong 5G adoption, the country is well-positioned to support high-quality streaming, including 4K content. However, challenges remain, particularly in network consistency. Despite widespread 5G availability,

users still rely heavily on 4G networks due to indoor coverage limitations, highlighting the need for seamless cross-network optimization to ensure a consistent user experience.

Audience behaviour in Malaysia emphasizes the importance of local content. Studies show that locally relevant programming, including animation and variety shows, often outperforms international content in terms of viewer retention. This presents a strategic advantage for national platforms like RTMklik,



which can leverage culturally relevant programming to build audience loyalty.

However, the market faces significant challenges, particularly digital piracy. A considerable proportion of Malaysian users continue to access illicit content, resulting in substantial revenue losses for the industry. RTMKlik's position as a free, legal platform serves as a crucial countermeasure, offering accessible content while promoting legitimate consumption.

Additionally, the rise of subscription fatigue has reshaped user behaviour. Consumers increasingly rotate subscriptions among multiple platforms, subscribing only when specific content is released. This creates an opportunity for RTMKlik to capture users seeking cost-effective alternatives without recurring financial commitments.

While OTT platforms focus on content delivery, the efficient management of media assets is equally important. Traditional media archives often face limitations, including unstructured

data, incomplete metadata, and slow retrieval. These issues result in underutilized content and inefficiencies in production workflows.

The concept of smart archives addresses these challenges by transforming passive storage systems into dynamic, AI-powered resources. Smart archives utilize AI technologies such as facial recognition, speech-to-text, object detection, and automated tagging to make content searchable and accessible. This significantly improves content discovery and reuse, enabling broadcasters to maximize the value of their existing assets.

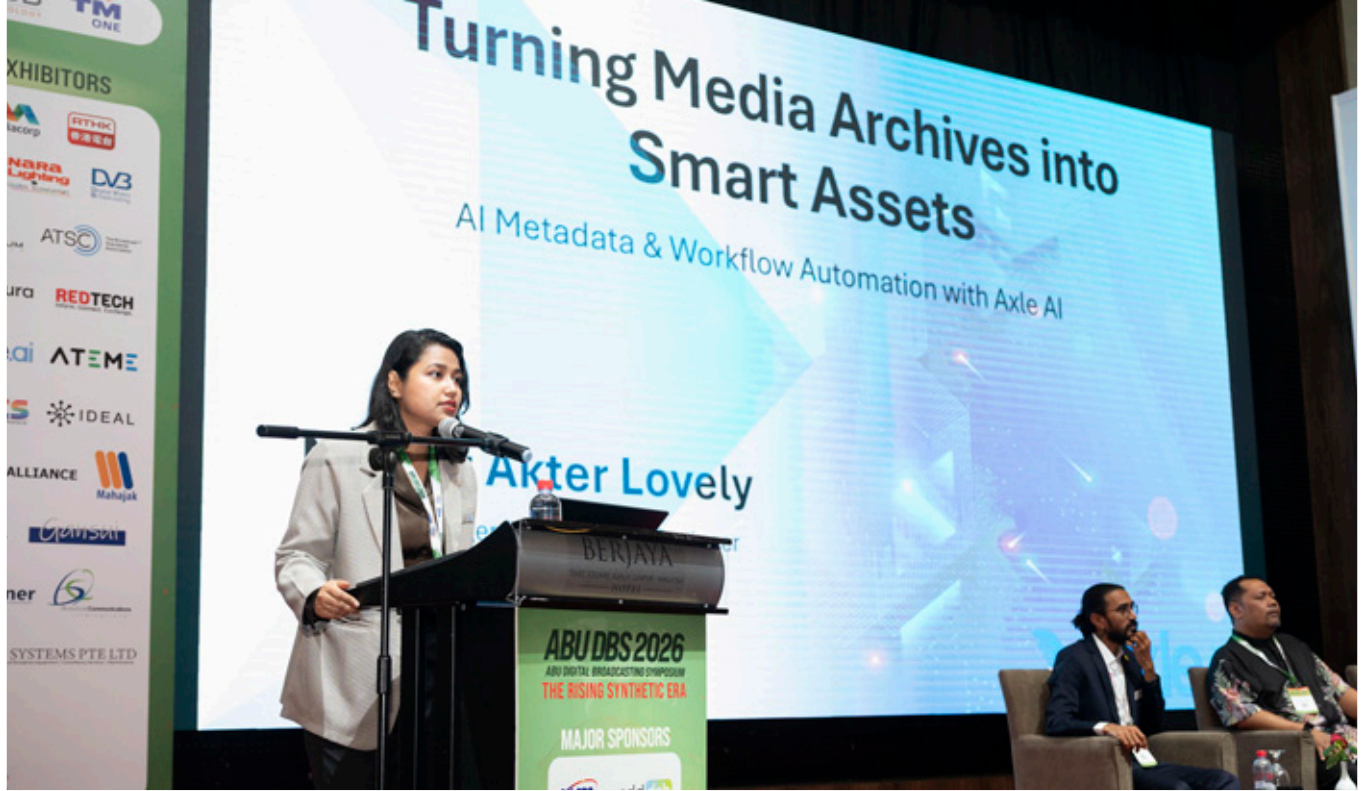
AI-powered solutions enable broadcasters to implement efficient media asset management systems without complex infrastructure. These systems support automated workflows, including content ingestion, proxy generation, metadata tagging, and indexing. The integration of AI into archive management offers several benefits:

- **Improved Efficiency:** Automated processes reduce manual labour

and accelerate content retrieval.

- **Enhanced Content Utilization:** Previously unused or difficult-to-find media can be repurposed for new productions.
- **Streamlined Production Workflows:** Faster access to content enables quicker turnaround times in media production.

An end-to-end smart archive workflow ensures that media assets are continuously processed, analysed, and made available for reuse, transforming archives into active contributors to content creation rather than static repositories. The integration of AI-driven smart archives further enhances the industry's capabilities by improving content accessibility, efficiency, and reuse. Together, these developments highlight a future where technology, content, and user experience converge to redefine the broadcasting landscape in Malaysia.





Session 4 | Advancements in Broadcasting Technologies and Standards



The session was moderated by **Sharad Sadhu** (Media Specialist, India), and the panellists were **Tham Wai Hoong** (Astrum-Singapore), **Lindsay Cornell** (WorldDAB-United Kingdom), and **Rosli Bin Abdul Rahman** (Appearl). The broadcasting industry is undergoing a rapid transformation driven by

digital technologies, changing audience behaviours, and the need for operational efficiency. Two key developments shaping this evolution are Digital Audio Broadcasting Plus (DAB+) and the Dynamic Media Facility (DMF) framework. While DAB+ focuses on enhancing radio delivery and listener experience,

DMF redefines how broadcast infrastructure is designed and operated. Together, they represent a shift toward flexible, scalable, and future-proof broadcasting ecosystems.

One of the key strengths of DAB+ lies in its ability to support both





existing analogue services and new digital-only offerings. This hybrid approach allows broadcasters to retain current audiences while simultaneously introducing innovative content formats. Regions such as Europe have already adopted DAB+ extensively, while countries across Africa, the Middle East, and Asia-Pacific – including Malaysia – are actively exploring its implementation.

DAB+ also introduces several digital enhancements beyond audio transmission. These include support for multimedia content such as text and images, as well as improved language and character encoding through standardized regional text profiles. This ensures accessibility and localization across diverse linguistic environments.

A critical advantage of DAB+ is its resilience in emergency situations. Unlike mobile networks, which may become congested or fail during crises, broadcast radio remains reliable. The DAB+ Automatic Safety Alert (ASA) system further enhances this capability by enabling targeted emergency alerts with geographic filtering, ensuring that only affected populations receive relevant warnings.

Additionally, DAB+ improves the listener experience through features

such as service following, which allows seamless switching between frequencies or services without interruption. Innovations like “push-to-local” functionality further prioritize local content, ensuring that listeners receive region-specific news and information as they travel. This is particularly valuable in countries with diverse local broadcasting markets, such as France.

While DAB+ addresses content delivery, the Dynamic Media Facility (DMF) concept revolutionizes broadcasting’s backend infrastructure. Traditional broadcast facilities are typically built for peak usage, resulting in high capital expenditure (CapEx) and significant underutilization of resources. These systems are often hardware-based, siloed, and difficult to scale.

DMF introduces a software-defined, IP-centric approach to media operations. Instead of relying on fixed hardware, workflows are dynamically created and managed in response to real-time demand. This allows broadcasters to allocate resources efficiently, scaling up during high-demand events and scaling down when not needed.

A defining feature of DMF is its use of automated orchestration. Functions such as ingest, encoding,

graphics, and playout are no longer tied to dedicated hardware; they now exist as flexible, virtualized services. This enables rapid deployment of new channels or services, often within minutes, significantly reducing time-to-air.

Another important aspect of DMF is its hybrid architecture, which integrates both traditional linear broadcast systems (e.g., SDI and SMPTE ST 2110) and modern asynchronous IP workflows. This ensures compatibility with legacy infrastructure while enabling a smooth transition to fully IP-based environments. The benefits of DMF are particularly evident in event-based broadcasting scenarios. For example, during a live event, the system can scale to full capacity with redundancy and active graphics/planning systems. Once the event concludes, resources are automatically returned to a shared pool, optimizing utilization and reducing operational costs.

The integration of DAB+ and DMF highlights a broader convergence within the broadcasting industry. On one hand, DAB+ ensures efficient and reliable content distribution to audiences. On the other hand, DMF enables broadcasters to produce and manage that content more efficiently.



The moderator was **Fintan Mc Kiernan**, Ideal Systems, with the panellists comprising **Tony Berthaud**, Harmonic; **Colin Prior**, Kaltura; and **Maurice Snell**, TSL. The global broadcasting industry is undergoing a profound transformation driven by the convergence of cloud computing, Internet Protocol (IP)-based workflows, and artificial intelligence (AI). The traditional linear broadcast model is increasingly being complemented – and in some cases replaced – by Over-The-Top (OTT) streaming services and hybrid delivery infrastructures. The materials presented at the ABU Digital Broadcasting Symposium 2026 highlight three critical dimensions of this transition: cloud-native OTT architectures, AI-driven audience engagement through agentic avatars, and the operational challenges of managing multi-vendor IP workflows.

A central theme emerging from Harmonic's presentation is the shift toward hybrid cloud architectures as the new industry norm. Broadcasters are no longer reliant solely on on-premises infrastructure but instead adopt a mix of cloud and traditional systems to balance scalability, cost, and reliability.

The Asian market clearly reflects this transition. Streaming services currently account for approximately 44% of video consumption and are projected to reach 54% by 2029, while traditional broadcast declines correspondingly. This shift is driven by demand for personalized, on-demand viewing experiences and targeted advertising.

Hybrid workflows provide significant economic advantages. For instance, predictable workloads such as 24/7 linear channels are more cost-effective on-premises, while variable workloads like live sports events benefit from cloud elasticity. A combined hybrid approach can reduce operational costs by over 30% when applied to transcoding, storage, and content delivery systems.

Additionally, modern OTT systems are evolving from basic Adaptive Bitrate (ABR) streaming to Intelligent Adaptive Delivery. Unlike traditional ABR, which reacts to network conditions, intelligent systems incorporate user behaviour, content type, and business objectives to simultaneously optimize Quality of Experience (QoE), revenue, and cost. AI-driven features such as content-

aware encoding, automated ad detection, and contextual metadata generation further enhance efficiency and monetization opportunities. These innovations enable broadcasters to dynamically insert advertisements, optimize bandwidth usage, and deliver personalized viewing.

Agentic avatars represent a novel AI-powered solution to this problem. These avatars act as real-time interactive agents embedded within the user experience, guiding viewers through content discovery, subscription management, and troubleshooting. By providing personalized recommendations and contextual assistance, they transform passive viewers into active participants.

Personalization is a key driver of engagement. Studies indicate that over 70% of users prefer tailored content, and many will disengage if personalization is lacking. Agentic avatars address this by leveraging real-time user data to deliver highly relevant recommendations and services across devices.

Furthermore, these systems reduce operational costs by minimizing



reliance on customer support centres. Issues related to billing, playback, or device setup can be resolved instantly within the platform, improving user satisfaction while lowering cost-to-serve.

Beyond engagement, agentic avatars generate valuable “revenue intelligence” by analysing user interactions, enabling broadcasters to refine monetization strategies,

such as AVOD, SVOD, and targeted advertising.

The future of broadcasting lies in integrating cloud computing, AI, and flexible IP-based infrastructure. Hybrid cloud models offer the optimal balance between cost efficiency and scalability, while intelligent OTT systems enhance delivery, monetization, and user experience.

At the same time, AI-driven innovations such as agentic avatars are reshaping audience engagement by delivering personalized, real-time interactions that improve retention and revenue.



Session 6 | Innovative Media Solutions: Deployment and Development



The session was moderated by **Dr Peter Siebert**, IEEE Broadcast Technology Society, and the panellists were **Ajeet Khare**, Canara Lighting-India; **Michael McEwen**, ATSC; **Dr Kanwar Jit Singh**, Tejas Network; and **Emily Dubs**, DVB-Switzerland. The panellists outlined significant advancements in broadcasting, focusing on AI-automated studio lighting, the versatile ATSC 3.0 standard, and the global deployment of DVB-I for hybrid media delivery.

Modern broadcasting demands speed, accuracy, and high quality, leading to the integration of AI in

studio lighting systems. Current systems utilize wireless DMX control (CRMxW-DMX) for remote management via tablets. Advanced automation includes voice-controlled lighting and sensor-based systems (motion, ambient light, and camera feedback) to reduce manual workload. AI transforms lighting from reactive to predictive. Expert systems learn from past broadcasts, while computer vision enables face detection, subject tracking, and skin-tone-aware colour correction.

This “closed-loop” system continuously monitors a scene via

cameras, analyses data such as subject position, and automatically adjusts DMX-controlled LED fixtures in real time. High initial investment, system complexity, and a dependency on high-quality data are primary concerns. Additionally, there is a continued need for specialized operators to supervise these AI systems.

ATSC 3.0 is a general-purpose, IP-based communications platform designed for highly efficient and secure delivery of various services. It supports up to 55 Mbps of bandwidth, features built-in geo-



targeting (addressability), and scales to millions of users via multicast. ATSC is known as “NextGen TV”. It offers 4K UHD video, improved HDR, immersive audio, and interactive personalized content. Direct-to-Mobile (D2M) transmits live content to mobile devices without an internet connection or a SIM card, a technology currently being trailed in 19 Indian cities.

Datacasting supports IoT sensor delivery, automotive firmware/map updates, and public safety data distribution. EdgeBeam Wireless is a U.S. joint venture leveraging

ATSC 3.0 for secure, high-speed data services, including Content Delivery Network (CDN) offloading. Emergency Communications provides resilient, encrypted delivery of instructions and video even when other networks fail.

DVB-I is a network-agnostic service layer that unifies linear and non-linear television services into a single interface. Hybrid Ecosystem combines various broadcast (DVB-T2, S2, NIP) and internet (DASH, mABR) delivery methods into harmonized interfaces for consumers. DVB-I supports AI-driven discovery,

conversational TV through AI agents, and personalized “conversational TV” experiences. Italy & Germany are leading with commercial trials and have collaborated on a “common profile” for receiver specifications. Trials in France and Spain focus on modernizing user experience (UX) and ensuring compliance with regulations for “Services of General Interest” (SOGI) prominence. Australia & New Zealand use DVB-I as a cost-effective alternative to upgrading digital terrestrial television (DTT), ensuring free-to-air TV remains accessible in an “IP-first” world.

Session 7 | Advancement and Innovation in Media Distribution & Delivery



The session was moderated by **Nick Piggot**, Project Director, Radio-DNS, and the panellists were **Bernie O’Neil**, WorldDAB-United Kingdom; **Subodh Aggarwal**, TVU; and **Sharad Sadhu**, Media Specialist, India. The session covered the global regulatory framework of the International Telecommunication Union (ITU), strategic public policy for DAB+ deployment, and technical solutions to achieve nationwide digital radio coverage.

During the presentation titled

“Advancement & Innovation in Media Distribution & Delivery,” TVU Networks highlighted the broadcasting industry’s transition from traditional hardware-based infrastructure to cloud-based and virtualized media workflows. The speakers discussed the limitations of conventional broadcast systems, including high operational costs, limited scalability, and inflexible delivery models, which have accelerated the demand for more efficient and adaptable broadcasting solutions.

The presentation further explained how modern media distribution increasingly relies on cloud technologies, software-defined workflows, IP-based transport, AI-driven automation, and CDN/ edge delivery systems to support scalable and multi-platform broadcasting operations. TVU Networks also introduced its cloud-based media ecosystem, which integrates functionalities such as remote production, transcoding, graphics, replay systems, social media streaming, and cloud playout services



into a unified platform.

The successful deployment of Digital Audio Broadcasting (DAB+) is not automatic; it is driven primarily by a clear policy framework. Effective policy shapes market conditions and reduces investment risk by focusing on five key areas:

1. **Coverage:** Ensuring digital signals reach the population.
2. **Content:** Providing a diverse service bouquet.
3. **Consumer devices:** Ensuring availability and affordability.
4. **Cars:** Maintaining radio's prominence in complex digital dashboards.
5. **Communication:** Educating the public about the benefits of digital.

Broadcasters and policymakers must coordinate on licensing frameworks, market structures, and financial incentives. WorldDAB emphasizes that "policy certainty" and a "clear

roadmap" are essential to avoid fragmentation and delay. A new Public Policy Toolbox, containing over 20 interventions, is slated for launch in May 2026 to guide governments through these transitions.

A recurring challenge in digital radio is achieving full geographic and population coverage without incurring prohibitive costs. Australia's experience highlights a significant gap between population and area coverage:

- **DAB+ (VHF Band III):** Covers 65% of the population but only 5% of the land area.
- **Analog AM:** Covers 98% of the population and approximately 90% of the land area. Expanding DAB+ to the remaining area is considered impractical and "beyond comprehension" due to the high number of transmitters required.

Experts argue that full coverage cannot be achieved with a single

frequency band or technology alone. Instead, a multi-system approach is recommended:

- **DAB+:** Ideal for high-density urban areas and indoor coverage.
- **DRM (Digital Radio Mondiale) in MW/FM Bands:** Acts as the "backbone" for rural, maritime, and large-scale geographic coverage.
- **Case Studies:** Norway utilized nearly 2,000 transmitters (including 1,000 for tunnels) to reach 99.5% of its population, illustrating high complexity. In contrast, Indonesia has adopted an official regulation specifying both DAB+ and DRM to ensure comprehensive coverage across its islands.

The transition to digital broadcasting requires a synergy of global standards (ITU), strong national policies (WorldDAB), and pragmatic technical solutions (DRM/DAB+ hybrids) to ensure radio remains a viable, high-quality, and accessible medium for all citizens.





Session 8 | Cloud-To-Edge Media Fabric: Building Scalable Broadcast Networks



The session was moderated by **Ir. Ts. Ahmad Shafiq Mirza Bin Mansor** (RTM-Malaysia), with panellists **Asharudin Bin Abdul Buhari** (Credence), **Kaleb Fretwell** (ATEME), and **Yoshinori Kadono** (NHK-Japan). The media industry is rapidly moving toward cloud-to-edge architectures

to improve efficiency, scalability, and cost effectiveness. Organisations such as ATEME, TM Group (Credence), and NHK highlighted solutions ranging from universal cloud ingest and end-to-end cloud infrastructure to specialised live sports transmission systems.

ATEME's "Cloud-to-Edge Media Fabric" focuses on an integrated workflow for ingesting, processing, and distributing video content.

- **Universal Ingest:** The TITAN Edge solution supports a wide range of protocols, including SRT, RIST,





Zixi, and legacy satellite/terrestrial standards (SAT/T2, ATSC).

- **Security and Reliability:** To ensure broadcast-grade quality over the public internet, the fabric uses Reliable Internet Stream Transport (RIST) and Secure Reliable Transport (SRT), along with SMPTE 2022-7 for hitless protection.
- **Processing at Scale:** The platform enables “Fast Offload” for occasional compute-intensive tasks (such as high-fidelity transcoding or HDR conversion) while maintaining a single orchestration layer for total control.
- **Efficiency:** Organizations can scale on demand by moving tasks to the cloud only when needed, thereby optimizing both operational and infrastructure costs.

TM Cloud Alpha Edge (CAE) provides the foundational cloud layer required for these intensive media workloads, particularly in the Malaysian market.

- **High-Availability Architecture:** The platform uses geographically separated Availability Zones (AZs) with low-latency connections (under 2ms) to ensure continuous service even if one zone fails.

- **Deployment Versatility:** CAE supports various models, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

Differentiating Factors:

- **Data Sovereignty:** Data is hosted in Malaysia, ensuring independence from international laws such as the U.S. Cloud Act.
- **Cost Predictability:** There are no data egress charges, which is a major financial advantage for high-bandwidth media applications.

Media Insight Platform: Beyond infrastructure, it includes specialized tools for OTT/streaming analytics, AI-driven sentiment analysis, and real-time audience tracking.

NHK has documented its multi-year evolution from traditional transmission to a fully redundant cloud-based system.

- **Development Milestones:** The system has been progressively refined through major events, starting with the 2023 Rugby World Cup (Phase 1), moving to 500+ MLB games in 2026 (Phase

2), and culminating in live coverage for the 2026 Milano Cortina Winter Olympics (Phase 3).

- **Phase 2 Impact (Footage):** By receiving feeds directly from the cloud via dedicated lines, NHK reduced transmission costs by 50% while improving operational efficiency through cloud-based recording and editing environments.
- **Phase 3 Strategy (Live):** For live Olympic coverage, NHK implemented a “Recommended Architecture”:
 1. Connecting on-premises facilities to the cloud via dedicated lines.
 2. Using geographically separate data centres for full redundancy.
 3. Deploying codecs with error-free packet selection to ensure broadcast stability.

The common development across the media industry is the transition from hardware-centric, siloed operations to flexible, IP-based cloud fabrics. This evolution not only reduces costs by up to 50% but also enhances the ability to deliver high-quality, data-informed media experiences to global audiences.



The session was moderated by **Andrew Davies**, ABU Radio, and the panellists were **Ts. Azhar Bin Abdul Latiff**, Medialab; **Alexander Zink**, Vice-Chair, **Fraunhofer IIS**, DRM-Switzerland; **Nick Piggot**, Radio-DNS. As community radio stations often face staffing, budgetary, and professional talent challenges, AI is emerging as a critical tool for operational sustainability. Many community stations struggle

to find professional voice-over talent or operate 24/7. AI-driven Text-to-Speech (TTS) technology, such as the Speechelo application, allows stations to generate natural-sounding voiceovers for promos and station IDs, significantly reducing production costs.

A structured workflow for AI radio production involves preparing text, selecting specific AI tones or

“engines”, generating the voiceover, and refining it through multiple iterations to achieve a realistic sound.

Beyond simple TTS, the industry is moving toward “AI Radio Platforms” that utilize Large Language Models (LLM) for script generation and Voice Cloning to maintain consistent station identities. Industry experts emphasize that AI is not intended to replace human DJs but rather to



assist them in managing programs and production more efficiently.

Digital Radio Mondiale (DRM) continues to position itself as the only ITU standard supporting all frequency bands (LF, MF, HF, and VHF), making it the direct digital successor to analogue AM/FM.

India boasts one of the world's largest deployments, with 39 transmitters covering 900 million people. Notably, 1 in 3 new cars on Indian roads is now DRM-enabled, totalling over 13 million vehicles as of January 2026. In China, a new national policy for DRM in the MF and HF bands was published in July 2025, signalling major adoption in the automotive sector.

DRM offers up to three programs, plus multimedia (Journaline), on a single frequency, providing CD-like audio quality and an Emergency Warning Functionality (EWF) that can automatically wake receivers to broadcast critical alerts. New frameworks, such as the Fraunhofer Multi-Standard Radio Receiver, allow for seamless integration of DRM, DAB+, and FM on platforms like Android Auto.

The future of radio is increasingly "Hybrid," defined as the parallel use of broadcast (FM/DAB/DRM) and IP connectivity to create a superior listener experience. While audio is delivered reliably and for free via broadcast, IP is used to add rich metadata, visuals, and interactivity.

As global automotive manufacturers (e.g., Volkswagen, BMW, Toyota) integrate sophisticated digital dashboards, radio must adopt open standards to remain prominent and visible.

RadioDNS provides a standardized, non-proprietary method for receivers to discover official metadata directly from broadcasters. It ensures a seamless transition from broadcast to IP streaming when a listener moves out of broadcast range. RadioDNS also provides accurate metadata (phonetics and text) to ensure voice assistants like Alexa or Siri can correctly identify and play local radio stations.

Session 10 | Securing Broadcast Networks in The Digital Transformation Era



The session was moderated by **Hirokazu Kamoda**, NHK-Japan, and the panellists were **Dr Les Sabel**, S-Comm Technologies, WorldDAB-United Kingdom; **Megumi Kawase**, Systems Engineer, NHK-Japan; **Ts. Mohammad Hafiz Bin Halal**, Malaysian Communications and Multimedia Commission, MCMC and **Frederik Sandbrink**, Deutsche Welle-Germany. Dr Les

Sabel (WorldDAB) emphasizes that communications systems are vital for saving lives, with radio often serving as the "last man standing" during disasters. The capacity for a system to withstand or recover quickly from difficulties. Major broadcast sites are classified as critical infrastructure and are designed with strengthened lattice towers to withstand extreme conditions, such as cyclones

exceeding 200 km/hr. Redundancy Strategies include the use of auto-failover diesel generators with several days of fuel on hand. Automatic Safety Alert (ASA) also provides a high-reliability emergency warning function.

Both NHK and Deutsche Welle (DW) presented on the implementation of the Coalition for Content Provenance



and Authenticity (C2PA) standard to combat “fake media”. Realistic fake images and videos of major events (e.g., fires) are easily created, making it risky for fakes to enter news production workflows. The C2PA Solution is a technical standard that attaches tamper-evident “provenance data” (capture, editing, and AI usage details) to an image or video. NHK uses C2PA on the ingestion side to verify content from journalists and agencies, while exploring distribution-side implementation to build audience trust.

Deutsche Welle is Germany's

international information provider and aims to provide independent information to over 337 million weekly users. DW successfully used cameras and Adobe tools to create signed files that display the “CR” (Content Credentials) icon to show the issuing authority (DW) and capture device. DW also tested a “glass-to-glass” workflow using a camera and Adobe Premiere, maintaining the C2PA manifest throughout the editing process.

The Malaysian Communications and Multimedia Commission (MCMC) presented findings from “Phase 2”

of their 5G Broadcast advancement study. Technical Performance was validated by stable one-to-many delivery, though further optimization is required. Compatibility remains a challenge, with only a limited number of functional devices currently available in the ecosystem. Surveys showed strong public interest but generally low awareness of the technology. Phase 2 successfully established the technical feasibility of 5G Broadcast in Malaysia, positioning the country as a regional leader in evidence-based exploration of this technology.





The moderator was **Dr Les Sabel**, S-Comm Technologies WorldDAB-United Kingdom, with the panellists comprising **Dr Peter Siebert**, IEEE Broadcast Technology Society; **Subodh Nepal**, ITU; and **Ahmad Fesol**, RTM-Malaysia. As global CO₂ concentrations reach historic highs (429 ppm in 2026), the broadcasting industry is scrutinizing its environmental footprint. A critical analysis reveals a significant disparity between traditional Digital Terrestrial Television (DTT) and Over-the-Top (OTT) streaming.

A study commissioned by Ofcom highlights the energy required for different delivery methods:

- **Transmission Efficiency:** DTT is significantly more efficient for distribution, consuming approximately **9.1 Wh per device viewing hour**, compared to 54 Wh for streaming.
- **Total Consumption:** Despite transmission differences, the total energy cost per viewing hour is comparable – **67 Wh for DTT** versus **58 Wh for OTT** – primarily because DTT is often consumed on larger, more power-hungry display screens.
- **The Device Factor:** In both

models, the end-user device (displays, routers, STBs) accounts for most emissions: **97% for DTT** and **90% for OTT**.

Maintaining a massive public FM network presents significant logistical and financial challenges, as demonstrated by the Radio Televisyen Malaysia (RTM) infrastructure. RTM's network is extensive, requiring constant management of:

- **34 FM Radio Channels.**
- **456 FM frequencies** are distributed nationwide.
- **Remote Physical Sites:** Many sites are located at high altitudes (peaks), making routine maintenance visits costly and time-consuming.

To sustain this network, RTM utilizes a multi-layered remote monitoring system to reduce fixed-interval routine visits:

- **Real-Time Monitoring:** Web-based interfaces enable technicians to monitor off-air audio and Integrated Receiver Decoder (IRD) status in real time.
- **Technical Oversight:** Systems track frequency, output levels, alarms, and service settings remotely.

• Environmental & Security

Control: Integration of CCTV and sensors for ambient temperature and humidity provides a comprehensive view of site health without a physical presence.

The future of broadcasting rests on three pillars: environmental responsibility by optimizing device and transmission efficiency; global coordination through the ITU to manage spectrum and standards; and operational sustainability through advanced remote monitoring technologies to maintain vital public services.

The session continued with a presentation on the International Telecommunication Union's role in shaping the future of global broadcasting through international coordination and standardization. ITU-R develops technical frameworks for spectrum management and broadcasting standards, supporting technologies such as UHD TV, 5G Broadcast, and immersive media. ITU-T focuses on network and multimedia service standardization, including IPTV, OTT architectures, AI-driven media delivery, and inclusive digital ecosystems, while



ITU-D supports countries in digital transformation and broadcasting migration strategies.

In addition, the panel discussed the importance of World Radiocommunication Conferences (WRCs), which are held every 3 to 4 years to update the international Radio Regulations and ensure

efficient, interference-free spectrum allocation. Future conferences, including WRC-27 and WRC-31, are expected to address spectrum requirements for broadcasting and mobile services, particularly within the 470-694 MHz frequency band.

Overall, the session highlighted that the future of broadcasting depends

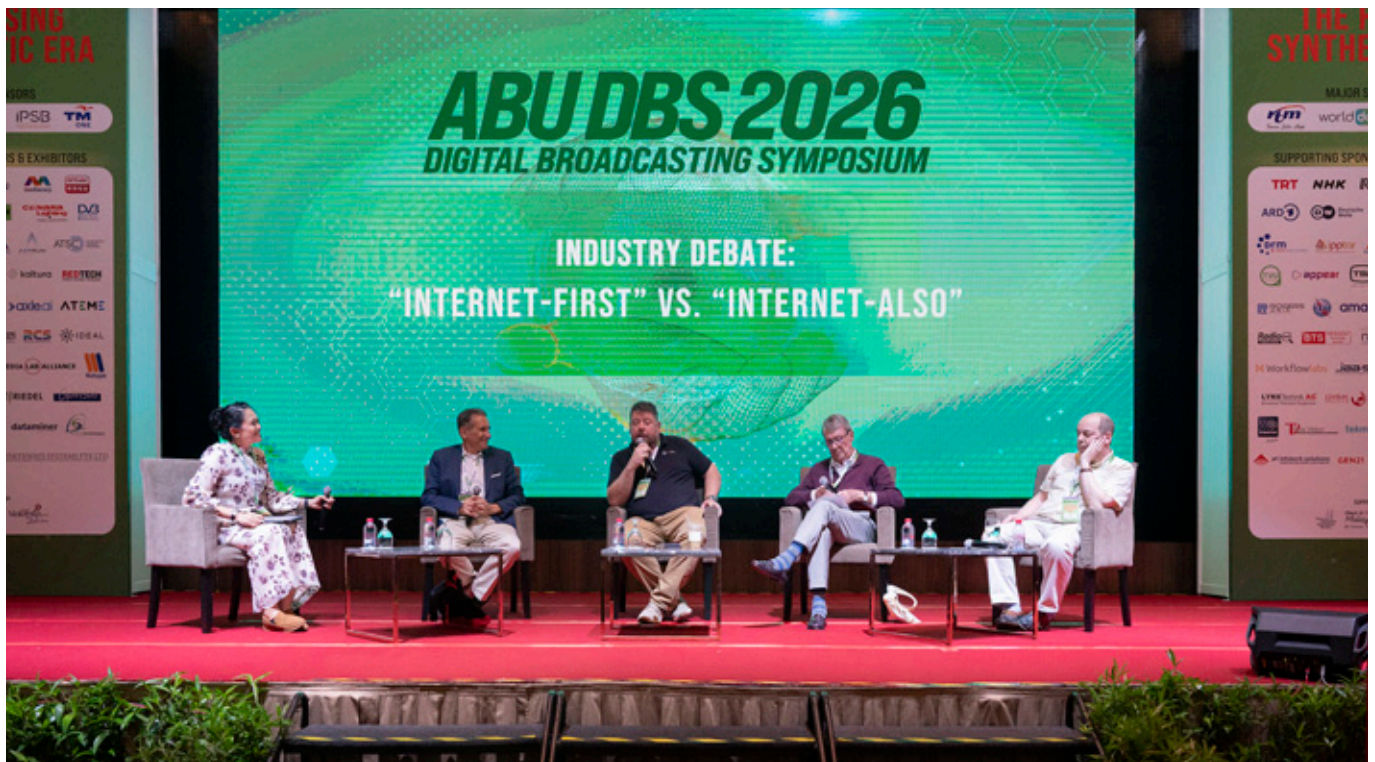
on three key pillars: environmental sustainability through energy-efficient broadcasting systems, international collaboration and spectrum coordination through the ITU, and operational sustainability enabled by advanced remote monitoring and smart infrastructure management technologies. ■





INDUSTRY DEBATE

INTERNET-FIRST VS. INTERNET-ALSO



Moderated by **Mardhiah Nasir**, Managing Director of IPSB Technology, this session critically examines the evolving strategies of broadcast and digital media in an internet-driven environment. The panel features **Dr Peter Siebert**, IEEE Broadcast Technology Society; **Fintan Mc Kiernan**, Ideal Systems; **Michael McEwen**, ATSC; and **Lindsay Cornell**, Chair, WorldDAB Technical Committee, BBC Digital.

INTRODUCTION

The broadcasting industry is experiencing a profound transformation, driven by technological convergence and evolving consumer preferences. Broadcasters, once the sole gatekeepers of content, now face disruption from telecommunications, mobile devices, and streaming

platforms. This editorial critically examines the panel's perspectives on crucial issues: the shift to internet-based broadcasting models, underlying economic dynamics, cultural consequences, and the adaptive measures broadcasters must pursue to remain relevant.

THE SHIFT FROM TRADITIONAL BROADCASTING TO INTERNET-BASED DELIVERY

Until the early 2000s, broadcasters monopolised content distribution. With the expansion of telecom networks, online delivery became feasible. Today, streaming platforms provide on-demand access – instantly and universally.

This transition encompasses more than new technology; it reflects a fundamental shift in consumer

preferences and behaviours. Younger audiences have shifted decisively away from scheduled programming, demonstrating the extent to which on-demand and mobile-centric consumption are displacing traditional broadcasting. The growing preference for portrait-oriented, mobile content challenges the sustainability of traditional broadcasting formats.

Key takeaway: This shift is irreversible. Broadcasters must prioritise internet-based strategies to remain relevant as traditional models are replaced by online platforms.

ECONOMIC PRESSURES AND INDUSTRY DISRUPTION

Economic imperatives are reshaping the industry. Declining subscription and advertising revenue reveals



vulnerabilities in traditional broadcasters' financial models.

Today, subscription income flows to global streaming giants such as Netflix, Amazon Prime Video, and Disney+. Digital platforms such as TikTok, Google, and social media capture the majority of advertising dollars.

These global corporations leverage large-scale operations, making it harder for local broadcasters to survive. The resulting revenue decline jeopardises the future of traditional broadcasting.

Key takeaway: Broadcasters must adapt to digital platforms to survive, as shifting audience and revenue trends signal an irreversible change.

CHANGING ROLE OF BROADCASTERS: FROM DISTRIBUTORS TO CONTENT CREATORS

A key inference is the redefinition of broadcasters' primary strengths. Instead of focusing exclusively on transmission, broadcasters must recast themselves as creators of distinctive, compelling content.

In an internet-centric environment, distribution increasingly relies on IP networks and digital outlets.

Broadcasters must elevate content creation, narrative craft, and audience connection. Collaborating with YouTube and social channels is now crucial.

Key takeaway: Broadcasters should focus on content creation and audience engagement rather than transmission technology to compete effectively.

CULTURAL AND SOCIETAL IMPLICATIONS

Despite economic and technological pressure, the cultural role of local broadcasting endures. Local broadcasters safeguard community identity and nurture cultural continuity, reinforcing their social significance beyond market forces.

The growing use of global streaming platforms, often lacking local content, risks cultural homogenization. If local broadcasters diminish, so may social cohesion and the diversity of media perspectives.

Key takeaway: Policy support and public service broadcasters play a crucial role in sustaining local culture and information.

PUBLIC BROADCASTERS AND THE CHALLENGE OF ADAPTATION
Public service broadcasters face a

unique dual challenge: upholding social responsibility while competing with digital-native platforms. Strategic adaptation is essential for these organisations to balance relevance and mission.

Recommended strategies are analytically driven: migrating to IP-based operations, integrating cloud and AI technologies, diversifying distribution channels, and tailoring content formats for increasingly mobile-centric audiences.

Key takeaway: Bridging the digital divide is essential to prevent exclusion of disadvantaged populations.

TECHNOLOGY, INFRASTRUCTURE, AND RESILIENCE

Technologies like 5G, satellite internet, and cloud-based production speed the move to internet-first broadcasting, reducing costs and broadening access—even in remote regions.

Increased dependence on internet infrastructure introduces operational vulnerabilities, including potential connectivity disruptions and diminished resilience during crises. A critical evaluation suggests implementing hybrid communication frameworks to ensure continuous public access to information during



emergencies.

REGIONAL DIFFERENCES AND GLOBAL TRENDS

While the transition to internet-based broadcasting is a global trend, its implementation and effects are modulated by regional variations in infrastructure, economic factors, cultural attributes, and regulatory frameworks.

Key takeaway: Hybrid broadcast and internet models may remain necessary in some regions, as

traditional broadcast still reaches further than internet streaming in certain areas.

CONCLUSION

Broadcasting stands at a turning point. Internet-based delivery is revolutionising media creation, distribution, and consumption. Traditional models face economic headwinds; survival demands that broadcasters embrace digital platforms and focus on content.

Transformation brings challenges.

Protecting culture, ensuring access, and maintaining resilient infrastructure are crucial. Public broadcasters will help balance innovation with social responsibility.

The future of broadcasting is integrating the internet into the broader media system. Content, technology, and society must evolve together. Key takeaway: The industry's future depends on balancing digital innovation with society's needs. ■



DBS WORKSHOPS

INTEGRITI PADU SDN BHD (IPSB) WORKSHOP NAVIGATING THE SYNTHETIC ERA: THE PULSE BEHIND THE PIXELS



INTRODUCTION

The synthetic era is revolutionizing how we connect with technology and each other, propelled by new waves of AI, digital media, and immersive experiences. This transformation reshapes how we consume information and invites us all to champion human-centric values in everything we do.

To set the stage for these discussions, this report explores digital consumption, cognitive development, and new responsibilities for media stakeholders.

DIGITAL NATIVES AND COGNITIVE TRANSFORMATION

Reflect on the impact: Digital natives – Gen Z and Alpha – are not just adapting; they are fearlessly leading this digital frontier. Living fully connected, they eagerly navigate multiple streams of digital information. We're not witnessing decline; we are witnessing their minds wired to multitask, spot patterns, and make lightning-fast decisions. Yet, with every leap forward comes challenges: attention is stretched thin, and the lure of instant feedback is stronger than ever.

STRATEGIC SCREEN TIME AND LEARNING OUTCOMES

Rethink how digital experiences shape our minds. Can screen time become our secret advantage? Let's look beyond the negatives and upend assumptions. High-quality

educational apps and interactive platforms can ignite curiosity and fuel lasting skills. But do not forget stepping into the real world remains essential. Strive for balance and witness new dimensions of growth.

THE SYNTHETIC PARADOX: ACCESSIBILITY AND AUTHENTICITY

In these exhilarating times for digital learning, the synthetic era throws down a challenge: How do we balance breathtaking technological breakthroughs with authenticity and accessibility? Complex digital systems only win audiences if they delight and empower. As AI-generated content expands, creators must double down on emotional resonance, empathy, and cultural sparks. Be the force behind content that builds trust, sparks responsibility, and unites communities – not just fleeting engagement.

FROM PASSIVE CONSUMPTION TO ACTIVE ENGAGEMENT

Notice the shift: Digital citizens today aren't content with just watching – they crave connection, interaction, and stories that feel personal. Forward-thinking platforms are blending global technologies with local voices, bringing culture to life. Interactive tools – adaptive content, instant feedback, user-driven storytelling – empower audiences and amplify learning like never before. Be at the forefront of this revolution!



ARTIFICIAL INTELLIGENCE IN MEDIA AND BROADCASTING

Embrace AI as your partner in crafting standout, interactive content. In media and broadcasting, AI sparks creativity by analyzing content, generating smart metadata, and shaping tailored recommendations. These advances empower you to connect the right story to the right audience, streamline production, and unlock new ways to monetize. Imagine summarizing, creating trailers and decoding audience analytics – now within reach thanks to intelligent workflows.

SUSTAINABLE DIGITAL ENGAGEMENT STRATEGIES

Adopt a proactive, full-circle digital engagement strategy. Picture this: You're attracting new audiences, welcoming them seamlessly, keeping them coming back, and even winning back those who drift. Let personalization be your secret weapon – as you deliver content that resonates,

adapts, and builds lasting relationships. Harness tools like push notifications and adaptive interfaces to create experiences your audience won't want to miss.

CONCLUSION

Step confidently into the synthetic era – where technology and human connection intertwine like never before. The hurdles of accessibility, authenticity, and content quality are your launchpads for bold innovation. Prioritize intentional screen time, wield AI wisely, and keep human-centered design at your core. The digital world is yours to shape. Remember: Every pixel pulses with the promise of advancing both tech and humanity.



ASTRUM WORKSHOP 5G NON-TERRESTRIAL NETWORK - MASSIVELY MULTIUSER SATELLITE-TO-DEVICE SERVICES

ABU DBS 2026
DIGITAL BROADCASTING SYMPOSIUM

ASTRUM WORKSHOP 5G NON-TERRESTRIAL NETWORK - MASSIVELY MULTIUSER SATELLITE-TO-DEVICE SERVICES



30 MARCH 2026 | 11:30 - 12:30

INTRODUCTION

The rapid evolution of communication technologies has led to the emergence of 5G Non-Terrestrial Networks (NTN), a paradigm shift aimed at extending connectivity beyond traditional terrestrial infrastructure. The workshop titled “5G Non-Terrestrial Network: Massively Multiuser Satellite-to-Device Services” by Astrum Mobile highlights how satellite integration into 5G ecosystems enables seamless communication in underserved and remote areas. This report explores the architecture, applications, adoption trends, and strategic importance of Satellite-to-Device (S2D) services within the NTN framework.

BACKGROUND AND RATIONALE

Despite significant progress in telecommunications, about 5% of the global population – 200-250 million people – lack access to communication. Affordability is another challenge, as 30-40% of people cannot access services due to high costs. These gaps are most pronounced in rural, maritime, and disaster-prone areas.

The Asia-Pacific region faces distinct barriers due to its expansive terrain and frequent disasters. This region experiences 40-50% of global disasters and up to 80% of associated economic losses. NTN technologies seek to address these issues by harnessing satellites for comprehensive, dependable, and affordable connectivity.

5G NON-TERRESTRIAL NETWORKS (NTN)

NTN was formalised in 3GPP Release 17 (2022), which added satellite integration into the 5G ecosystem. The goal is to create a space-based base station that provides coverage in areas where terrestrial networks are

inaccessible or unstable.

NTN systems use satellites in GEO, MEO, and LEO for wide-area coverage. A key innovation is a direct connection to standard 5G smartphones and devices. This removes the need for specialised equipment.

Release 19 (2025) introduced Broadcast over Satellite (BOG). This enables massively multiuser services with a single downlink. It greatly reduces delivery costs and improves scalability.

SATELLITE-TO-DEVICE (S2D) ARCHITECTURE

S2D services mark a major advance in communication technology. The system merges satellites, 5G core networks, and ground gateways to deliver content directly to end-user devices (UEs), including smartphones, IoT sensors, and autonomous systems.

Key features include:

- Wide-area coverage across land, sea, and air
- Support for unlimited devices simultaneously
- Broadcast and multicast capabilities for efficient data distribution
- Integration with IoT, drones, and autonomous platforms

This system enables efficient transmission for live broadcasting, datacasting, and emergency alerts, while easing congestion on terrestrial networks.

USE CASES AND APPLICATIONS

The workshop outlines several high-impact use cases across government, enterprise, and consumer sectors,



demonstrating how S2D technology can address the challenges and objectives outlined in previous sections.

S2D enables emergency mass alerts. Real-time evacuation instructions, weather warnings, and disaster updates can reach smartphones even when terrestrial networks fail. It also supports maritime safety, broadcasting piracy alerts and navigation updates to offshore vessels.

1. Sovereignty and Infrastructure

Examples include border security, agricultural IoT access, and distance learning delivery. These services help governments maintain real-time awareness and deliver key updates in remote or underserved areas.

2. Enterprise Applications (B2E)

S2D enables simultaneous software and firmware updates across fleets of vehicles, drones, and IoT devices. It enables high-precision positioning and large-scale distribution of IoT data, thereby optimising operational efficiency and reducing costs.

3. Consumer Services (B2C)

Consumers receive data-free broadcasts of TV, radio, and video content, especially in isolated or maritime settings. Content can be preloaded during low-traffic times, ensuring uninterrupted service without relying on cellular data.

4. Digital Content Distribution

A Space-based Content Delivery Network (CDN) streamlines the distribution of media, advertising, and digital signage across vast regions, reducing reliance on terrestrial systems.

ADOPTION TRENDS AND MARKET OUTLOOK

NTN adoption is rising rapidly, with early pilots in 2024 and rapid growth forecasted from 2025. Leading telecom providers such as AT&T, Vodafone, and T-Mobile are investing in satellite-enabled services.

By 2026 and after, commercial deployment is expected to accelerate. This growth will be driven by greater

device compatibility, increased industry collaboration, and regulatory harmonisation – especially in the L-band spectrum (1467-1492 MHz).

- Increasing device compatibility
- Industry collaboration (e.g., chipset manufacturers and satellite providers)
- Regulatory harmonisation, particularly in L-band spectrum (1467-1492 MHz)

PILOT TESTING AND VALIDATION

Pilot trials in Singapore and other locations established S2D service viability. Tests assessed:

- Weather resilience of satellite signals
- Continuous live broadcasting during extreme conditions
- User experience during disaster scenarios

Results show S2D systems sustain dependable communications during severe weather, making them highly effective for disaster risk management.

ASTRUM MOBILE'S ROLE AND FUTURE DIRECTIONS

Astrum Mobile is advancing S2D technology and operates in Singapore and the United States. The company plans to launch NEASTAR-1, a high-powered L-band satellite, by 2027 to expand coverage in the Asia-Pacific region. Astrum is pursuing partnerships to grow S2D, focusing on cooperation with governments, telecoms, and technology firms.

CONCLUSION

5G Non-Terrestrial Networks and S2D services represent a transformative leap toward global connectivity. By overcoming geographic, financial, and infrastructure barriers, these technologies provide robust communication even in the harshest environments.

Merging satellite capabilities into the 5G ecosystem increases coverage and introduces new applications in public safety, enterprise operations, and consumer markets. As use grows and the technology evolves, S2D will help bridge the digital divide and reinforce resilience to future challenges.

IPPTAR WORKSHOP GENERATIVE AI IN AUDIO-VISUAL CONTENT CREATION: OPPORTUNITIES, CONSTRAINTS, AND STRATEGIC INTEGRATION

ABU DBS 2026
DIGITAL BROADCASTING SYMPOSIUM

IPPTAR WORKSHOP AI IN AV PRODUCTION: INNOVATION, IMPACT, INFINITY



30 MARCH 2026 | 14:00 - 15:00

INTRODUCTION

The rapid advancement of Generative Artificial Intelligence (AI) is transforming the media and broadcasting landscape, particularly in video and audio content production. As highlighted in the IPPTAR workshop material, AI is no longer confined to experimental applications but is increasingly integrated into mainstream production workflows. However, despite its immense potential, generative AI remains constrained by technical, ethical, and creative limitations. This report examines the pragmatic integration of AI with live-action footage, its current challenges, and its strategic applications in modern broadcasting.

THE EVOLUTION AND ROLE OF GENERATIVE AI IN MEDIA

Generative AI has evolved from Artificial Narrow Intelligence (ANI) – a type of AI designed for specific, limited tasks – to the emerging concept of Artificial General Intelligence (AGI), which aims to perform any intellectual task that a human can. In media production, current AI tools are used for functions such as generating background visuals (B-roll, supplemental footage), creating visual effects (VFX, digitally created imagery), and assisting in post-production workflows (the process of editing and finalising media content).

Major production studios, including global streaming platforms, now use AI to generate realistic imagery, automate editing, and improve workflows. These trends build on technologies like machine learning, neural rendering, and deep generative models.

The workshop emphasises AI as an enhancement to storytelling and efficiency rather than an end in itself. This helps balance innovation with creative authenticity.

KEY CHALLENGES AND LIMITATIONS OF AI IN VIDEO PRODUCTION

While generative AI offers transformative capabilities, several critical limitations hinder its full adoption:

1. Consistency and Stability

AI-generated videos often struggle with temporal consistency, leading to visual artefacts or frame-to-frame inconsistencies. This is particularly problematic in narrative-driven content where continuity is essential.

2. Accuracy and Hallucination

AI systems may generate inaccurate or fabricated details, a phenomenon known as “hallucination”. For example, when generating culturally specific elements such as traditional clothing, AI models may produce incorrect representations due to biased training data.

3. AI Bias

Historical training bias in models, mainly trained on Western or Chinese datasets, leads to inaccuracies in culturally specific content, underscoring the need for localised datasets.

4. Uncanny Valley Effect

AI-generated characters may evoke discomfort among audiences due to subtle imperfections in realism. This psychological barrier limits the acceptance of fully AI-generated actors.



5. Technical and Operational Constraints

The workshop also references the “shutdown” or imposed limitations of certain AI systems. In this context, a shutdown refers to instances in which the service provider restricts use or disables the system, underscoring that scalability (the ability to handle increasing workloads) and reliability (the system’s consistent performance) remain ongoing challenges in AI deployment.

STRATEGIC INTEGRATION OF AI IN CONTENT PRODUCTION

Rather than relying entirely on AI, the workshop proposes a hybrid approach tailored to the project’s nature. Four key strategies are identified:

1. Fully AI-Generated Content

This approach is suitable for fantasy-driven or stylised content, where strict realism and continuity are less critical. AI tools can generate entire scenes, characters, and environments with minimal human intervention.

2. AI + Live-Action Footage

For realistic productions, AI is used to enhance live-action footage. This includes compositing, background generation, and minor visual enhancements, while maintaining narrative continuity.

3. AI + Live-Action + Extended Reality (XR)

This strategy incorporates XR technologies, where XR means Extended Reality – an umbrella term covering technologies like virtual reality (VR), augmented reality (AR), and mixed reality (MR). For example, Unreal Engine-based virtual production uses XR techniques to create immersive environments. AI-generated assets are integrated with real-time rendering systems, enabling cost-effective large-scale productions.

4. AI + Live-Action + XR + 3D Asset Generation

The most advanced approach involves combining AI with high-precision 3D asset generation – the process of creating accurate digital models – particularly for historical dramas. Through digital archiving (the preservation of digital records) and 3D scanning (capturing real-world objects for digital use), production teams can create accurate representations of costumes, props, and environments.

This method also enables:

- AI-driven digital crowds, reducing the need for large numbers of extras
- Faster pre-production and post-production workflows

- Seamless integration of historical and fictional elements

Such strategies demonstrate how AI can be scaled according to production complexity and requirements.

THE IMPORTANCE OF LOCALISATION AND CULTURAL ACCURACY

The workshop highlights the need for localised AI training. Global models often misrepresent non-Western cultures – e.g., generating inaccurate Hanbok – due to insufficient data.

To address this, broadcasters like KBS are investing in custom datasets and digital archives to ensure that AI-generated content maintains cultural authenticity. This approach highlights the growing importance of data sovereignty and localisation in AI-driven media production.

FUTURE OUTLOOK

The future of generative AI in broadcasting lies in collaborative human-AI workflows. Key trends expected to shape the industry include:

- Increased use of AI-assisted production pipelines
- Integration with real-time rendering and virtual production technologies
- Development of region-specific AI models for cultural accuracy
- Enhanced automation in editing, scripting, and content personalisation

However, achieving these advancements will require continued improvements in model reliability, ethical AI practices, and audience acceptance.

CONCLUSION

Generative AI represents a powerful tool for transforming audio-visual content creation, offering unprecedented efficiency and creative possibilities. However, its limitations – particularly in terms of consistency, accuracy, and cultural representation – necessitate a cautious, strategic approach.

The IPPTAR workshop underscores the importance of pragmatic integration, where AI complements rather than replaces traditional production methods. By combining AI with live-action footage, XR technologies, and localised datasets, broadcasters can harness its potential while maintaining quality and authenticity.

Ultimately, the success of AI in media production depends not on the technology itself, but on how effectively it is used to enhance storytelling and audience engagement.

ABU DBS 2026
DIGITAL BROADCASTING SYMPOSIUM

AUDIO 360

GLOBAL TRENDS IN RADIO, PODCASTING AND AI



30 MARCH 2026 | 15:30 - 16:30

INTRODUCTION

The 2026 audio landscape is defined by the continued resilience of traditional radio, deliberate expansion in podcasting, and the transformative adoption of AI technologies. While digital disruption is evident, audio remains central to delivering information and entertainment, particularly in European and Asia-Pacific markets.

THE STATE OF GLOBAL RADIO

Radio consistently achieves significant reach across diverse demographics, despite the rise of on-demand audio platforms.

- **Reach and Consumption:** In Europe, radio reaches 84% of citizens weekly, with listeners tuning in for an average of 2 hours and 14 minutes daily. Even among younger audiences (ages 15-24), reach remains high at 73%.
- **Public Service Media (PSM):** PSM radio holds a strong position, reaching 43% of Europeans weekly. The dominant genres for public radio include Music (52%), News/Current Affairs (21%), and Regional/Local content (9%).
- **Digital Presence:** Broadcasters have successfully transitioned to digital, with over 288 internet streams operating in the EBU (European Broadcasting Union) area alone.

PODCASTING: MOTIVATIONS AND CONTENT TRENDS

The workshop presents differentiated motivations for radio and podcast consumption.

- **Audience Motivations:** *** Radio:** Primarily used for enjoyment, routine, keeping company, and passing the time.

- o **Podcasts:** Consumed to “learn something new”, “indulge a passion” or “be kept up to date” on specific topics.

- **Production Breakdown:**

- o **Original Podcasts:** 27%
- o **Catch-up Radio:** 40%
- o **Video Podcasts:** 33% (reflecting the “visual radio” trend).

- **Targeting Niche Audiences:** While 73% of podcasts target younger audiences, there is a growing segment (12%) focusing on niche groups such as farmers and UMKM (Micro, Small, and Medium Enterprises).

THE AI REVOLUTION IN AUDIO

AI is no longer a futuristic concept but a core component of the 2026 audio production workflow.

- **Creative and Operational Efficiency:**

- o **Scripting and Research:** Using Large Language Models (LLMs) like ChatGPT and Perplexity for episode planning and research.
- o **Audio Enhancement:** Tools like Adobe Podcast and Descript are used for noise removal and “studio-quality” leveling.
- o **Voice Synthesis:** ElevenLabs and similar platforms are used for voice cloning and multi-language dubbing.

- **Automated Content Creation:** AI is being used to generate “news bites”, social media assets, and even full “AI Radio” experiences where AI hosts interact with listeners in real-time.

- **The “Human-in-the-Loop” Model:** The workshop emphasizes that AI should be viewed as a “co-pilot”. The most successful implementations combine AI efficiency with human editorial judgment and creativity.



STRATEGIC RECOMMENDATIONS FOR BROADCASTERS

To ensure ongoing competitiveness, the report recommends a multi-platform “Audio 360” strategy.

1. Embrace Hybrid Models: Maintain strong terrestrial broadcast roots while expanding into high-quality original podcasting.
2. Recognise that one-third of podcasts are now consumed with a visual component. Invest in professional video capture for radio programming to address this trend.
3. Adopt Ethical AI: Implement AI tools to reduce the

“drudgery” of production (transcription, editing) so talent can focus on high-impact storytelling.

4. Know the Audience: Tailor content specifically to the different motivations of live radio listeners vs on-demand podcast subscribers.

CONCLUSION

In 2026, the audio sector maintains its robustness and adaptability. By employing AI, fostering podcast engagement, and leveraging radio’s reliability, broadcasters can sustain relevance in an increasingly competitive media environment.



DVB WORKSHOP

DVB AT THE INTERSECTION OF IP, MOBILE AND BROADCAST

ABU DBS 2026
DIGITAL BROADCASTING SYMPOSIUM

DVB WORKSHOP

DVB AT THE INTERSECTION OF IP, MOBILE, AND BROADCAST



31 MARCH 2026 | 15:30 – 16:30

INTRODUCTION

The Digital Video Broadcasting (DVB) ecosystem is undergoing a major transformation driven by the convergence of broadcast, broadband, and mobile technologies. Traditionally, broadcasting relied on one-to-many transmission systems such as terrestrial, satellite, and cable networks. However, the rapid growth of internet-based streaming services has shifted consumer expectations toward on-demand, multi-device, and interactive media consumption.

The workshop highlighted innovations such as DVB-NIP, DVB-I, 5G Broadcast, and DVB-SIS, which bridge traditional broadcasting with IP-based delivery to create a unified, efficient global content distribution ecosystem. This report explores these technologies, their architecture, use cases, and implications for the future of media delivery.

DVB-NIP: A NEW PARADIGM IN BROADCASTING

DVB-NIP (Digital Video Broadcasting – Native IP) represents a significant evolution from traditional DVB transport stream broadcasting to fully IP-based delivery. It is often described as “OTT via satellite” because it integrates broadcast infrastructure with OTT streaming models. Unlike legacy systems that rely on MPEG transport streams, DVB-NIP uses IP encapsulation combined with adaptive bitrate (ABR) streaming. This enables both unicast and multicast delivery, improving bandwidth efficiency while supporting high-quality video formats such as HD and 4K.

Key advantages include:

- Delivery of content anywhere, anytime, on any device
- Efficient use of bandwidth through multicast ABR
- Support for diverse services, including education,

hospitality, and mobility

- Reduced infrastructure costs and improved energy efficiency

Real-world deployments demonstrate DVB-NIP's potential. Satellite operators are leveraging it to provide multi-screen Direct-to-Home (DTH) services, while organizations, such as educational initiatives, use it to distribute offline content to remote regions without internet access.

DVB-I AND 5G BROADCAST

DVB-I introduces a service layer that enables users to discover and access television services regardless of the delivery network. It standardizes service discovery, channel lists, and electronic program guides (EPGs), making television more accessible and user-friendly.

When combined with 5G Broadcast, DVB-I extends broadcasting into mobile ecosystems. 5G Broadcast, standardised by 3GPP, allows high-power transmission, operation without SIM cards, and compatibility with existing mobile devices.

Benefits include:

- Seamless switching between broadcast and unicast networks
- Delivery of emergency alerts and public service information
- Enhanced interactivity and user engagement
- Efficient large-scale distribution of live events

This convergence allows content delivery across terrestrial, satellite, broadband, and mobile networks without separate systems.

ADDRESSABLE TV AND MONETISATION

Addressable television represents a major advancement in broadcasting monetisation. Enabled by DVB-I and DVB-TA, it allows broadcasters to deliver targeted advertisements tailored to individual viewers or households.

Key features include:

- Dynamic ad insertion
- Audience measurement and analytics
- Integration with hybrid broadcast-broadband TV (HbbTV)
- Personalised viewing experiences

This approach significantly improves advertising efficiency and opens new revenue streams for broadcasters. It also enhances viewer engagement by delivering more relevant content.

DVB-SIS: EXPANDING COVERAGE AND REDUCING COSTS

DVB-SIS (Single Illumination System) is designed to extend television coverage to underserved regions while minimising operational costs. It enables the reconstruction of terrestrial broadcast signals at remote transmission sites using satellite-delivered metadata.

Key features include:

- Centralised configuration at the broadcast headend
- Deterministic and synchronised transmission
- Reduced reliance on terrestrial infrastructure
- Compatibility with both DTH and DTT systems

This technology has been successfully deployed in multiple countries, enabling cost-effective broadcasting to large populations – including during major events such as international sports tournaments.

FUTURE IMPLICATIONS AND INDUSTRY IMPACT

The convergence of DVB technologies with IP and mobile networks is reshaping the broadcasting industry. Broadcasters can now deliver content more efficiently while expanding their reach to new audiences.

Key trends include:

- Increasing adoption of hybrid broadcast-broadband systems
- Growth of mobile-first media consumption
- Expansion of personalised and interactive services
- Greater emphasis on energy efficiency and sustainability

These developments are expected to drive innovation and competition in the media industry, ultimately benefiting consumers with higher-quality, more accessible content. The DVB ecosystem is evolving toward a fully IP-based, converged media environment. Technologies such as DVB-NIP, DVB-I, 5G Broadcast, and DVB-SIS collectively redefine how content is delivered and consumed.

They offer flexibility, an improved user experience, cost efficiency, and broader access to content. As these technologies mature, broadcasting will become more integrated, network-agnostic, and better able to meet the demands of a digital-first audience.



WORLDDAB WORKSHOP DESIGNING RESILIENT DAB+ DIGITAL RADIO NETWORKS

ABU DBS 2026
DIGITAL BROADCASTING SYMPOSIUM

WORLDDAB WORKSHOP FROM FM TO DAB+: KEY CONSIDERATIONS IN GETTING IT RIGHT FIRST TIME

world **dab** 1 APRIL 2026 | 15:30 - 16:30

INTRODUCTION

The WorldDAB workshop underscored the significant momentum of DAB+ digital radio worldwide, particularly in the Asia-Pacific (APAC) and African regions. WorldDAB, as the global industry forum for digital radio, facilitates collaboration between broadcasters, regulators, and manufacturers to promote the adoption and implementation of the DAB+ standard. This report synthesizes key technical developments, economic analyses comparing DAB+ with 5G Broadcast, and specific regional progress in Thailand and Indonesia.

Globally, several countries are at various stages of DAB+ adoption. Saudi Arabia and South Korea have moved to regular services, while many others – including Thailand, Indonesia, Malaysia, and Vietnam – are conducting trials or expressing formal interest. In Africa, Kenya is emerging as a strong candidate for DAB+ due to FM band saturation and high radio reach, which exceeds 80% of the population.

KEY TECHNICAL DEVELOPMENTS AND STANDARDS

The WorldDAB Technical Committee enhanced DAB standards, adding regional text profiles for African languages and Thai. This allows receivers to display local characters, aiding market acceptance and compliance.

Another significant technical innovation is the Automatic Safety Alert (ASA). ASA leverages the reliability of broadcast radio to provide real-time, automatic emergency alerts without user intervention. It can even wake radios from sleep mode, ensuring critical safety information reaches the public during crises when mobile networks might be down. The standard also includes geofencing capabilities for regionalized alerting.

Further enhancements include 'Public Prominence' signalling, which helps users discover public service content in a crowded digital media environment, and the 'Push to Local' mechanism, which allows broadcasters to favour local service variants over national ones in moving vehicles. This ensures listeners receive the most relevant local news and weather.

ECONOMICS OF DAB+ VS. 5G BROADCAST

The workshop highlighted that DAB+ remains more cost-effective than 5G Multicast-Broadcast Services (MBS) for radio delivery. 5G MBS infrastructure requires higher capital and operating expenditures, mainly because more transmission sites are needed to achieve comparable coverage.

Furthermore, 5G MBS faces several hurdles to widespread adoption. Mobile Network Operators (MNOs) have not yet shown a clear commitment to selling 5G MBS-enabled smartphones or supporting broadcast-operated systems. History suggests that without MNO support, such technologies often fail to gain consumer confidence. In contrast, DAB+ is already a mature ecosystem, with over 1,000 receiver models available at prices starting from \$20 USD and widespread inclusion in new cars.

REGIONAL PROGRESS: THAILAND AND INDONESIA

Thailand is making excellent progress toward full DAB+ deployment by 2026. After successful trials in Bangkok and regional provinces, the National Broadcasting and Telecommunications Commission (NBTC) announced frequency plans and receiver standards in the Royal Gazette in 2024. Key upcoming milestones include network provider trials scheduled for late 2025 and the issuance of



content provider licenses planned for late 2026.

Indonesia is also advancing under its 2023 Master Plan for terrestrial radio. Radio Republic Indonesia (RRI) has led DAB+ services in Jakarta, Bandung, and Surabaya since 2015, and has recently expanded coverage with

new high-power transmissions in Semarang, Yogyakarta, and Malang. By the end of 2026, the government expects to finalize national receiver standards. Commercial operators will be required to obtain a license and finalize a commercial agreement with RRI before launching services. ■



CCBN-ABU **NEXUS Event**



AI

TIME

22nd-24th, April, 2026

LOCATION

Beijing, China

Hosted By: CCBN & ABU

For registration, please contact ABU at aqilah@abu.org.my

For logistics, please contact CCBN at zhangzhen@ccbn.cn

ENGINEERING AN END-TO-END BROADCAST MANAGEMENT PLATFORM FOR INTERNATIONAL TELEVISION OPERATIONS

ABSTRACT

Modern international television broadcasting requires increasingly complex workflow structures involving schedule planning, metadata management, content verification, rights compliance, and multi-platform publishing. As broadcast ecosystems continue to expand across linear, digital, and online platforms, fragmented tools and manual coordination methods may create inefficiencies, increase risk, and reduce scalability.

To address these challenges, Türkiye Radio and Television Corporation (TRT) developed an in-house Broadcast Management System (BMS) for its international television operations. TRT BMS is an integrated platform designed to centralize scheduling, metadata management, automated Electronic Program Guide (EPG) generation, playout verification, AsRun analysis, and reporting workflows within a unified architecture.

This paper presents the engineering approach behind TRT BMS, including its system objectives, architectural design, core technical modules, and implementation methodology. The study further outlines the performance improvements achieved through workflow automation, improved synchronization across broadcast-related platforms, reduced manual intervention, and enhanced reporting capabilities. Finally, the paper discusses future development plans including anomaly detection, video fingerprinting, semantic video analysis, and intelligent user-support modules.

Keywords: Broadcast Management System, Scheduling Automation, EPG Distribution, AsRun Analysis, Workflow Integration, International Broadcasting

1. INTRODUCTION

The broadcasting industry has undergone significant transformation in recent years due to the increasing complexity of modern media environments. Traditional television broadcasting has evolved beyond linear transmission and now requires simultaneous coordination across multiple domains including scheduling, metadata management, content preparation, regulatory compliance, digital publishing, and multi-platform distribution.

International broadcasters, in particular, face additional complexity due to the dynamic nature of global news production, multilingual content requirements, frequent schedule changes, and the need for real-time synchronization between broadcast and digital publishing platforms. These requirements demand a highly coordinated environment where accuracy, timing, and system interoperability are critical. The increasing complexity and interdependency of modern broadcast operations are illustrated in **Figure 1**.

Evolution of Modern Broadcast Workflow Complexity



Figure 1. Evolution of Modern Broadcast Workflow Complexity.

In many broadcasting environments, workflow processes have historically been supported through combinations of standalone software tools, spreadsheets, manual planning methods, and disconnected departmental systems. While such approaches may remain functional in smaller-scale environments, they create limitations when managing large-scale and high-frequency broadcasting where speed, precision, and adaptability are essential.

As a result, broadcasters increasingly require integrated digital platforms capable of consolidating workflows into centralized and scalable management systems. These platforms must support not only scheduling and playout preparation, but also metadata-driven automation, real-time verification, reporting, and interoperability across multiple downstream systems.

To support these requirements within its international television broadcasting environment, TRT designed and developed an in-house Broadcast Management System (TRT BMS), with the goal of digitally transforming and centralizing the entire broadcast workflow lifecycle.

2. BROADCAST MANAGEMENT CHALLENGES IN INTERNATIONAL TELEVISION

Managing international television broadcasts involves significantly greater complexity than traditional linear channel scheduling. Broadcasters must coordinate multiple layers simultaneously, including long-term programming strategy, daily schedule execution, metadata governance, compliance monitoring, and digital platform synchronization.

These requirements become increasingly challenging in dynamic news environments where schedules may require frequent adjustments, live events can alter programming at short notice, and multiple assets must be prepared and synchronized across several systems.

One of the primary challenges is schedule planning complexity itself. Broadcast scheduling is not limited to assigning programs into time slots; it also requires detailed management of segment timing, secondary events, filler content, promotional materials, inter-program transitions, and frame-accurate alignment with playout requirements. As scheduling granularity increases, maintaining accuracy through manual planning becomes increasingly difficult.

Another major challenge lies in metadata dependency across the broadcast workflow. Modern television environments rely heavily on structured metadata for content identification, version control, categorization, promotional planning, rights tracking, and downstream integrations. Where metadata is managed inconsistently or across fragmented tools, synchronization issues and system errors may arise.

In addition, broadcasters must ensure continuous synchronization between scheduling systems and publishing platforms. Program schedule data is no longer used solely for playout preparation, but also feeds EPG systems, digital publishing platforms, mobile applications, websites, and third-party distribution systems.

Verification and post-broadcast analysis also represent

increasingly important requirements. Broadcasters must validate actual transmission outputs against planned schedules, review AsRun logs, monitor deviations, and generate analytical reports for assessment, compliance, and strategic planning.

Collectively, these challenges highlight the growing need for integrated and automated systems capable of supporting the full lifecycle of modern international broadcast management.

3. SYSTEM OBJECTIVES

In response to the growing complexity of international television broadcasting, TRT initiated the development of an integrated Broadcast Management System (BMS) designed to centralize and modernize its international channel workflows.

The primary objective of TRT BMS was to establish a unified platform capable of managing the full broadcast lifecycle within a single integrated environment.

The key design objectives of TRT BMS were defined as follows:

1. Centralization of Broadcast Processes

To unify scheduling, metadata management, playout preparation, verification, and reporting under a single platform architecture.

2. Reduction of Manual Workload

To minimize repetitive manual intervention through workflow automation and metadata-driven process design.

3. Improvement of Scheduling Precision and Flexibility

To support detailed and frame-accurate scheduling capabilities suitable for dynamic broadcast environments.

4. Automation of Multi-Platform Publishing

To automate downstream outputs including EPG generation, digital publishing feeds, and external schedule distribution.

5. Enhancement of Visibility and Analysis

To provide integrated reporting, AsRun analysis, and post-broadcast verification capabilities.

6. Establishment of Scalable Technical Infrastructure

To create a modular and extensible architecture capable of supporting future broadcast technology initiatives.

Based on these objectives, TRT BMS was engineered as a modular in-house platform tailored specifically to TRT's international television broadcasting requirements.

4. SYSTEM ARCHITECTURE

TRT BMS was engineered as an end-to-end platform structured around the natural lifecycle of broadcast content, from preparation and planning to transmission support and post-broadcast analysis.

Rather than separating tasks across disconnected tools, the system was designed as a unified architecture in which each workflow stage feeds directly into the next within a continuous digital pipeline.

The architectural foundation of TRT BMS is based on centralized metadata-driven workflow management. At

End-to-End TRT BMS Workflow Architecture



Figure 2. End-to-End TRT BMS Workflow Architecture.

the core of the platform lies the Program Database, which serves as the primary source of truth for content metadata, scheduling definitions, and program code generation. Each content item is registered with structured metadata and assigned a unique program code prior to production and broadcast preparation.

Once metadata and scheduling parameters are defined, the workflow progresses into the Weekly Grid Planning module, where high-level scheduling structures are prepared using reusable templates and schedule-copy mechanisms.

The approved weekly planning data is then transferred into the Daily Scheduling Engine, where second-level broadcast schedules are generated with precise timing details.

At this stage, TRT BMS manages not only core programme blocks but also secondary broadcast elements such as promos, idents, weather segments, menus, and interstitial materials through a rule-based automation engine.

Following schedule finalization, TRT BMS automatically generates playout-ready transmission files in broadcaster-compatible formats for direct import into playout automation systems.

In parallel, approved scheduling and metadata data are processed through the EPG Distribution Layer, where Electronic Program Guide information is generated automatically and distributed via API-based integrations.

Following transmission, TRT BMS completes the feedback loop through its AsRun Processing and Analysis Engine.

Playout logs generated by transmission systems are imported into the platform and reconciled against planned schedules to identify deviations, measure actual broadcast performance, and produce analytical outputs.

Through this architecture, TRT BMS establishes a fully integrated digital workflow supporting the complete lifecycle of international television broadcast management.

The complete end-to-end workflow architecture of TRT

BMS is illustrated in **Figure 2**.

4.1 TECHNICAL INFRASTRUCTURE FOUNDATION

From an engineering perspective, TRT BMS is implemented as a centralized web-based platform architecture supported by database-backed workflow engines and modular service components.

The system utilizes API-driven integrations for downstream communication with publishing, scheduling, and distribution systems, enabling real-time synchronization across connected platforms.

Its modular and extensible design allows TRT to continuously expand functionality and integrate future technology modules without requiring architectural redesign.

A high-level overview of the technical infrastructure and integration architecture of TRT BMS is presented in **Figure 3**.

5. KEY TECHNICAL MODULES AND INNOVATIONS

Beyond its end-to-end architecture, TRT BMS incorporates several technical modules specifically engineered to automate complex broadcast workflows and improve accuracy.

Among these, three core innovation areas form the technological foundation of the platform: algorithm-assisted program code generation, rule-based scheduling automation, and post-broadcast reconciliation analysis.

5.1 ALGORITHM-ASSISTED PROGRAM CODE GENERATION

One of the foundational technical requirements of international broadcasting is the assignment of unique program identifiers for all broadcastable content.

These identifiers are essential for scheduling, traceability, playout preparation, reporting, and downstream metadata synchronization.

Prior to TRT BMS, program codes were generated manually through spreadsheet-based workflows, creating risks related to inconsistency, duplication, and human error.

Technical Infrastructure & Integration Architecture

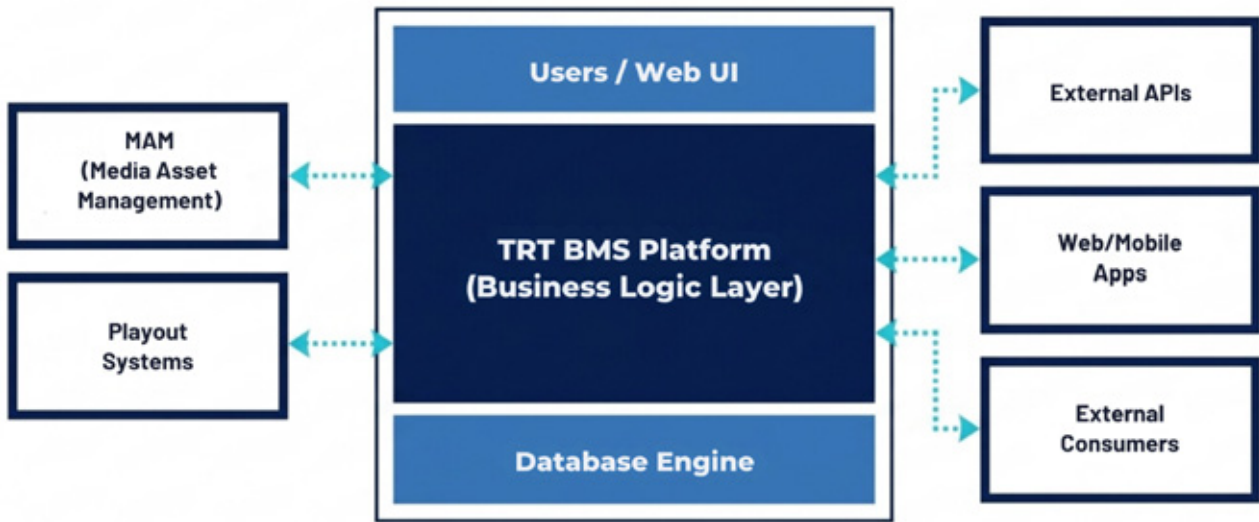


Figure 3. Technical Infrastructure and Integration Architecture.

To address this challenge, TRT BMS introduced an algorithm-assisted automated program code generation engine capable of producing standardized and unique identifiers based on predefined metadata structures and scheduling parameters.

The system generates codes dynamically according to content type, versioning structure, part segmentation, and planned broadcast timing.

This automation improves generation speed while eliminating manual inconsistencies in one of the most fundamental stages of broadcast preparation.

5.2 RULE-BASED SCHEDULING AND AUTOFILL ENGINE

To reduce repetitive planning activities, TRT BMS incorporates a rule-based scheduling engine that automates large portions of the scheduling workflow.

This engine uses structured metadata and configurable business rules to populate schedules with broadcast elements including programme clips, promotional content, idents, weather segments, and other secondary assets.

Scheduling decisions are executed according to parameters such as active date ranges, frequency rules, time restrictions, daypart constraints, and placement logic.

The autofill engine works in conjunction with the template-

based scheduling system, allowing operators to establish reusable scheduling patterns while dynamically adjusting schedule population based on current metadata and automation logic. The simplified decision flow of the rule-based scheduling and autofill engine is illustrated in Figure 4.

5.3 PLANNED VS. ASRUN RECONCILIATION AND ANALYSIS ENGINE

One of the most significant technical components of TRT BMS is its post-broadcast reconciliation engine. Following broadcast, playout logs are imported into the platform and processed through TRT BMS's reconciliation engine, where the system evaluates differences between scheduled content and actual aired content.

This includes detection of substitutions, omissions, cancellations, live insertions, and timing deviations.

The reconciliation engine is particularly critical for TRT's international news operations, where live programming and breaking-news events may alter schedules multiple times per day.

By automating this process, TRT BMS transformed what was previously a highly manual monthly reporting workflow into an automated analytical process capable of producing detailed broadcast reports within seconds.

The reconciliation workflow of the Planned versus AsRun

Rule-Based Scheduling and Autofill Logic



Figure 4. Rule-Based Scheduling and Autofill Logic.

Planned vs AsRun Reconciliation Workflow

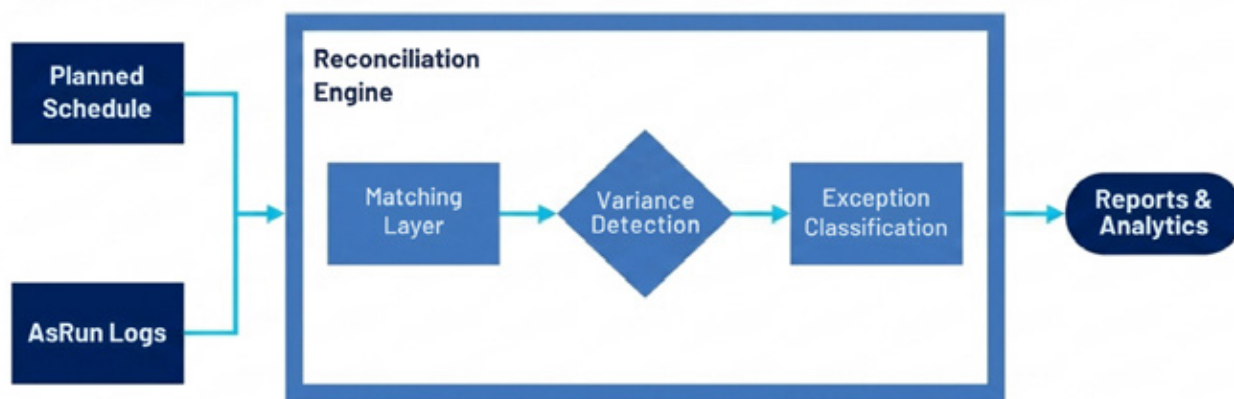


Figure 5. Planned vs AsRun Reconciliation Workflow.

analysis engine is presented in **Figure 5**.

6. IMPLEMENTATION STRATEGY AND DEPLOYMENT APPROACH

The development of TRT BMS originated from TRT's need for a broadcast management platform specifically aligned with the requirements of its international television channels.

During the evaluation phase, TRT assessed multiple commercial broadcast management solutions available in the market; however, several implementation challenges were identified.

First, many commercially available platforms were designed around generalized international broadcasting workflows that did not fully align with TRT's internal scheduling methodologies and production processes.

While such systems offered broad functionality, certain workflow-critical requirements specific to TRT's international broadcasting environment were either unavailable or difficult to adapt without substantial customization.

Second, the acquisition and long-term licensing costs associated with enterprise-grade third-party broadcast platforms represented a significant financial consideration.

In addition to software licensing, many solutions required vendor-dependent customization and maintenance models that could reduce long-term agility and flexibility.

Third, TRT required a system architecture capable of evolving rapidly alongside changing editorial and production requirements.

In dynamic broadcast environments, workflow requirements may shift frequently, particularly in international news operations where flexibility and rapid adaptation are essential.

TRT therefore prioritized technical ownership and development agility as strategic requirements during platform selection.

Based on these considerations, TRT elected to pursue a fully

in-house engineering approach, assigning the complete design and development of the platform to its internal information technology and engineering teams.

This strategy enabled TRT to retain full control over product architecture, workflow customization, technical roadmap planning, and long-term extensibility.

The implementation of TRT BMS followed a phased deployment methodology, with system modules introduced progressively rather than through a single large-scale migration.

This phased approach allowed TRT to validate each module incrementally, collect real user feedback, and refine functionality throughout the deployment lifecycle. Special emphasis was placed on close collaboration between engineering teams and scheduling personnel during development.

Because broadcast scheduling workflows contain substantial domain-specific knowledge, TRT adopted a collaborative design model in which software engineers and scheduling professionals worked jointly throughout the design and testing phases to ensure technical solutions accurately reflected real workflow requirements.

This implementation strategy ultimately enabled TRT to deploy TRT BMS as a fully operational in-house broadcast management platform tailored specifically to the needs of TRT's international television broadcasting environment.

7. OPERATIONAL RESULTS AND PERFORMANCE IMPACT

Since its deployment, TRT BMS has delivered measurable performance improvements across TRT's international television broadcast workflows.

By consolidating previously fragmented manual processes into a centralized and automated platform, the system has significantly enhanced efficiency, consistency, and visibility throughout the scheduling lifecycle.

One of the most notable performance gains has been observed in post-broadcast analysis workflows.

Performance Improvements After TRT BMS Deployment

	Before TRT BMS	After TRT BMS
AsRun Analysis	16 Person-Hours	5 Seconds
Grid/EPG Prep	Days	Seconds
Publishing	Manual	Automated
Distribution	Separate Updates	API Push
Reporting	Manual	Instant

Figure 6. Performance Improvements After TRT BMS Deployment.

Prior to TRT BMS, AsRun reconciliation and monthly reporting required approximately two personnel working a combined total of sixteen person-hours per month through manual counting and spreadsheet-based analysis processes.

Following implementation of TRT BMS’s automated reconciliation engine, the same analytical outputs can now be generated in approximately five seconds.

Significant efficiency improvements have also been achieved in schedule preparation and publishing workflows.

Tasks such as weekly grid preparation, Electronic Program Guide (EPG) generation, and multi-platform schedule publishing, which previously required extensive manual preparation over multiple days, can now be executed through automated workflows within seconds once scheduling data is finalized.

In addition to time efficiency, TRT BMS has substantially reduced manual touchpoints across the broadcast planning lifecycle.

Through workflow automation and API-driven downstream integrations, scheduling data can now be distributed simultaneously across dozens of internal and external consuming systems without repetitive manual intervention. This architecture has also improved data consistency across TRT’s publishing ecosystem.

Because all downstream outputs originate from a centralized source, schedule information, metadata, and publishing data remain synchronized across EPG aggregators, digital platforms, websites, mobile applications, and third-party distribution partners.

TRT currently distributes scheduling data to dozens of API consumers and ultimately supports publication across hundreds of downstream viewer-facing platforms.

Beyond direct efficiency gains, TRT BMS has improved workflow visibility by enabling real-time access to planned versus actual broadcast comparisons, automated reporting outputs, and near-instant analytical feedback following transmission.

This enhanced visibility supports more informed decision-making across scheduling, review, and strategic planning functions.

Overall, TRT BMS has transformed TRT’s international broadcast workflows from labor-intensive manual processes into a highly automated and data-driven broadcast management environment.

A summary of the key performance improvements achieved after TRT BMS deployment is shown in **Figure 6**.

8. FUTURE DEVELOPMENT ROADMAP

While TRT BMS currently serves as a fully operational end-to-end broadcast management platform, TRT continues to expand the system’s capabilities through ongoing research and development initiatives focused on next-generation broadcast automation and intelligent analysis technologies. One planned area of development is the integration of advanced video fingerprinting technologies.

Building upon TRT’s existing expertise in audio-based fingerprinting and rights-related monitoring systems, TRT aims to extend content analysis capabilities beyond audio recognition toward full visual-content fingerprinting and identification workflows.

This expansion is expected to enhance content traceability, rights verification, and broader media analysis capabilities across broadcast assets.

A second planned development area is the implementation of automated Quality Assurance and anomaly detection modules.

These systems are intended to monitor schedules and transmission outputs for technical, editorial, or procedural irregularities, helping teams identify issues before or immediately after transmission.

By incorporating intelligent detection mechanisms, TRT aims to strengthen broadcast reliability and reduce the risk of oversight.

TRT is also actively exploring the implementation of AI-powered user-support technologies designed to assist personnel through natural-language interaction and intelligent workflow guidance.

These tools are envisioned to support scheduling, reporting, and management personnel by improving accessibility to system functions and accelerating routine tasks.

In addition, TRT is researching semantic video analysis technologies aimed at automatically detecting unwanted, sensitive, or potentially non-compliant visual content within media assets.

Through semantic search and AI-assisted visual recognition, TRT plans to support earlier warning mechanisms and accelerate pre-broadcast review and editorial control processes.

These capabilities are expected to improve the speed and effectiveness of content compliance verification while reducing manual review burden.

Through these initiatives, TRT aims to evolve TRT BMS beyond workflow automation into a broader intelligent broadcast ecosystem capable of supporting future broadcaster needs through AI-enhanced decision support and content intelligence technologies.

9. CONCLUSION

TRT BMS demonstrates that broadcaster-led in-house engineering can successfully address the increasing complexity of modern international television operations through integrated workflow automation and intelligent system design.

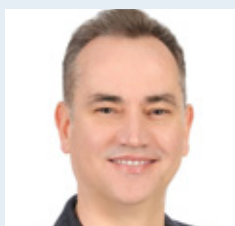
By consolidating scheduling, metadata management, automated publishing, playout preparation, post-broadcast reconciliation, and analytical reporting into a unified platform, TRT has established a scalable and highly efficient digital broadcast management environment tailored specifically to the needs of its international television channels.

Beyond delivering measurable improvements in speed, efficiency, and data consistency, TRT BMS illustrates the strategic value of combining engineering expertise with deep broadcast domain knowledge in the design of specialized media technology solutions.

As broadcasting environments continue to evolve toward increasingly data-driven and AI-assisted workflows, TRT remains committed to further advancing its broadcast technology ecosystem through continued innovation in intelligent automation, content analysis, and next-generation workflow support systems.

TRT BMS demonstrates that broadcaster-led, in-house engineering can play a critical role in shaping the future of intelligent, scalable, and adaptive broadcast operations in an increasingly digital media landscape.

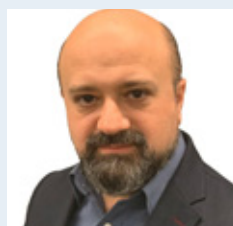
ABOUT THE AUTHORS



Ufuk Yalçın

Engineer & Project Manager, TRT

Ufuk Yalçın is an engineer and project manager at TRT with more than 25 years of experience in broadcasting and information technologies. He specializes in the design, development, and management of in-house broadcast management systems supporting scheduling, pre-broadcast quality control, operational analysis, and media workflow automation. He has led and coordinated projects for TRT BMS, e-Television, and large-scale election broadcasting support systems, working closely with broadcast operations teams to deliver long-term institutional platforms aligned with international broadcasting standards.



Mehmet Güneş

*Scheduling and Quality Assurance Manager,
TRT International News Broadcasts*

Mehmet Güneş is the Scheduling and Quality Assurance Manager for TRT International News Broadcasts. He has worked at TRT for approximately 11 years and has nearly 27 years of experience in the media sector. Throughout his career he has held roles across many areas of television and broadcasting. Prior to joining TRT, he worked as a Berlin correspondent for an international news agency and, earlier, as Broadcast Director for FOX Television's Turkish-language broadcasts in Germany. ■



HFCC A26 GLOBAL COORDINATION CONFERENCE

The A26 Global Shortwave Coordination Conference took place in Kuala Lumpur, Malaysia, from 19 to 23 January. Around 50 frequency managers from Asia, Australia, the Arab States, Europe, and the Americas attended. Six ABU members participated: **IRIB, KBS, NHK, NRTA, SBA** and **TRT**.

The conference opened with a welcome address by ABU Director of Technology, **Dr Veysel Binbay**, emphasising the importance of international cooperation in managing the shortwave spectrum. Despite rapid advances in digital and satellite technologies, shortwave broadcasting remains a vital and resilient medium for reaching remote communities, delivering emergency information, and overcoming geographical and infrastructure barriers. The remarks highlight the critical role of HFCC coordination conferences in ensuring efficient spectrum management and minimising interference through collaboration and mutual respect among broadcasters worldwide.

Key topics included the A26 operational schedule, reports from working groups, and financial matters. Deadlines for submitting and finalising the A26 conference requirement data were set.

The Group of Experts (GOE) meeting focused on several updates related to high-frequency (HF) broadcasting. Key discussions included the ongoing revision of the ITU-R HF Broadcasting System Design Handbook, with updated structure and integration of DRM (Digital Radio Mondiale) content, expected to be finalised by the end of the current study cycle. The meeting also addressed proposed updates to WRC-27 resolutions and recommendations on digital modulation in the HF broadcasting bands and on the coordination of HF broadcasting schedules.

The HFCC has welcomed several new members, whose memberships will be approved during the plenary session on Thursday. The new members include Herbert Wisser from the Netherlands, a private individual who operates his own station and has previously participated in the HFCC representing ICN (Icon BV/Mediahuis Radio). In addition, two organisations from Armenia have joined: Radio CJSC, also known as Noratus, and AR Radio Intercontinental. These additions reflect the continued growth and participation within the HFCC community.

Looking ahead, the B26 Global Coordination Conference has been confirmed for Yerevan, Armenia, from 24 to 28 August 2026. ■

A26 GLOBAL COORDINATION CONFERENCE

19-23 January 2026
Melia Hotel, Kuala Lumpur



A26 GLOBAL COORDINATION CONFERENCE

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ASBU
Arab States Broadcasting Union



ATX ENTERPRISE

20 - 22 MAY 2026 | SINGAPORE EXPO

One of Asia's most established gatherings for the broadcast and media technology industry returns to Singapore EXPO from 20–22 May 2026. Leaders across production, content creation, distribution, and media technology will examine how AI-driven innovation, immersive media, pro-AVL technologies, and evolving technical standards are shaping the future of broadcast across the region.

Meet the Speakers



**Anil
Nihalani**

CHIEF TECHNOLOGY OFFICER,
MEDIACORP



**Anowarul
Azim**

VICE PRESIDENT OF
TECHNOLOGY, AKASH DIGITAL TV



**Unmish
Parthasarathi**

EXECUTIVE DIRECTOR, PICTURE
BOARD PARTNERS



**Nikhil
Kharoo**

GLOBAL HEAD OF
PARTNERSHIPS, RAZOR INC.



**Mousumi
Dutt**

EXECUTIVE PRODUCER,
INFRONT SPORTS



**Jittiwong
Wannachai**

SENIOR PROGRAM PRODUCER,
RADIO THAILAND



**Jimmy
Tan**

HEAD OF ASTRO STUDIOS,
ASTRO



**Nobukuni
Matsutsuka**

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THINK-CELL SOFTWARE



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**BROADCAST
ASIA**

News from The ABU Region

NHK'S 24-HOUR SHORTWAVE BROADCAST TO THE MIDDLE EAST

In response to recent events in Iran, NHK has initiated temporary shortwave broadcasts of its Japanese-language international radio service, NHK WORLD-JAPAN Radio, as of March 1. This action reflects NHK's role as an international public service media organization, aiming to deliver essential information to Japanese nationals residing or traveling in the region.

Following attacks on Iran by the United States and Israel, internet connectivity and international telephone services in the region have become unstable, limiting access to information in Japanese. In response, NHK initiated temporary shortwave transmissions of its Japanese-language international radio service, NHK WORLD-JAPAN Radio, to provide essential updates for Japanese nationals in the area. The broadcasts commenced at 11:30 a.m. (Japan Standard Time) on Sunday, March 1.

Typically, NHK broadcasts six hours of shortwave programming per day to the Middle East. However, due to current circumstances, the schedule has been expanded to offer a continuous 24-hour service. Alongside content from NHK Radio 1, the broadcasts feature timely safety and security information for individuals in the region.

In neighboring countries or regions where internet access is available, NHK offers Japanese-language news on the NHK WORLD-JAPAN website, including simultaneous and on-demand streaming of its television and radio programming. Audiences are encouraged to utilize these trusted sources to help ensure their safety.

Details of the Temporary Transmission

During the temporary transmission period, NHK is providing simultaneous broadcasts of NHK Radio 1, in addition to NHK WORLD-JAPAN's Japanese-language international news and "Overseas Safety Information", which features travel advisories from Japan's Ministry of Foreign Affairs, including updates on the situation in Iran. Shortwave broadcasts, being transmitted directly from Japan, are regarded as less susceptible to restrictions by local authorities.

The broadcast frequencies will change as needed (subsequent frequencies are listed below). Information on the frequencies and other details of the temporary transmissions will be announced on NHK WORLD-JAPAN's Japanese-language website.

Emergency Shortwave Transmissions to the Middle East: Broadcast Schedule and Frequency List

NHK is providing 24-hour temporary shortwave transmissions

of Japanese-language news and programming to the Middle East from the KDDI Yamata Transmitting Station in Koga City, Ibaraki Prefecture, and other relay sites.

Transmissions from the Yamata Transmitting Station

01:00 - 02:00	11915 kHz
02:00 - 04:00	11670 kHz
04:00 - 06:00	9665 kHz
06:00 - 08:00	11675 kHz (regular slot)
08:00 - 10:00	11660 kHz
10:00 - 14:00	17560 kHz
14:00 - 18:00	9700 kHz
18:00 - 22:00	9740 kHz
22:00 - 23:00	11685 kHz
23:00 - 01:00	9450 kHz

Transmissions from the France Relay Station

02:00 - 04:00	11800 kHz (regular slot)
12:00 - 14:00	6150 kHz (regular slot)

[C+T]

RTHK AND RTM SIGN MOU TO ENHANCE COLLABORATION

The new Director-General of RTM, Ashwad Ismail, stated that the collaboration also encompasses program sharing and the exchange of professional talent between the two public broadcasters.

The initiative also serves as a platform for RTM and RTHK to understand each other's cultures, communities, and potential.

Through this co-production, both parties gain a deeper understanding not only of Hong Kong and Malaysia but also of the connections between their people and the relationship between the public broadcasters of both countries.

In the era of artificial intelligence, the focus of the collaboration is on strengthening human connections. As the local proverb goes, 'To know is to love'.

Engagement with international partners is seen as essential to fostering mutual understanding in a rapidly changing, hyper-connected world.

A Memorandum of Understanding (MoU) was signed between RTM, represented by Ashwad Ismail, and RTHK, represented by Director of Broadcasting Angelina Kwan Yuen Yee, at Menara Angkasapuri.

Angelina described the MoU as the beginning of broader cooperation between the two organisations.

She expressed RTHK's intention to pursue joint productions with RTM, share programs, and focus on talent and professional exchanges as a key area of collaboration.

This collaboration enables the best of Hong Kong and Malaysia to be brought together in a single program. Through such initiatives, the organizations aim to reach audiences in Malaysia, across Asia, and eventually in southern China near Hong Kong. [\[RTM\]](#)

ABC SIGNS MOUS IN MALAYSIA, MONGOLIA AND TIMOR-LESTE

ABC International has continued to strengthen its regional partnerships in 2026, signing Memorandums of Understanding (MoU) with broadcasters and media organisations in Malaysia, Mongolia, and Timor-Leste. The move marks an ongoing trend of cross-border collaboration within the Asia-Pacific media landscape.

Since the program's inception in 2022, ABC International has entered into 23 similar agreements with prominent media organisations across Asia and the Pacific. These agreements are designed to facilitate content sharing, knowledge exchange, technical training, and broader media development initiatives.

The latest agreements include formal partnerships with Timor-Leste's public service news agency Tatoli, Mongolian National Broadcaster (MNB), and Malaysian state broadcaster Sarawak Media Group (SMG).

Under these MoUs, MNB and SMG will collaborate with ABC International on content sharing – including news, current affairs, factual, sports, and lifestyle programming – as well as on the exchange of technical expertise. The agreement with Tatoli also incorporates ongoing collaboration with ABC International Development, which has supported Tatoli in launching an English-language news service and other capacity-building projects in recent years.

ABC International Head Claire M. Gorman stated that the organisation has focused on strengthening relationships with regional partners and formalising tailored agreements. According to Gorman, each MoU establishes a framework for collaboration in areas such as content and information sharing, as well as media capacity building, creating new opportunities for engagement.

Gorman also expressed optimism regarding the latest agreements with Tatoli, MNB, and SMG, highlighting the potential for closer collaboration and mutual support for their respective audiences. [\[RadioInfo\]](#)

PRASAR BHARATI EXTENDS DEADLINE FOR TV CHANNELS TO JOIN WAVES OTT PLATFORM, INVITES WIDER INDUSTRY PARTICIPATION

Prasar Bharati has extended the deadline for linear satellite television channels to join its OTT platform, WAVES, until 31 March 2026. This update, announced on 19 February 2026, follows the initial call for applications released in November 2025 and aims to encourage a wider range of broadcasters to take part in the platform's expansion.

Broadcasters must submit applications by 5 PM on the closing date, using the prescribed format and required documents. Applications already submitted will be considered, and existing terms and conditions remain unchanged.

Since its launch, WAVES has demonstrated significant growth, surpassing two million downloads by April 2025 and attracting about 640,000 regular users. The platform offers a wide array of Indian television channels and programs, making it a valuable resource for diverse audiences both in India and abroad.

The service now reaches viewers in 181 countries. India leads in audience numbers, followed by the USA, UK, UAE, Australia, France, and Belgium.

Prasar Bharati aims to establish WAVES as a comprehensive online destination for Indian television by inviting more channels to join the platform. The organisation emphasises that collaboration with a broader mix of broadcasters will enrich content variety and the viewer experience.

For smaller and regional broadcasters, joining WAVES presents an opportunity to reach new audiences without the costs typically associated with cable or satellite distribution. This initiative aligns with Prasar Bharati's commitment to fostering greater accessibility and diversity in Indian broadcasting. The extent of participation among channels will become clearer after the March deadline. [\[ABU News\]](#)

MEDIACORP AND MASTERCARD UNVEIL SINGAPORE'S FIRST TRANSACTION-POWERED MEDIA MEASUREMENT SOLUTION

Mediacorp and Mastercard have teamed up to launch Singapore's first media measurement solution that uses anonymised, aggregated transaction data. This new system aims to change how advertising success is measured, providing brands with a clearer picture of what works and what doesn't.

The partnership gives brands detailed insight into how people move from seeing an advert to making a purchase. By using Mastercard's transaction data, Mediacorp's platform lets advertisers see which campaigns lead to real results, like store visits or sales. This helps companies understand the real impact of their ads, not just how many people saw them.

This new approach is important for Singapore's advertising industry, as it uses real data to measure how effective campaigns are. By bringing together Mediacorp's reach across TV, radio, digital, social media, and outdoor advertising with Mastercard's payment insights, brands can finally link ad exposure to actions like buying or visiting stores.

Advertisers can see not just who saw their ads, but also how many people went to a store or bought something. They can track changes in market share and compare results against competitors, making advertising more transparent and results driven.

This partnership builds on Mediacorp's Ultimate

Omnichannel Impact framework, which focuses on giving brands real value and insight from their advertising. The framework is based on five pillars: Culture, Content, Connection, Context, and Conversion. [\[ABU News\]](#)

DAB+ TECHNOLOGY IS FIRMLY ESTABLISHED ACROSS SAUDI ARABIA, KUWAIT, AND BAHRAIN

DAB+ has become well established in Saudi Arabia since its successful launch in August 2023. The digital radio technology, which offers improved audio quality and a greater selection of stations compared to traditional FM, will once again be featured at the upcoming Saudi Media Forum, reflecting its growing influence in the region and increasing adoption among broadcasters and listeners alike.

In the past year, the DAB+ network expanded to nine additional cities and major highways in Saudi Arabia, significantly broadening coverage for commuters and urban populations. In the broader Gulf region, Bahrain launched DAB+ in 2023, joining a growing list of countries investing in digital radio infrastructure. Kuwait, an early adopter since 2014, now operates 15 stations and continues to demonstrate the long-term viability of the technology in the region.

WorldDAB has collaborated with regional organizations, including the Arab States Broadcasting Union (ASBU), to develop a specific set of Arabic characters within the WorldDAB digital radio standard. This technical development has supported regional implementation and ensures that digital radio content is accessible and relevant to Arabic-speaking audiences.

The upcoming Saudi Media Forum will prominently feature DAB+, with WorldDAB President Jacqueline Bierhorst representing the organisation at the event. The forum is expected to draw leading figures from across the media and technology sectors, providing a platform for discussion on the rapid evolution of digital broadcasting in the Middle East.

The Saudi Media Forum 2026, along with the FOMEX Exhibition, is set to highlight the future of digital media transformation, showcasing the latest developments in broadcasting and production technologies. Attendees will have the opportunity to experience demonstrations of emerging media platforms and learn about cutting-edge innovations shaping the future landscape of audio and visual content.

Bierhorst is scheduled to lead a masterclass titled “DAB+: The Future of Digital Radio Broadcasting and the Evolution of Audio in the Smart Era,” examining DAB+ as a key factor in the transformation of the audio media industry. Additionally, she will participate in a panel session titled “How Does 5G Redefine the Television and Radio Broadcasting Experience?” [\[RadiolInfo\]](#)

RIEDEL EXPANDS GLOBAL SUPPORT NETWORK WITH NEW KUALA LUMPUR OFFICE

Riedel Communications has expanded its presence in Southeast Asia with the opening of a new office in Kuala Lumpur, Malaysia. The facility is designed to enhance the company's global Customer Success and IT software support operations, supporting a shift toward software-

driven and service-based media workflows. The move signals Riedel's ongoing commitment to delivering 24/7 expertise for its evolving portfolio.

The Kuala Lumpur office opened on 28 January, headed by Service and Support Manager Mustapha Kamal, who previously spent four years at Riedel's Wuppertal headquarters. The launch event featured a ribbon-cutting ceremony, technology demonstrations, and networking opportunities for local partners and customers. Attendees were introduced to the team's role in supporting both local and global clients.

With the increasing shift toward software and IT-based environments, Riedel has identified a growing need for continuous, specialist support. The Kuala Lumpur team operates in shifts, including weekends, to provide global expertise in deploying, supporting, and maintaining customer applications within complex IT infrastructures. The Kuala Lumpur team currently consists of 12 locally recruited software and IT engineers responsible for supporting initial deployments of Riedel solutions, including Virtual SmartPanel (VSP), the STAGE software platform, and SAME Smart Audio & Mixing Engine. The team is also set to provide technical support for future software-centric products and will undergo comprehensive training as part of their onboarding process.

Riedel Communications noted that Malaysia's robust talent pool and investments in education and IT infrastructure make Kuala Lumpur a strategic location for supporting the company's global transition to software and IT-based solutions. The office is expected to enhance Riedel's long-term presence and capabilities in the Asia-Pacific region. [\[C+T\]](#)

TVRI MOVES TO BRIDGE DIGITAL DIVIDE IN PAPUA PEGUNUNGAN WITH JAYAWIJAYA TRANSMITTER

Indonesia's state-owned broadcaster, TVRI, is accelerating efforts to enhance digital broadcast infrastructure in Papua Pegunungan, with a key focus on optimizing the Jayawijaya transmitter. This move is part of the network's broader strategy to close the digital gap in Indonesia's remote eastern regions and ensure more equitable access to public television services.

Following Indonesia's nationwide analog switch-off in 2022, TVRI's transmitters in Papua Pegunungan stopped operating. The broadcaster has been waiting for digital transmitter installations from the Ministry of Communication and Digital Affairs (Komdigi), under the Digitalization of Broadcasting System (DBS) initiative.

With the DBS project facing delays, TVRI is pursuing interim measures to restore television access for Papua Pegunungan's population, which has increasingly relied on social media as a primary news source. This update was shared during a recent meeting between TVRI and the Jayawijaya Regency Government in Jakarta.

TVRI's broadcast network currently reaches about 75 percent of Indonesia's population. However, approximately a quarter of citizens – primarily in remote and underdeveloped 3T regions such as Jayawijaya – remain underserved by television broadcasts.

The transmitter optimization project reflects TVRI's commitment to closing this accessibility gap, in line with national directives emphasizing the public's right to accurate and reliable information.

Government leadership has highlighted TVRI's role in ensuring honest reporting and countering misinformation, which is considered vital to maintaining social cohesion.

Local officials, including Jayawijaya Regent Atenius Murip, have expressed hope that the deployment of digital transmitters will soon provide residents with full access to government programming and major international events, such as the 2026 FIFA World Cup.

Stakeholders emphasize the importance of expanding TVRI's reach to all segments of Jayawijaya's population, enabling the community to stay informed and engaged on topics ranging from government initiatives to global sports events. [TVRI]

THAI PBS TRANSITIONS FROM "TV FIRST" TO "DIGITAL FIRST" APPROACH

Assoc. Prof. Dr. Wilasinee Phiphitkul, Director of Thai PBS, notes a major shift in media use after COVID-19. She says younger generations like Gen Z are unlikely to return to traditional TV, preferring various platforms and often using multiple devices simultaneously.

Dr. Wilasinee emphasises that Thai PBS aims to foster media literacy and active citizenship, with initiatives to combat misinformation.

Many consumers no longer watch TV alone; it often plays in the background while they use phones, computers, or tablets.

Dr. Wilasinee says the future of media requires a "digital-first" rather than a "TV-first" mindset. COVID-19 sped this shift, prompting Thai PBS to overhaul its website for diverse audiences.

The new website unites 10 content categories from Thai PBS. Credit: Thai PBS

Thai PBS reinforces its position as public media by ensuring its platform welcomes and provides tailored content for people of all backgrounds, interests, and age groups through diverse programming and accessible design.

Dr. Wilasinee explains that Thai PBS updated its website and online media to improve accessibility and adapt to changing consumer habits, ensuring relevance for all generations, especially Gen Z.

The redesigned website combines technology and convenience, serving as a gateway to quality content from 10 Thai PBS sub-sites. Additionally, grouping topics lets users personalize their experience, quickly find topics, and access content efficiently.

Thai PBS offers safe, reliable content across platforms. In doing so, the broadcaster prioritizes accuracy, appropriateness, and inclusivity, ensuring coverage remains relevant to diverse perspectives.

Dr Wilasinee reiterates the need to create content for multiple digital platforms, not just television.

The organization promotes open dialogue by featuring panels with experts and community leaders, exposing audiences to diverse viewpoints, and actively curating content to avoid echo chambers and information silos. Thai PBS encourages rational discourse and rejects hate speech, making its online platforms safe, interactive learning spaces.

Thai PBS aspires to be a leader in the broader media industry by shaping industry standards and practices, not only providing content.

By upholding ethical principles, Thai PBS ensures that the information it provides is accurate, fair, and transparent. Dr. Wilasinee highlights Thai PBS's strong news position and strict ethical standards, demonstrated by its careful handling of sensitive topics and rigorous fact-checking. The broadcaster is joining the International Fact-Checking Network (IFCN) to boost credibility.

Dr. Wilasinee says Thai PBS stands out by prioritizing the public good over ratings and building wisdom and strength for society – key to public media.

As part of its digital transformation, Thai PBS is developing data systems to analyze real-time user behavior. As a result, the organization can tailor content, increase engagement, and meet diverse needs.

Rather than focusing solely on ratings, Thai PBS platforms support community and citizen content to foster collective problem-solving and knowledge-sharing.

Thai PBS plans to grow educational programs and workshops to boost media literacy and increase Thai-produced content on streaming platforms.

Looking ahead, Dr. Wilasinee says TV will remain in Thai society, but its role is changing. TV content must stand out. The media now use online techniques, such as digital marketing.

She notes a shift to a global content outlook. As a result, Thai PBS is ready to work with entrepreneurs to strengthen Thailand's streaming market.

Dr. Wilasinee notes that as online media grows, so do concerns about media security and misinformation. In response, Thai PBS wants to empower society with media literacy and active citizenship.

In response to these challenges, Thai PBS will shift from content maker to a collaborative content hub, supporting partnerships and raising media literacy. The broadcaster will continue to deliver accurate news through rigorous editorial standards and provide solutions-focused content designed to support social and environmental sustainability.

[Thai PBS] ■

DIGITAL BROADCASTING *Updates*

D2M TECHNOLOGY SHOWS NO DEVICE OVERHEATING OR 4G/5G INTERFERENCE TEST RESULTS

A study by IIT Kanpur and Tejas Networks found that Direct-to-Mobile (D2M) transmission in the 470–582 MHz band causes no harmful interference to key mobile networks and only a marginal increase in device temperature. However, broader real-world trials are still needed before large-scale deployment.

Prasar Bharati, India's public broadcaster, released findings from controlled lab tests conducted at Aracion Technology, a NABL-accredited and TEC-designated facility in Bengaluru.

Test Setup and Methodology

The study used a 40W D2M radio head and a compatible smartphone to measure device temperature and check for mobile network interference.

Thermal Performance Results

Engineers tested the handset's temperature during prolonged use, comparing continuous D2M video playback with YouTube streaming over 4G.

After three hours, the device reached about 35°C in D2M mode and about 33°C during 4G streaming. The lab said this small increase is normal and does not pose an overheating risk.

Interference and Network Compatibility

A second test checked if a live 40W D2M transmission affects mobile network performance, focusing on bands n71, n28, and n5.

Engineers used standard 3GPP tests to measure receiver sensitivity and throughput with and without D2M. They found no drop in performance, and a desensitisation value of 0 dB met 3GPP blocking standards.

They measured spurious emissions from the D2M transmitter across many frequencies and found levels far below 3GPP limits. This shows the transmission does not

interfere with nearby spectrum services under these test conditions.

Implications and Next Steps

The results show that D2M technology can work with existing mobile networks in the UHF band without major technical problems.

But the study used controlled lab setups and fixed parameters. Industry experts say large-scale field trials are needed to confirm these findings under real-world conditions, where more variables exist.

The future rollout depends on spectrum regulation and agreement with telecom operators, who have concerns about interference and the business impacts of D2M.

[\[bestmediainfo\]](#)

INTERRA EXHIBITING STREAMING-FIRST QC, REAL-TIME MONITORING & AI WORKFLOWS

Interra Systems will showcase its latest advances in automated quality control (QC), real-time monitoring, and captioning. These offerings address the changing needs of streaming service providers and broadcasters. The industry now faces tighter budgets and rising operational complexity. As a result, there is greater demand for solutions that ensure efficiency and reliability across both live and file-based workflows.

As IP- and streaming-first environments grow, media organizations focus more on scalable, reliable operations. Interra Systems' solutions support mission-critical workflows, delivering ready media intelligence for FAST, live linear, and on-demand services. Automated QC, captioning, and real-time monitoring are core pillars, especially in IP and OTT streaming.

Interra will present the ORION Suite, which improves visibility in streaming and live operations. It provides comprehensive monitoring and analytics. The BATON platform is a robust automated QC solution. It helps maintain consistent media quality at scale. The VEGA Media Analyzer will also be showcased. It offers debugging and ensures compliance with changing standards.

The company will introduce BATON 9.4. This upgrade enhances audio and video QC capabilities. It offers better detection accuracy, fewer false positives, and more reliable automation. This minimizes the need for manual rechecks. The update also supports Oracle Cloud Infrastructure as S3-compatible storage. It now includes one-click diagnostics for faster troubleshooting and resolution of operational issues.

Streaming is growing worldwide. Interra Systems aims to strengthen its solutions. The goal is to help media companies keep high-quality delivery while meeting bigger technical and operational demands. [\[APB+\]](#)

IMT-2030: TECHNICAL REQUIREMENTS FOR THE 6G FUTURE

Experts at the International Telecommunication Union (ITU) have agreed on technical performance requirements for IMT-2030. This framework will underpin future 6G systems. The draft requirements, adopted by consensus in February, mark a key milestone in shaping next-generation wireless connectivity.

The specifications were finalized by ITU-R Working Party 5D. This group is part of the ITU Radiocommunication Sector (ITU-R). They created a unified set of criteria for evaluating candidate 6G radio interfaces. Formal approval is expected from the parent body, ITU-R Study Group 5, at its December meeting.

IMT-2030 builds upon the current 5G framework, called IMT-2020, within the ITU. It introduces enhanced capabilities that support more immersive user experiences and new forms of digital interaction. The draft report, titled “Minimum requirements related to technical performance for IMT-2030 radio interface(s),” specifies 20 technical performance requirements. It specifically introduces seven new metrics for 6G capabilities.

Six key usage scenarios define these requirements: immersive communication, hyper-reliable and low-latency communication, massive communication, ubiquitous connectivity, artificial intelligence and communication, and integrated sensing and communication. Together, these scenarios showcase the anticipated diversity and complexity of future 6G applications.

The new requirements build on the IMT-2030 framework first published by the ITU in December 2023 under Recommendation ITU-R M.2160. This framework establishes guiding principles for next-generation network design, including sustainability, security, and resilience, bridging the digital divide, and enabling ubiquitous intelligence.

As the United Nations agency for digital technologies, the ITU envisions 6G as a platform that delivers affordable, resilient, and energy-efficient connectivity. These benefits will impact sectors such as healthcare, education, agriculture, and disaster response. 6G will also extend connectivity to underserved and remote communities and may help reduce global inequalities in digital access.

The defined requirements create a globally harmonized technical foundation for evaluating candidate technologies. They guide ongoing research and standardization efforts. While these requirements set minimum performance benchmarks, they do not prescribe specific implementation methods or guarantee deployment outcomes. Instead, these requirements support detailed evaluation guidelines and help accelerate the evolution of 6G standards.

The committee has submitted the IMT-2030 draft report for formal approval. The ITU-R Study Group 5 will decide at its meeting scheduled for 1 December. [ITU](#)

ATSC STANDARDS UPDATE: NEW DOCUMENTS PUBLISHED

The Advanced Television Systems Committee (ATSC) has released two newly approved documents on its website, reflecting ongoing refinements to the ATSC 3.0 standard. Members are also currently balloting several additional specifications.

One of the newly published documents is A/322:2026-01, “Physical Layer Protocol”. It consolidates a recent amendment approved on 26 January 2026. The update primarily addresses errata related to MIMO scattered pilot pattern 4_2 in configurations using 32K FFT. It also removes an optional MIMO-related correction. This correction conflicted with continual pilot patterns. These changes ensure that such configurations are not implemented in practice.

The second document, A/331:2025-10 Amendment No. 1, “Common Data Service,” was approved on 11 February 2026. It introduces a new service type value, “Common Data Service.” This service is specifically designed for file delivery using ROUTE. It does not include additional signaling or transport options. The service supports distributing data across multiple services, similar to ESG functionality. The amendment also removes outdated references to CTA-766. It incorporates references to the Code Point Registry and makes minor editorial corrections. A consolidated rollup version of this amendment into the full A/331 standard is expected to be published soon.

Several documents are currently undergoing ballot review by the ATSC membership. Among them is S32-707r5. This is a proposed amendment to A/327. It focuses on time-division multiplexing (TDM) between ATSC and other broadcasting systems, including LTE-based 5G Broadcast. The document outlines physical layer profiles. These profiles enable resource sharing across different transmission systems.

Another document under ballot is S38-608r10. This is a proposed revision of A/344:2025-07, which governs ATSC 3.0 interactive content. This revision introduces updates and clarifications identified since the current version was released. Complementing this is S38-566r28. It provides recommended practices for broadcasters and application developers utilizing the interactive environment defined in A/344.

Additionally, within TG3, a new ballot has been initiated for the annual revision of A/300, “ATSC 3.0 System.” This update includes enhancements to Annex B, which covers ATSC 3.0 operating configurations. The update also incorporates updates to references and schemas across

the full suite of ATSC 3.0 standards and recommended practices.

These ongoing developments highlight ATSC's continued efforts to refine and expand the ATSC 3.0 ecosystem. They ensure alignment with evolving broadcast technologies and use cases. [\[ATSC\]](#)

CML MICRO LAUNCHES THE CMX918 ULTRA-LOW-POWER SDR TUNER ENABLING LONGER BATTERY LIFE FROM LF TO VHF

ML Micro had launched the CMX918 in January. This advanced multi-mode Software-Defined Radio (SDR) tuner offers ultra-low power consumption

as its main benefit for portable, embedded, and always-on radio applications. The device is designed to significantly extend battery life while maintaining high RF performance, addressing demand for energy-efficient radio solutions across industries.



The CMX918 expands CML Micro's portfolio of mixed-signal, RF, and microwave semiconductor technologies, enabling manufacturers to develop compact, next-generation radio devices with enhanced tuning capabilities and reduced power requirements. It is particularly suited for battery-powered, space-constrained applications, including handheld receivers, remote sensors, and automotive and maritime systems, where power efficiency is a critical design factor. The device also supports seamless integration through standard interfaces such as SPI, I²C, and I²S.

Designed for broad compatibility, the CMX918 supports both analog and digital transmission standards. In addition to AM, FM, and single sideband (SSB), it accommodates specialist data services such as NAVDAT, as well as key digital broadcasting technologies, including Digital Radio Mondiale (DRM). This versatility allows manufacturers to deploy a single platform across diverse use cases and regional broadcast requirements.

The CMX918 has a compact 5 × 5 mm footprint. It covers 150 kHz to 108 MHz (LF, MF, HF, VHF). Its software-driven architecture enables low-power, high-performance operation. This makes it ideal for advanced designs where size and efficiency matter.

The device uses a low-IF architecture with an integrated low-phase-noise voltage-controlled oscillator (VCO). This ensures stable and reliable signal reception. Features like software-configurable automatic gain control (AGC), selectable intermediate frequency (IF) bandwidths, and

standardized digital interfaces increase its flexibility. The CMX918 can operate as a standalone receiver or as part of a larger radio system.

Key technical capabilities include high spurious-free dynamic range for improved signal integrity, fast-locking VCO performance, and support for a wide range of modulation schemes across both analog and digital domains. Its compact VQFN32 package further supports integration into space-constrained designs.

The CMX918 targets OEMs and system integrators and supports digital broadcast radio, professional communications, IoT, automotive, and embedded SDR platforms. It builds on CML Micro's SDR technology and enables efficient, high-performance, low-power receiver development.

The CMX918 works with the EV9180 evaluation kit and ES9180 software tools, which use the PE0004 Universal Interface Card. These tools provide a stable, repeatable environment for testing and integration. They help speed up the time-to-market for new radio designs. [\[CML Micro\]](#)

DVB ADDS T/UWA 005 DYNAMIC METADATA TO THE VIDEO CODING SPECIFICATION

The Digital Video Broadcasting (DVB) Project has introduced support for T/UWA 005 dynamic metadata into its core specification for video and audio coding across broadcast and broadband delivery systems. The update is included in a new revision of DVB BlueBook A001, commonly referred to as DVB-AVC, which will be submitted to the European Telecommunications Standards Institute for formal standardization as an update to TS 101 154.

This enhancement broadens the range of High Dynamic Range (HDR) Dynamic Mapping solutions available to broadcasters and device manufacturers. The newly incorporated T/UWA 005 Dynamic Metadata for Imaging (DMI), developed by the UHD World Association (UWA), is specified for use with modern video codecs, including HEVC, AVS3, and VVC.

T/UWA 005 defines a dynamic metadata framework designed to support HDR Dynamic Mapping, enabling more precise adaptation of HDR content across a variety of display environments. Its inclusion in TS 101 154 helps manufacturers and service providers improve content consistency and quality for end users and expands interoperability options within the ecosystem.

HDR Dynamic Mapping enables receiving devices, such as televisions, to adjust HDR video signals based on the display's capabilities. By leveraging Dynamic Mapping Information (DMI) embedded within the video bitstream, content originally mastered on professional reference monitors can be optimally rendered on consumer displays with varying performance characteristics.

The addition of T/UWA 005 complements existing HDR Dynamic Mapping solutions already specified in TS 101 154. These include SMPTE ST 2094-10 (Application #1), ETSI TS 103 433-2 (SL-HDR2), and SMPTE ST 2094-40 (Application #4). The new metadata standard is introduced alongside these technologies and does not replace any of the previously defined approaches.

In parallel, DVB has also updated its Service Information specification to include the necessary signaling support for T/UWA 005. The revised document, published as DVB BlueBook A038r19, will likewise be submitted to ETSI for formal standardization as an updated version of EN 300 468.

These updates reflect DVB's ongoing efforts to enhance flexibility and interoperability in HDR delivery, benefiting broadcasters, device makers, and viewers by supporting a broader range of technologies and use cases across modern broadcast and broadband environments. [\[DVB\]](#)

HBBTV ASSOCIATION FORMALLY INTEGRATES DIGITAL RIGHTS MANAGEMENT (DRM) INTO CORE SPECIFICATION

The HbbTV Association has released version 2.0.5 of its core specification, featuring major updates for hybrid broadcast and broadband TV services. This version, based on 2.0.4 from two years ago, was formally approved by the Steering Group.

HbbTV 2.0.5 introduces several key technical enhancements that align with current industry trends, including improved security, expanded codec support, and deeper integration with emerging broadcast standards. The update enables more advanced, scalable, and interoperable interactive television services across connected TV ecosystems.

One of the most notable developments is the formal integration of Digital Rights Management (DRM) into the core specification. While DRM has long been supported in HbbTV-enabled devices, this is the first time it has been explicitly defined in the standard, establishing a harmonized, interoperable framework. Devices must now support at least one of the DRM systems outlined in the HbbTV DRM specification, namely Microsoft PlayReady or Google Widevine, to ensure the secure delivery of premium content and meet the requirements of broadcasters, platform operators, and content owners.

The specification also introduces formal support for WebAssembly, allowing more advanced and efficient application capabilities within HbbTV environments. This support enables use cases such as optimized decoding of auxiliary video streams, including accessibility services like sign language overlays. WebAssembly support builds on capabilities that browser engines such as Chrome and WebKit already offer, but the HbbTV framework now standardizes it.

In addition, HbbTV 2.0.5 supports next-generation video codecs such as AV1 and VVC, although their implementation remains optional. The update also introduces enhanced web security measures and includes several simplifications for implementers, such as removing unused features, deprecating legacy elements, and relaxing certain requirements to improve interoperability.

The updated specification further improves integration between HbbTV and DVB-I, as introduced in version 2.0.4. The specification clarifies support for DVB-I applications associated with entire service lists, empowering service providers and platform operators to manage user consent requirements, including GDPR-related agreements. The association incorporated feedback from early implementations, resulting in multiple technical corrections and refinements.

To support industry adoption, the HbbTV Association will issue a Request for Proposals (RfP) to extend its Conformance Test Suite and ensure compatibility with the new specification. The HbbTV 2.0.5 specification and supporting documentation are now available in the association's Resource Library.

Overall, the release underscores how HbbTV continues to evolve as a key enabler of hybrid TV services, supporting the convergence of broadcast and broadband delivery with enhanced functionality, security, and user experience. [\[tvtechnology\]](#) ■

Equipment Trends

ATOMOS EXPANDS LIVE PRODUCTION LINEUP WITH SHOGUN AV-19



Atomos has added the Shogun AV-19 to its professional ecosystem, a 19-inch, rack-mountable 4K HDR monitor-recorder-switcher. Designed as a central hub for live production, broadcast, and video village environments, it combines multi-camera switching, ISO recording, and advanced monitoring into a single streamlined solution.

Built in a rugged 7RU form factor, the Shogun AV-19 is engineered for the rigors of both studio and outside broadcast workflows. Whether installed in a fixed broadcast rack or a portable flight case for live events, its robust chassis ensures reliability in fast-paced production scenarios. The large, color-accurate 4K HDR display, featuring DCI-P3 color space support, provides directors and technical teams with the clarity needed for real-time monitoring of complex multi-camera shoots.

The Shogun AV-19 is a versatile rack-mount monitor, recorder, and switcher for live production. With quad-channel ISO recording, live switching, industry codecs, and NDI HX3, it delivers the performance, reliability, and flexibility needed for fast-paced environments.



The Shogun AV-19 excels as a recording powerhouse, capable of simultaneously recording up to four isolated SDI camera feeds along with a fifth program output. It supports a wide range of industry-standard codecs, including Apple ProRes, ProRes RAW, and Avid DNx, delivering high-quality

10-bit 4:2:2 video up to 8Kp60. Media can be captured internally on high-speed CFexpress cards or externally via USB-C storage, offering flexible options for high-bandwidth workflows and fast post-production turnarounds.



Beyond its core functions, the unit is built for mission-critical applications, serving as a secure backup recorder, an instant review station, and a confidence monitor. It comes equipped with Atomos' comprehensive suite of professional monitoring tools, including EL Zone false color, focus peaking, waveform monitoring, Log-to-LUT viewing, and quad-view monitoring. Features such as anamorphic de-squeeze and HDR-to-Rec.709 conversion further enhance its utility across diverse production environments.



- A Audio**
XLR inputs for line-level or mic sources, with selectable 48 V phantom power for compatible mics. XLR outputs for monitoring.
- B Power**
1 x 6-pin XLR for DC power supply included, or single battery (purchased separately).
- C HDMI & SDI**
2 x 12G-SDI (6G/3G backwards compatible) + 2 x 3G-SDI inputs. Level A & B supported. 1 x 12G-SDI out. 1 x HDMI output up to 4K60P.
- D Networking**
RJ45 Ethernet port unlocks powerful IP workflows with a single, standard network cable, including NDI and cloud connectivity.
- E Sync**
Supports reference signal input to lock to an external source. Can also be used as a LTC timecode input for multi-camera setups.
- F USB**
2 x USB-C ports for attaching external storage media, camera control, and other accessories.

Connectivity is a key strength. NDI HX3 supports sending and receiving broadcast-quality video, audio, and metadata over a single Ethernet cable. This is a significant advantage for remote and mobile productions. For professional audio, the unit includes two full-size XLR inputs with 48V phantom power. These have dedicated meters, gain controls, and frame-accurate audio delay.

The Shogun AV-19 fits into a 19-inch rack-mount chassis and features user-definable function buttons. Operators customize their workflows to quickly access key tools. The arrival of the Shogun AV-19 marks a significant step forward for live production professionals. It consolidates switching, recording, and monitoring into a single rack-mountable unit. Atomos has created a solution that simplifies setup, reduces equipment clutter, and enhances workflow efficiency. The unit handles high-resolution formats, records multiple ISO feeds simultaneously, and integrates seamlessly

via NDI. This makes it an incredibly versatile tool.

For broadcasters, live event crews, and production teams in fast-paced environments, the Shogun AV-19 delivers reliability, performance, and flexibility. It is poised to become an invaluable asset. Productions can maintain the highest standards of quality and efficiency from capture to final cut. [\[Atomos\]](#)

IMAGINE COMMUNICATIONS INTRODUCES PRISMON MULTIVIEWER



Imagine Communications has expanded its monitoring portfolio. The company launched Prismon, a new and advanced operator-focused multiviewer. Prismon is designed for the demands of modern media environments, providing detailed signal analysis, customizable layouts, and seamless integration with cloud workflows. It combines sophisticated master control and cloud capabilities, delivering ultra-low-latency production performance, as seen in Imagine's established SNP Multiviewer.

This powerful combination positions Imagine Communications as a provider of one of the most comprehensive IP- and IP-hybrid multiviewer offerings on the market.



Prismon is engineered for ultimate flexibility, supporting both on-premises and cloud deployment through its software-defined design. As a converged audio-visual monitoring platform, Prismon supports live production, playout, distribution, and OTT streaming workflows, allowing operators to adapt quickly and efficiently to changing broadcast conditions and operational needs.

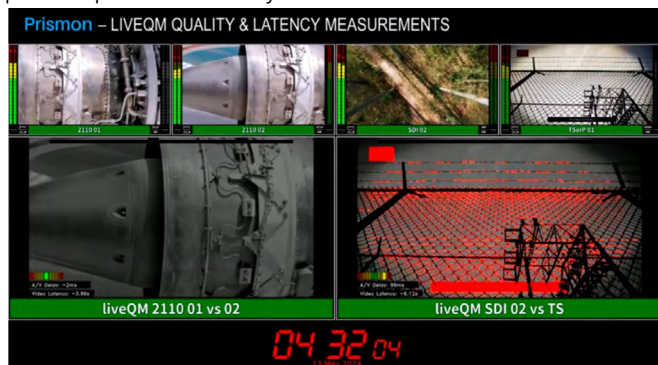
Its scalable, distributed architecture enables real-time management of thousands of signals across multiple display mosaics, supporting uninterrupted monitoring of vast, complex signal environments. Operators benefit from high reliability, responsiveness, and clear signal visualization, even under heavy load. The platform brings together diverse source types – including SDI, ST 2110, ST 2022-6, and OTT streams – into a single integrated monitoring environment,

simplifying workflows and reducing operational complexity.

Prismon features a centralized, workflow-optimized control interface. This helps operators manage its extensive functionality with ease. Technical teams can then manage all displays and sources from one location. This streamlines complex monitoring tasks and improves situational awareness.



The introduction of Prismon is a significant advancement for broadcast and media facilities. It helps organisations looking to modernize their monitoring infrastructure. Its software-defined nature and ability to operate across on-premises and cloud environments offer flexibility. This approach future-proofs operations as they evolve toward IP-based workflows.



For operators, the benefits are clear: ultra-low latency ensures critical issues are spotted in real time, while the ability to unify thousands of signals – from legacy SDI to modern IP streams – into a single, manageable interface dramatically simplifies complexity. By combining massive scalability with an operator-friendly centralized control system, Prismon empowers broadcasters to maintain the highest levels of confidence and quality across their entire signal chain, from production to distribution. [\[Imagine Communications\]](#)

NET INSIGHT LAUNCHES NIMBRA 520 FOR PREDICTABLE LIVE MEDIA EXECUTION AT A LOWER COST PER STREAM

Net Insight has unveiled the Nimbra 520, a high-density media processing node engineered to simplify live contribution and distribution across both managed and unmanaged networks. As broadcasters and service providers face constant pressure to handle more feeds, more venues, and more cloud connections, the need to reduce costs while maintaining flawless performance has never been greater. The Nimbra 520 directly addresses this challenge.

Built as an integral part of Net Insight's Nimbra Live execution layer, the Nimbra 520 brings consistent, deterministic performance into hybrid live media environments. It is designed for scenarios where operational simplicity, cost



control, and maintaining confidence under pressure are paramount. Rather than optimizing isolated device functions, it extends Net Insight's Live Intelligence approach, delivering measurable performance across real-world networks. This empowers operators to stay in firm control, even during peak events, network failures, congestion, or periods of rapid change.

The Nimbra 520 stands out for its efficiency. With multi-channel HEVC and AVC encoding, it saves up to 50 percent in bandwidth compared to legacy workflows. This lets customers scale contribution and distribution without expanding network infrastructure.

Furthermore, the Nimbra 520 is designed to fundamentally change the economics of live media operations. When combined with Nimbra Edge, it introduces a simple, flexible per-stream cost model. Centralized orchestration and automated lifecycle management reduce operational overhead, prevent costly overprovisioning, and minimize costs and the impact of network failures.

The Nimbra 520 is versatile. It supports unmanaged internet contribution, hybrid cloud workflows, and managed IP networks. In managed settings, it fits smoothly into Net Insight's platform-based operations. In unmanaged settings, it delivers predictable behavior through Edge-orchestrated workflows. This flexibility makes it ideal for broadcasters, service providers, regional sports networks, and cloud-connected production. At the technical level, the Nimbra 520 features multi-channel HEVC and AVC processing that delivers professional broadcast quality. It supports Ultra HD (UHD) workflows, 10-bit video, and ultra-low-latency operation. Its high-density architecture ensures operators can achieve significant bandwidth and infrastructure savings while maintaining the predictable, reliable performance required for professional live media, regardless of whether they operate on managed or unmanaged IP networks.



The launch of the Nimbra 520 marks a pivotal step forward for live media operations. By combining high-density processing with intelligent software-defined economics, Net Insight has created a solution that solves the modern broadcaster's biggest dilemma: how to do more with less. Cutting bandwidth use by half, simplifying operations, and offering a flexible per-stream cost model is transformative. This lets broadcasters, service providers, and sports networks expand coverage, adopt cloud connectivity, and use

unmanaged networks – while maintaining top broadcast quality. The Nimbra 520 lowers total ownership cost and delivers flexibility to scale operations with confidence. [\[Net Insight\]](#)

HARMONIC REDEFINES THE ECONOMICS OF VIDEO PLAYOUT WITH NEW SPECTRUM X PLUS MEDIA SERVER



Harmonic has unveiled Spectrum™ X Plus, the latest in its acclaimed Spectrum X media server line, doubling channel density and dramatically simplifying video ingest and playout for broadcasters and content owners. This leap in performance lowers broadcast delivery costs per channel, redefining industry economics.

Spectrum X Plus strengthens Harmonic's leadership by enabling users to deploy playout infrastructure where it's needed most. Broadcasters can choose on-premises, cloud-based with Harmonic's VOS®360 Media SaaS, or hybrid environments, tailoring their setup to operational needs. This flexibility helps optimize resources and future-proof investments.

Efficiency Gains with Lower Cost Per Channel

With support for up to eight HD or two UHD channels per server, Spectrum X Plus reduces rack space and power use, lowering operating costs. Users can manage complex workflows, like multi-channel ingest and integrated playout, more efficiently, enabling streamlined operations and significant resource savings.

Advanced Capabilities for Enhanced Video Playout

In addition to efficiency, Spectrum X Plus simplifies playout by integrating graphics, audio control, MCR switching, and subtitle insertion into one system. UHD workflow support enables users to easily adopt advanced formats such as HDR and immersive audio, ensuring productions meet modern standards while reducing complexity.

Seamless Transition to IP

Spectrum X Plus uses software-based architecture, freeing users from traditional hardware limits. For those transitioning to IP, it supports SDI and ST 2110 IP I/O, making it easy to adopt new workflows at a pace that suits you. This flexibility allows organizations to modernize infrastructure without disruption.

Streamlined Expansion to Cloud Playout

A major user benefit is Spectrum X Plus's compatibility with Harmonic's cloud offerings. It shares files and graphics with VOS360 Media and integrates with existing automation systems, so users can easily expand to cloud resources – supporting business continuity and enabling broadcasters to launch new channels rapidly as needs change.

AI-Ready Architecture with GPU Acceleration

With its software-driven design, Spectrum X Plus prepares

users for future innovation. GPU acceleration enables AI capabilities, such as automatic captioning and translation, which streamline tasks and reduce the ongoing cost of manual operations.

A Future-Ready Foundation for Modern Broadcasting

The launch of Spectrum X Plus represents a transformative moment for broadcast playout. By doubling channel density and halving the cost per channel, Harmonic has delivered a solution that directly addresses the industry's most pressing economic challenges today. But the benefits extend far beyond immediate cost savings.

Spectrum X Plus, with its software-based flexibility, hybrid and cloud support, and readiness for IP and AI, offers broadcasters a strategic long-term solution. Users gain the agility to adapt quickly while maintaining high quality and reliability, ensuring their operations are both modern and resilient. [\[Harmonic\]](#)

IKO MEDIA SETS NEW OPERATIONAL STANDARD WITH ITS IKOSYSTEM

iKO Media, a global provider of satellite, cloud, and over-the-top (OTT) broadcast solutions, has launched iKOSYSTEM. This platform is described as the industry's first truly unified broadcast operation platform. Available immediately to all iKOMG customers, iKOSYSTEM centralizes every subscribed service into a single, secure operational environment. It effectively eliminates the fragmentation that has long plagued broadcast infrastructure management.



Designed as a true broadcast operations control center, iKOSYSTEM empowers channels, platforms, and networks with complete operational visibility across their entire technical ecosystems. From playout and monitoring to electronic program guide (EPG) management, OTT delivery, free ad-supported streaming television (FAST), and audience engagement tools, customers can now access, operate, and monitor all their subscribed services through a single login and a unified real-time dashboard.

The platform delivers a single secure login across all authorized iKOMG services, streamlining access while providing real-time operational visibility across diverse environments. Embedded HLS previews give operators instant visual confidence, while Role-Based Access Control ensures that the right people have the right level of access. Secure OAuth2 and SAML authentication protocols protect the environment, and real-time alerts, SLA monitoring, and full audit trails ensure the platform is engineered for accountability as much as for automation. Its API-ready integration further ensures seamless integration with existing workflows.

One of the platform's most innovative features is its dynamic service aggregation. Services are automatically enabled based on a customer's specific contracts, enabling the instant enablement of new solutions without the need to onboard additional platforms or learn new interfaces. As channels and networks grow and their needs evolve, iKOSYSTEM is designed to grow effortlessly alongside them.

By unifying every operational tool into a single pane of glass, iKO Media has set a new benchmark for how broadcast infrastructure should be managed. iKOSYSTEM not only simplifies day-to-day operations but also enhances oversight, strengthens security, and improves accountability. For broadcasters and content providers, this translates directly into greater efficiency, reduced complexity, and the confidence to scale their operations seamlessly. With its ability to adapt and expand as a business grows, iKOSYSTEM represents more than just a new platform – it is a future-ready foundation for streamlined, intelligent broadcast management. [\[iKO Media\]](#)

BRIDGE TECHNOLOGIES ENHANCES VB440 WITH MULTI-SERVICE AV SYNC COMPARISON

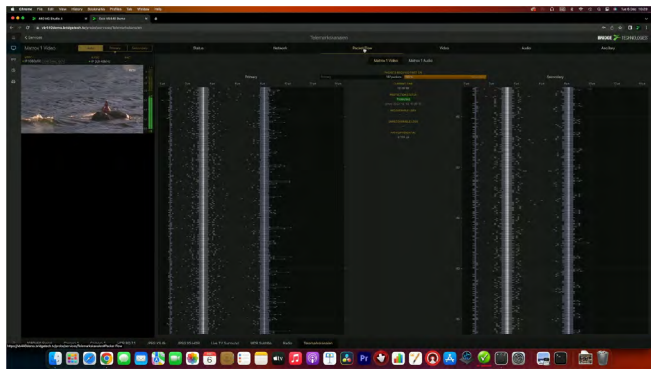


Bridge Technologies announced a major upgrade to the audio-video (AV) Sync function of its VB440 production probe. This enhancement now enables the comparison of AV synchronisation across multiple services, allowing for frame-level synchronization measurement across different delivery paths of the same service. The VB440 production probe is a device used to monitor, analyse, and measure audio and video signals in broadcast and production environments.

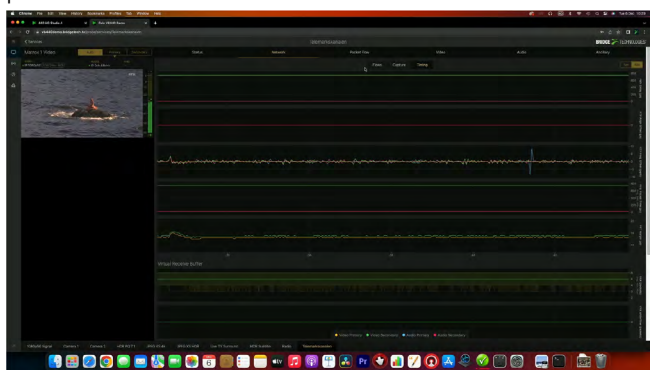
Designed primarily for live IP production environments where redundancy and resilience are essential, but applicable in a wide range of contexts, this new feature allows engineers to assess and compare multiple flows carrying the same service – for instance, across satellite, SRT, or other IP routes. The result is seamless, glitch-free switching between redundant feeds when it matters most.

The new functionality builds on the core of the VB440's AV Sync Generator feature. The AV Sync Generator first introduced a content-based approach to monitor synchronization within a single service. Instead of relying only on packet timestamps, the system puts machine-readable markers into audio and video. These markers are analyzed after the service is reconstructed at the client. This allows real-time, frame-accurate measurement based on content, not just the transport layer.

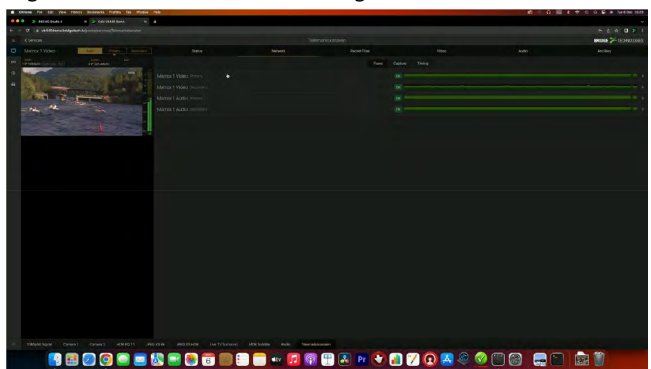
Since its initial introduction, the AV Sync Generator has been expanded to include ancillary data synchronization, allowing



precise visualization of timing differences between video, audio, and associated metadata – including immersive audio formats. Additional tools, such as rolling-shutter simulation and blink-and-beep reference cues, further enhance usability, helping broadcasters meet accessibility, compliance, and workflow consistency requirements across complex production chains.



The newly added multi-service comparison capability extends this foundation to address scenarios common in live sports and premium broadcasting, where the same service is often delivered via multiple independent paths specifically for resilience. Because these diverse paths often have different timing characteristics, the VB440 now enables users to place multiple incoming services on a shared timeline within the sync client. Engineers can visually stack and compare feeds against a chosen reference, instantly identifying frame-accurate offsets and adjusting delays to allow uninterrupted, high-confidence source switching.



Bridge Technologies designed the interface for rapid, in-the-moment decisions. Users can add new services to the timeline with one click and arrange them in an intuitive workspace. Multi-path alignment becomes fast and efficient. APIs allow users to build automation tools using the probe's frame-accurate sync data to help broader workflows. By moving beyond simple packet-level analysis to true content-based synchronization, Bridge Technologies has given broadcast engineers unprecedented precision and confidence in managing redundant live feeds. The ability to visually compare multiple incoming paths on a single, frame-accurate timeline transforms what was once a complex, error-prone task into a streamlined, intuitive process. For live sports and event broadcasters where every millisecond

counts, this enhancement ensures that redundancy truly delivers on its promise – providing a seamless safety net that operates without viewers ever noticing the switch. It is a powerful step forward in maintaining the highest standards of quality and reliability in the most demanding production environments. A significant new enhancement to the AV Sync function in its VB440 production probe introduces a multi-service AV sync comparison capability that enables frame-accurate synchronization assessment across multiple delivery paths of the same service. [\[Bridge Technologies\]](#)

COBALT DIGITAL LAUNCHES ARIA-AUD-MON-V AUDIO MONITOR FOR DEMANDING BROADCAST ENVIRONMENTS

Cobalt Digital has expanded its award-winning ARIA series. The ARIA-AUD-MON-V is a compact 1RU rack-mountable audio monitor. It is designed to deliver precision audio monitoring in professional broadcast, production, and post-production environments. This unit is ideal where space is at a premium.

The ARIA-AUD-MON-V combines high-quality audio reproduction with extensive connectivity options, making it a versatile solution for modern broadcast facilities. At the heart of the unit is a 30-watt Class D amplifier that provides 15 watts per channel, driving a high-performance full-range stereo speaker system that delivers clear, accurate audio reproduction across the frequency spectrum. The system offers an acoustic frequency response of 150 Hz to 16 kHz, with hum and noise performance better than -60dB below full output and a maximum SPL of 93 dB(A) before protection limiting engages at one meter.



Power flexibility is a key feature of the ARIA-AUD-MON-V. It is engineered with redundancy in mind. The unit includes two dual external DC power supply inputs. This provides backup power capability for mission-critical applications. A PS-72W-24V-S760K power supply is included. The PoE++ Power over Ethernet port is compliant with IEEE 802.3bt. It delivers up to 60 watts. The system automatically switches between DC and AC power sources for seamless power redundancy.

Connectivity on the ARIA-AUD-MON-V is comprehensive. Two full-sized 75Ω BNC SDI inputs support 12G/6G/3G/HD/SD signals and MADI. One full-sized 75Ω BNC AES-3id PCM input supports sample rates of 32, 44.1, 48, and 96 kHz. Two GPI connections automate speaker muting. There are also two balanced audio inputs on a three-pin terminal block. These deliver stereo at 20kΩ impedance, with a maximum of +24 dBu and a reference level of +4 dBu. Frequency response is ±0.25dB from 30Hz to 20 kHz. Typical CMMR is 60dB at 60Hz.

Advanced connectivity is provided by two 25G SFP cages. These support a range of connector and signal processing options. This includes SDI over Fiber for up to 12G SDI



signals. ST 2110 connectivity is also supported with appropriate licenses.

Output capabilities are robust. The unit features one 12G/ MADI loop-through and two balanced analog monitor outputs on a three-pin terminal block. These have 60 Ω impedance. The maximum output level is +24 dBu, with a reference level of +4 dBu (-20 dBFS). Frequency response maintains ± 0.25 dB precision from 30Hz to 20 kHz. The signal-to-noise ratio exceeds 100dB across the same range. A 1/4-inch TRS headphone jack is on the front panel for private monitoring.

The ARIA-AUD-MON-V is built for continuous operation in professional environments. Its operating temperature range is 0° to 40°C (32° to 104°F), non-condensing. The unit is housed in a robust 19-inch wide rack-mount metal chassis. It measures 1.75 inches high (1RU) and 4 inches deep. The base weight is 3 pounds without connected audio monitoring. The included PS-72W-24V-S760K power supply and cable add about 1 pound.

The ARIA-AUD-MON-V offers advanced audio quality, flexibility, and reliability for professional broadcast environments. Its redundant power options, comprehensive input and output connectivity, and compact 1RU form factor suit a range of applications, including broadcast master control, production trucks, post-production suites, and video village setups. By supporting both traditional SDI and MADI, as well as modern IP-based ST 2110 workflows via its SFP cages, the unit remains adaptable as facilities transition to IP infrastructure. GPI automation control, web-based remote management, and an intuitive touchscreen interface with eight individual volume controls enable precise operator control, whether at the rack or remotely. For professionals requiring a reliable, high-performance audio monitoring solution that accommodates demanding workflows in limited rack space, the ARIA-AUD-MON-V delivers strong performance, flexibility, and value. [\[Cobalt Digital\]](#)

LINK ELECTRONICS INTRODUCED NEW REAL-TIME SPEECH-TO-TEXT CAPTIONING DEVICE

Link Electronics has unveiled the Voyavox, an automated, real-time speech-to-text captioning solution that delivers advanced speech recognition with sub-five-second latency for streaming and fast-paced broadcasting environments.



With its advanced speech recognition and average latency of under 5 seconds, Voyavox transforms spoken words into clear, accurate text almost instantly. This speed and precision make it an ideal solution for a wide range of content, including live sports, news, political coverage, fast-paced commentary, and regular programming, as well as

streamed services.

The Voyavox efficiently handles a variety of speaking styles, accents, and pacing with ease. Delivering 95% accuracy, it reduces errors, improves viewer comprehension, and delivers a more polished, professional broadcast experience. By maintaining such high accuracy in real-time, broadcasters can significantly enhance the quality of their live programming.

Beyond the viewer experience, Voyavox supports accessibility and compliance. It allows broadcasters to meet FCC requirements and reach deaf and hard-of-hearing viewers. The system performs on-device speech-to-text conversion in real time. This keeps live content accessible without needing cloud-based services or expensive post-production editing. Accessibility is part of the workflow, making inclusive content delivery easier across all formats or environments.

The hardware is designed for flexibility and ease of use. The Voyavox receives audio through a USB connection to the Orion encoder or via a 3.5mm audio jack. It features a Graphical User Interface (GUI) that allows users to remote into the system from anywhere on their network. While the unit is typically located in the control room, it can be accessed from virtually anywhere, providing operators with unparalleled freedom of movement. The intuitive user interface allows operators to start and stop captioning with a single button press or set the system to a continuous loop, providing 24/7 captioning without manual intervention.

Setup is quick and efficient, as the unit comes preset with standard audio and caption data outputs for Link Electronics encoders. Voyavox is made in the USA and backed by a 1-year warranty and free 24/7 customer support.

Link Electronics has built its reputation on providing access to various modes of video and audio communication. Accessibility for the deaf and hard of hearing has been the primary objective of their endeavours since their founding. The advancement of technology and the adoption of more sophisticated designs have resulted in a marked improvement in captioning quality and, consequently, a higher-quality viewing experience for end users. Link serves broadcasters in the television market, municipalities, educational institutions, and closed captioning services worldwide, with most equipment backed by an industry-leading 10-year warranty and all products carrying 24/7/365 free technical support.

By combining sub-five-second latency with 95% accuracy, Voyavox delivers a powerful solution that bridges the gap between live production speed and the critical need for accessibility. For broadcasters, this means the ability to serve a wider, more inclusive audience while maintaining full compliance with regulatory standards, all without adding layers of complexity or cloud-based latency to their workflow. The system's remote accessibility and simple user interface ensure that engineering teams can maintain control from anywhere, while the on-device processing guarantees consistent performance regardless of internet connectivity. Whether deployed for live sports, breaking news, or regular programming, Voyavox empowers broadcasters to deliver real-time content instantly accessible to everyone, enhancing both the reach and reputation of their programming. [\[Link Electronics\]](#) ■

How to contribute to the Technical Review

Would you like to contribute an article to the ABU Technical Review?

We welcome submissions from everyone. This is an excellent opportunity to showcase your organisation's work and gain significant exposure.

We are open to a variety of articles, including research papers, details on new technical developments, or any content that will interest TR readers. The Technical Review, our quarterly publication, is distributed to all ABU members, industry partners, and technical staff, as well as international organisations such as the ITU, other broadcasting associations, and universities.

While it primarily targets engineers, it also features general interest news stories. It contains articles on new technologies, developments in broadcasting, member innovations, and other materials of interest to engineers.

Your article can be of any length and written in any style. Should you include photos, please ensure they are high resolution (at least 2 megapixels). Although we cannot offer payment, we do provide a free half-page advertisement for select articles, especially those covering technical research. This advertisement will be placed immediately after your article, giving your organisation extra publicity.

Additionally, articles by ABU members on Case Studies, Research, and Practical Implementations are eligible for the annual ABU Technical Review Prizes, which include a cash prize and a certificate.

You can view previous issues of the Technical Review on the ABU website's main page or directly at: <https://www.abu.org.my/technical-review/>

We look forward to considering your submission.



The ABU Technical Committee Meets in Ulaanbaatar



If you need more information, please contact: balqis@abu.org.my

Personalities & Posts

A DISTINGUISHED FAREWELL: YBHG. DATUK SUHAIMI SULAIMAN AND HIS LEGACY AT RTM



YBhg. Datuk Suhaimi Sulaiman
Director-General of Broadcasting Radio
Televisyen Malaysia (RTM)

As YBhg. Datuk Suhaimi Sulaiman prepares to conclude his tenure as Director-General of Radio Televisyen Malaysia (RTM). His leadership marks a transformative era for Malaysia's public broadcasting, defined by renewed relevance and forward-looking change.

Appointed on 19 January 2023 to lead RTM, Datuk Suhaimi brought decades of experience across Malaysia's media ecosystem. His appointment marked a strategic move to blend private-sector dynamism with the values of public service broadcasting.

A familiar face in Malaysian homes since the 1990s, he began his career as a news presenter and editor at TV3. There, he established a reputation for credibility and strong editorial grounding. He later became CEO and Editor-in-Chief of Astro AWANI. He played a pivotal role in shaping it into a respected 24-hour news channel known for analytical depth and professional journalism.

His leadership journey continued as CEO of Sarawak Media Group, where he spearheaded the launch and positioning of TVS, strengthening the regional broadcasting presence. In 2020, he also served as Chairman of BERNAMA, contributing to national-level media governance.

At RTM, Datuk Suhaimi initiated progressive modernisation. Under his stewardship, RTM intensified its digital-first approach. The broadcaster strengthened its OTT platform,

RTM Klik, to expand accessibility beyond conventional broadcast boundaries. He championed newsroom revitalisation, refreshed studio presentation formats, and emphasised compelling storytelling in drama and documentary productions.

His strategy included long-term planning toward RTM's 80th anniversary in 2026. He aspired to elevate production quality to international standards. At the same time, he worked to preserve RTM's mandate as a trusted public broadcaster.

Beyond management and policy, Datuk Suhaimi is also an author and communication advocate. His books, including "I Hate Public Speaking" and "What's Next?", reflect his passion. He empowers professionals with confidence, clarity, and strategic thinking.

As he prepares for retirement, Datuk Suhaimi concludes a transformative period at RTM, leaving behind a strengthened organisation, a renewed sense of direction, and a generation of broadcasters inspired by principled, future-ready leadership.

His legacy will continue to influence RTM through elevated production standards, a robust digital platform, and a generation of broadcasters equipped with skills for the evolving media landscape, resonating within RTM and across the Asia-Pacific broadcasting community. ■

BBS New President

Mr Dorji Tashi joined Bhutan Broadcasting Service (BBS) on 1 December 2025 as the youngest Chief Executive Officer in the organisation's history. Before this, he served as CEO of the Food Corporation of Bhutan, one of the country's largest and oldest state-owned enterprises, where he led the corporation from financial losses to operational and financial stability. Prior to that, he was Executive Director of the Loden Foundation, a civil society organisation that promotes youth entrepreneurship, strengthens institutional capacity, and expands support systems for aspiring young entrepreneurs.

Educated in Bhutan for both early and tertiary studies, Mr Tashi gained seven years of professional experience before pursuing a Master of Business Administration in the United Kingdom. He has also completed a certificate course in Social Policy, enhancing his expertise in governance and inclusive development. Recognised as one of Bhutan's emerging leaders, he is noted for his visionary outlook, strategic management, and strong team leadership, combining corporate management and social sector experience.

Beyond his executive roles, Mr Tashi has served on multiple company boards and high-level steering committees, contributing to policy and institutional development. He remains committed to social causes, actively championing initiatives that support community development and youth empowerment, reflecting his dedication to both professional excellence and societal impact. ■

WBU-TC New Chairman

Dr Veyssel Binbay, Director of Technology & Innovation at the Asia-Pacific Broadcasting Union (ABU), has been elected as the new Chair of the World Broadcasting Unions (WBU) Technical Committee. This committee is a key forum for global broadcasting unions to collaborate on technical innovations, standards, and spectrum issues crucial to the industry's future.

Dr Binbay succeeds Bassil Zoubi of the Arab States Broadcasting Union and will be supported by Antonio Arcidiacono (European Broadcasting Union) and John Lee (North American Broadcasters Association) as Vice-Chairs. His election highlights the global broadcasting community's confidence in ABU's leadership and expertise.

Under Dr Binbay's guidance, the WBU Technical Committee aims to further strengthen international cooperation on emerging technologies and promote sustainable development in broadcasting worldwide. ■

Congratulation!



DBS TEAM



ABU DBS 2026, led by **Dr Veyssel Binbay**, showcased strong leadership and team dedication. The team hosted expert panels, facilitated interactive workshops, and staged an industry showcase. These efforts collectively drove the event's success. Building on this momentum, Dr. Veyssel designed the DBS 2026 theme: "The Rising Synthetic Era." The event ran from 30 March to 2 April 2026 at Hotel Berjaya Times Square in Kuala Lumpur. The theme captured the rapid transformation sweeping the broadcasting industry. Artificial intelligence, automation, and generative technologies are now emerging as active creative partners, no longer limited to supporting tools.

Far from being a distant concept, "The Rising Synthetic Era" stands on broadcasters' doorsteps. AI-generated visuals, hyperreal audio, virtual presenters, and automated storytelling flood the mainstream. These technologies redraw the boundaries of content creation and delivery. The impact extends beyond the technical; it reshapes culture. This shift reinvents how audiences interact with media. DBS 2026 confronted difficult questions. Can authenticity survive when machines shape every broadcast? Will audiences trust what they see and hear? The symposium directly tackled these issues. It explored implications for production, security, engagement, and ethical governance. The event urged industry leaders to innovate while staying true to their core values.

DBS 2026 demonstrated its forward-looking approach by launching a dedicated mobile app. Attendees accessed real-

time information about speakers and exhibitors, navigated streamlined event details, and used a built-in chat function to enhance networking among international delegates.

Perhaps the most headline-grabbing innovation was the use of an AI-generated voice-over announcer. Built with ElevenLabs technology, it engaged delegates, introduced speakers, and facilitated session flow. This showcased practical AI integration on the main stage. Interactive platforms such as AhaSlides further energized sessions. Making real-time Q&A a staple ensured every participant had the opportunity to contribute.

Behind the scenes, DBS 2026 embodied a commitment to technical excellence. An advanced AV rig showcased an HP Z640 workstation, multiple video capture cards, Kameha HDMI splitters and switches, and four Dell Precision laptops. This setup streamlined how organizers managed presentations and content. Instead of cluttering the room with monitors, organizers reduced the number of displays and relied on a single large screen as a multiviewer, creating a cleaner and more efficient environment. The DataVideo PTZ-140 camera captured sessions and live workshop demonstrations. In keeping with the event's innovative spirit, DBS launched a remotely managed signage system powered by a Raspberry Pi, connecting the TV to a cloud-based platform for seamless content updates and scheduling. These innovations ensured the technical backbone aligned with the event's forward-thinking vision. ■



2026

January	Engineering Fundamentals Level-1	Online
19 - 23 January	HFCC A26 Conference	Kuala Lumpur, Malaysia
30 March - 2 April	ABU Digital Broadcasting Symposium 2026	Kuala Lumpur, Malaysia
3 April	ABU Technical Bureau Mid-Year Meeting	Kuala Lumpur, Malaysia
3 April	WBU TC Meeting	Online
22-24 April	CCBN-ABU NEXUS	Beijing, China
20-22 May	BroadcastAsia Workshop	Singapore
May	Member Innovation Webinar	Online
June	ABU-DRM Workshop	Online
June	Engineering Fundamentals Level-2	Online
July	World-DAB-ASBU-ABU Workshop	Online
August	ABU-IPPTAR Workshop	Kuala Lumpur, Malaysia
September	Member Innovation Webinar	Online
September	Industry Webinar on OTT Platforms	Online
September	Technical Bureau Annual Meeting	Online
13 October	Media Provenance Summit Japan	Tokyo, Japan
30-31 October	Technical Committee Meeting	Colombo, Sri Lanka
December	Member Innovation Webinar	Online

2027 ²²⁻²⁵ MARCH 2027 ABU DIGITAL BROADCASTING SYMPOSIUM

For more information,
please contact us:
+603 2282 3592
dbs@abu.org.my

ADVER TISE WITH US

Contact cassandra@abu.org.my