ULAANBAATAR
Asia-Pacific Broadcasting Union
62nd General Assembly and Associated Meetings

Asia-Pacific Broadcasting Union | MNB

TECHNICAL COMMITTEE MEETING

11-12 September 2025
Tuushin Hotel, Ulaanbaatar, Mongolia

Doc T-25/1

TC PROGRAMME
Venue: Tuushin Hotel

THURSDAY | 11 SEPTEMBER

TC PROCEEDINGS

09:00 - 09:30 **Welcome Address by the Chairperson, Technical Committee**
Mr Masashi Kamei, Chairperson, ABU Technical Committee and Senior Research Engineer, NHK STRL-Japan

Welcome Address from the Host
Mr Sukhbayar Sukhbaatar, Honorary Vice-Chairperson, ABU Technical Committee and CTO, MNB-Mongolia

Opening Address by ABU Secretary-General
Mr Ahmed Nadeem, Secretary-General, ABU

TC PROCEEDINGS

09:30 - 10:30 **Confirm Agenda and TC-2025 Proceedings and Appointment of Rapporteurs**

ABU Technology Activity Report

ABU AI Principles Document

10:30 - 11:00 *Tea, coffee & networking*

INVITED PRESENTATIONS – Part 1

11:00 - 11:45 Moderator: **Mr Tolga İnce,** Chief Engineer, TRT-Türkiye

SPEAKERS:

- **Mr Zhang Wei**, Deputy Director of the Academy of Broadcasting Science, NRTA, China
- **Mr Chi Wah LEUNG**, Head of Engineering, RTHK, Hong-Kong-China
- **Mr Masashi Kamei,** Senior Research Engineer, NHK STRL-Japan

THE HOST PRESENTS | MNB

11:45 - 12:30 Moderator: **Mr Masashi Kamei,** Chairperson, ABU Technical Committee and Senior Research Engineer, NHK STRL-Japan

SPEAKERS:

- **Mr Sukhbayar Sukhbaatar,** CTO, MNB-Mongolia
- **Mr Bolorkhuu Namsraijav,** Broadcast Technology Specialist of Communications Regulatory Commission of Mongolia, CRC-Mongolia

12:30 - 14:00 *Networking lunch*

TOPIC AREA REPORTS

14:00 - 15:30

Distribution
Dr Hirokazu Kamoda, Principal Engineer, Planning Division, Engineering Administration Department, NHK-Japan

Spectrum
Dr Guosong Li, Senior Engineer, NRTA, China

Training & Services
Mr Prakash Veer, Deputy Director General, NABM, Prasar Bharati, India

Production
Mr Kazim Pektaş, Chief Engineer, TRT-Türkiye

15:30 - 16:00 *Tea, coffee & networking*

ABU ENGINEERING AWARDS 2025

16:00 - 14:45 **Announcement of Winners of the Annual ABU Engineering Award and Technical Review Prizes 2025**

End of TC Meeting Day 1

FRIDAY | 12 SEPTEMBER

INVITED PRESENTATIONS – Part 2

09:30 - 10:30 Moderator: **Mr Zhang Wei**, Deputy Director of the Academy of Broadcasting Science, NRTA, China

SPEAKERS:

- **Mr Tolga İnce,** Chief Engineer, TRT-Türkiye
- **Dr Mohieddin Moradi**, Director of R&D, IRIB, Iran
- **Ms Oyuntuya Dugersuren,** IT Engineer, TV5-Mongolia

10:30 - 11:00 *Tea, coffee & networking*

ELECTION OF OFFICE BEARERS | ABU TC

11:00 - 12:30 **TC Elections**

12:30 - 14:00 *Networking lunch*

PANEL DISCUSSION: Future of Linear Channels – Will There Be Any?

14:00 - 15:30 Moderator: **Dr Veysel Binbay,** Director of ABU Technology & Innovation

PANELLISTS:

- **Mr Zhang Wei**, Deputy Director of the Academy of Broadcasting Science, NRTA, China
- **Mr Chi Wah LEUNG**, Head of Engineering, RTHK, Hong-Kong-China
- **Dr Mohieddin Moradi**, Director of R&D, IRIB, Iran
- **Mr Tolga İnce,** Chief Engineer, TRT-Türkiye
- **Mr Sukhbayar Sukhbaatar,** CTO, MNB-Mongolia

15:30 - 16:00 *Tea, coffee & networking*

MEMBERS' UPDATES & CLOSING

16:00 - 16:30 **Members' Updates**

Information Exchange and Status Reports

16:30 - 17:30 **Future Meetings**

ABU DBS 2026, Kuala Lumpur, 30th March – 2nd April 2026

Appointment of Honorary Vice-Chairperson from the host of the 2026 ABU General Assembly

Closing remarks by TC Chairperson

End of TC Meeting

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Asia-Pacific Broadcasting Union | MNB Mongolian National Broadcaster

TECHNICAL COMMITTEE MEETING

11-12 September 2025
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AGENDA

Day 1 | Thursday, 11 September

1. Opening Session
   - 1.1 Welcome Address by Chairperson, ABU Technical Committee
   - 1.2 Welcome Address by the Host, MNB-Mongolia
   - 1.3 Opening Address by ABU Secretary-General
2. Confirm Agenda and TC-2025 Proceedings and Appointment of Rapporteurs
3. ABU Technology Activity Report
4. ABU AI Principles Document
5. Invited Presentations – Part 1
6. The Host Presents
7. Report from Topic Area Chairpersons
8. Announcement and Presentation of the 2025 ABU Technical Review Prizes and Engineering Awards

Day 2 | Friday, 12 September

9. Invited Presentations – Part 2
10. Election of Office Bearers
11. Panel Discussion: Future of Linear Channels - Will There Be Any?
12. Members' Updates
13. Information Exchange and Status Reports
14. Future Meetings
15. Appointment of Honorary Vice-Chairperson from the host of the 2026 ABU General Assembly
16. Closing

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ABU TECHNOLOGY

LIST OF DOCUMENTS

Doc No	Source	Title of the Document
T-25/1	ABU TD	Programme
T-25/2	ABU TD	Agenda
T-25/3	ABU TD	List of Documents
T-25/4	ABU TD	TD Activity Report
T-25/5	ABU TD	Report on the Annual Meeting of the Technical Bureau
T-25/6	ABU TD	ABU AI Principles Document
T-25/7	TA-T	Topic Area Chairperson's Report – Distribution
T-25/8	TA-S	Topic Area Chairperson's Report – Spectrum
T-25/9	TA-TS	Topic Area Chairperson's Report – Training & Services
T-25/10	TA-P	Topic Area Chairperson's Report – Production
T-25/11	ABU TB	Terms of Reference – Topic Areas and Projects
T-25/12	ABU TD	Calendar of Events
T-25/13	ABU TD	List of Delegates
T-25/20	**STATUS REPORTS**	
T-25/20-1	The Voice of Vietnam – Vietnam	
T-25/20-2	Radio Television Hong Kong – Hong Kong, China	
T-25/20-3	Mediacorp – Singapore	
T-25/20-4	Mongolian National Public Radio & Television – Mongolia	
T-25/20-5	Vanuatu Broadcasting and Television Corporation – Vanuatu	
T-25/20-6	National Broadcasting Services of Thailand – Thailand	
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T-25/20-8	Sri Lanka Rupavahini (TV) Corporation – Sri Lanka	
T-25/20-9	Turkish Radio and Television Corporation – Türkiye	
T-25/20-10	Radio and Television of the People's Republic of China – China	
T-25/20-11	China Media Group – China	
T-25/20-12	Television Broadcasts Limited – Hong Kong, China	
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Doc No	Source	Title of the Document
	PRESENTATIONS	
T-25/30	**THE HOST PRESENTS**	
T-25/30-1	MNB-Mongolia	The Broadcasting Industry and Technologies of Mongolia
T-25/31	**PANELLIST SESSION**	
	Future of Linear Channels – Will There Be Any?	
T-25/32	**Part 1 | Advancements in Broadcasting Technology & Standards**	
T-25/32-1	RTPRC-China	Artificial Intelligence Applications in Broadcasting and Television
T-25/32-2	RTHK-Hong Kong, China	DRM Technology Update
T-25/32-3	NHK-Japan	NHK STRL's Activities – Future Vision 2030-2040
T-25/33	**Part 2 | Advancements in Broadcasting Technology & Standards**	
T-25/33-1	TRT-Türkiye	-
T-25/33-2	IRIB-Iran	Enhancing the Resilience of TV Broadcasting Networks in Crisis Events
T-25/33-3	TV5-Mongolia	AI-Driven Virtual Hosting System
T-25/34	**OPENING & CLOSING SESSIONS**	
T-25/34-1	NHK-Japan	Welcome Address – Mr Masashi Kamei, Chairperson, ABU Technical Committee and Senior Research Engineer, NHK STRL-Japan
T-25/34-2	MNB-Mongolia	Welcome Address from the Host – Mr Sukhbaayar Sukhbaatar, Honorary Vice-Chairperson, ABU Technical Committee and CTO, MNB-Mongolia
T-25/34-3	ABU	Opening Address by ABU Secretary-General, Mr Ahmed Nadeem
T-25/34-4	NHK-Japan	Closing Address – Mr Masashi Kamei, Chairperson, ABU Technical Committee and Senior Research Engineer, NHK STRL-Japan

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ABU Technology Activity Report for TC-2025

The ABU Technology Department had a productive period, marked by extensive preparations and the successful execution of our flagship symposium, DBS 2025, alongside a wide range of specialized workshops and webinars. Our core focus was on key technological trends such as cloud services, evolving media integration, and the transformative potential of artificial intelligence (AI) and sustainability in broadcasting. The detailed activities below underscore our commitment to knowledge exchange and technical excellence across the membership.

- **Workshop on Cloud Services and Remote Tools for Broadcasters**

Dates and Location: 26–28 November 2024, held at Dewan Cendekiawan, IPPTAR, Kuala Lumpur, Malaysia. **Organization:** Jointly organized by the ABU Technology Department and the Institut Penyiaran dan Penerangan Tun Abdul Razak (**IPPTAR**).

The three-day workshop was a highly targeted event designed to familiarize broadcasters with **emerging technological trends**, particularly in the adoption of **cloud services** and the implementation of **remote production tools**. The event attracted **over 35 participants**, with strong representation from our members, including RTM-Malaysia, RTHK-Hong Kong, along with several invited non-member government agencies from Malaysia. The high participation rate from RTM signals strong local interest and commitment to these cutting-edge workflows.

The session featured esteemed speakers from leading solution provider companies across the region, notably **Harmonic, Skyline, IPSB, Benchmark, and TVU**. Crucially, the final day included a technical visit to **RTM's facilities**, where **Mr. Shafiq from RTM** provided attendees with a highly detailed explanation of RTM's operational processes and workflow. This practical component provided valuable, real-world context on integrating these new technologies. The overall feedback from participants, speakers, and IPPTAR was overwhelmingly positive, confirming the high value of this specialized training.

- **DIGITAL BROADCASTING SYMPOSIUM 2025 (DBS 2025)**

The Digital Broadcasting Symposium 2025, held from **24–27 February 2025** at Wyndham Acmar Klang, Klang, Malaysia, was the department's largest and most significant undertaking of the period, successfully establishing its status as the region's premier event for technical innovation. Under the compelling theme, ***"Personal-cast: Interactive Broadcasting, Tailored for You,"*** the symposium provided a crucial, high-level platform for the Asia-Pacific broadcasting community to converge, exchange strategic knowledge, and explore future technologies. The event preparation began nearly four months in advance, with the TD team holding twice-weekly meetings from November 2024 onward to meticulously plan every detail, from the finalization of the theme to task assignments.

The operational execution was flawless, culminating in a highly attended event featuring a diverse lineup of **774 participants from 38 countries and 234 organizations**. This included a significant delegation of **294 participants from 49 ABU member organizations**. The event's commercial success and industry support were robust: the exhibition floor featured **38 booths utilized by 26 key exhibitors** and attracted support from **4 major sponsors, 1 luncheon sponsor, 1 lucky draw sponsor, 1 lanyard sponsor, and 3 workshop sponsors**. This scale not only validates the relevance of the DBS platform but also underscores our ability to drive industry engagement and knowledge dissemination on a massive scale.

DBS 2025: Content, Structure, and Preparation Milestones

The comprehensive program was structured to deliver maximum educational value, featuring **12 highly specialized conference sessions, 7 hands-on workshops, and 2 exclusive masterclasses**. The conference sessions were designed to cover the full spectrum of broadcast evolution. **Day 1 (25 Feb)** focused on content creation and immersive media, with sessions dedicated to *Personalization and AI in Broadcasting Content Creation* (Session 1), *Immersive Media* (Session 2), *Innovations in Media Archives and AI Integration* (Session 3), and *Real-Time Interactivity* (Session 4). **Day 2 (26 Feb)** shifted focus to infrastructure, distribution, and security, covering *Advancements in Broadcasting Technologies and Standards* (Session 5), *Next-Gen Media Distribution* (Session 6), *Cybersecurity in Broadcasting* (Session 7), and an *Industry Debate* (Session 8). **Day 3 (27 Feb)** concluded with discussions on ecosystem convergence and sustainable practices, featuring *Hybrid Media Ecosystems* (Session 9), *Innovative Media Solutions* (Session 10), *Advances in Cloud Workflows and Remote Tools* (Session 11), and finally, *Sustainability and Efficiency in Broadcasting* (Session 12).

Leading up to the event, the team achieved significant milestones: By December 2024, **11 exhibitors** were confirmed, with key personnel assigned to critical areas: Aqilah overseeing exhibitors and sponsorship, Balqis handling registration and event promotion, Aswandi focused on video and social media promotion, and Afiq managing conference

speakers and workshops. By January 2025, this success was amplified, with **17 confirmed exhibitors** and a roster of **19 registered speakers** (and 12 pending registration), reflecting intense industry interest. The interactive component was particularly strong, delivered through two high-value Masterclasses: **IRIB's** *Techniques for High Quality Video Production in Broadcasting* and the **ABU's** own session on *The Latest Podcast Trends and Tools*. Key technical Workshops, essential for practical skills, were led by organizations including **IPSB**, **WorldDAB**, **DRM Consortium**, **Fraunhofer IIS**, **DVB**, and **Accedo**, ensuring participants received both strategic insights and hands-on technical guidance.

- **ABU-VYPA-NETSTAIRS Webinar – AI TV: The Future of Television!**

Date: January 23rd, 2025, at 3:00 PM MYT (via Zoom Webinar). **Duration:** 1.5 hours (presentation) + 30 minutes Q&A.

This webinar focused on how **AI, Web 3.0, and smart devices** are rapidly revolutionizing the television industry, a topic of growing strategic interest for all broadcasters. The event was highly successful in terms of reach, attracting **105 participants from 34 organizations across 23 countries**, significantly exceeding initial targets and demonstrating the strong demand for content on AI-driven media strategies.

The core discussion, presented by **Dr. Moradi (CEO, Netstairs)** and moderated by **Mr. Vijjay (CEO, Vypa)**, focused on the role of AI within smart TV sets, exploring how this technology drives targeted viewer engagement, enables new content distribution methods like AI distribution, and facilitates future-ready broadcasting through interactive OTT services and Web3.0 Swiss ID sessions. The strong attendance from countries like Turkey (22 participants) and Pakistan (26 participants from Virtual University) highlights the broad regional relevance of this technology to our members.

- **Engineering Fundamental Course – Level-1 (Online)**

Dates: 17 March to 19 June 2025.

This multi-level training course was specifically designed for **young/junior engineers and newcomers** to broadcast engineering, with the objective of providing a strong foundational knowledge base. The demand was exceptional, with **138 nominees** received across **15 member organizations**. To maintain quality, **52 candidates** were selected for this initial batch, underscoring the competitive nature of the enrollment.

The course was delivered entirely online to provide flexible access and included a rigid structure of **10 technical topics**, encompassing core broadcast concepts like Video/Audio Basics, Digital Communication, Networking & IT Basics, and the Overall Broadcast Chain. The curriculum was supported by module quizzes and regular **Live Q&A sessions** (e.g., sessions held on April 8th and April 29th) with the expert lecturers, led by Dr. Veysel Binbay, who developed the content. The course culminated in a Closing

Ceremony on June 19, where attendees shared constructive feedback—such as suggestions for subtitles and improved video post-production—while strongly praising the course for being informative, practical, and highly valuable for strengthening technical knowledge. This course has proven its worth and is planned for repetition for the remaining nominees, with successful participants invited to the advanced **Level-2**.

- **ABU-CCBN Nexus Event**

Dates and Location: April 22–25, 2025 in Beijing, China. **Collaboration:** This was a pioneering joint initiative organized by the China Content Broadcasting Network (**CCBN**), led by the Academy of Broadcasting Science, National Radio and Television Administration (PRC), in partnership with ABU.

The inaugural event was centered around the theme **"Where Media Meets AI,"** and successfully united international experts, industry leaders, and innovators to shape the future of AI-driven media. The event saw participation from **10 international participants representing 7 ABU member organizations**, highlighting our strong connections with Chinese media organizations.

A key activity was the **CCBN-ABU Nexus AI Workshop** on April 23, which was moderated by **Mr. Sheng Zhifan**, Vice Chair of the ABU Technical Bureau. Presenters included esteemed engineers **Ir. Ts. Ahmad Shafiq Mirza bin Mansor from RTM** and **Zhang Lejiong from RTHK**, sharing critical, practical insights on AI-driven media production. This event was instrumental in promoting the ABU's influence in the Chinese market and fostering strategic partnerships in the crucial domain of artificial intelligence.

- **ABU-DRM Webinar: DRM Latest Development and Aspect of Implementation**

Date and Format: 6th May 2025, online.

This highly focused webinar, successfully hosted by ABU Technology, gathered digital radio experts and regional broadcasters to explore advancements in Digital Radio Mondiale (**DRM**) technology and its strategic implementation, particularly across the Asia-Pacific region. The session emphasized DRM's relevance as an **energy-efficient, cost-effective, and multimedia-capable digital broadcasting solution** capable of bridging information gaps in underserved areas. The event was attended by **15 participants representing 7 member organisations**, reflecting a dedicated interest group focused on digital radio transition.

The session featured global experts who shared crucial deployment and technical information. **Ruxandra Obreja** highlighted global DRM deployments and the Consortium's ongoing support; **Yogendra Pal** shared insights from India's large-scale DRM rollout and the importance of policy backing; and **Alexander Zink** presented technical updates like **DRM for FM, emergency warning functionalities, and multimedia applications such as Journaline**. The discussion concluded with a robust

Q&A segment covering essential topics such as receiver availability and licensing models, with the Technology Department urging continued collaboration with the DRM Consortium for future developments and pilot initiatives.

- **BroadcastAsia 2025 – Exhibition and Workshop**

Dates and Location: 27 to 29 May 2025 at the Singapore EXPO, as part of the AsiaTechxSingapore programme.

ABU was a proud partner of this major industry event, successfully showcasing its initiatives and the contributions of its members via a dedicated booth, which attracted numerous attendees and ABU members. Furthermore, ABU delivered a specialized workshop on 28 May 2025, titled **"Future of Media Delivery: Expectations & Facts,"** in Hall 5.

The workshop was a practical, high-level discussion focused on narrowing the gap between content delivery expectations and on-the-ground realities in the rapidly evolving media landscape. It was expertly moderated by **Mr Peh Beng Yeow (Mediacorp)** and featured a diverse panel of international experts, including **Ms Emily Dubs (DVB Project), Mr Michael McEwen, and Dr Peter Siebert (IEEE BTS)**. The session provided meaningful, real-world insights into emerging trends, technical considerations, and implementation challenges for media and tech stakeholders.

- **ABU-ASBU-WorldDAB Technical Workshop – New Development for DAB+ Systems**

Dates and Format: 15–17 July 2025, online (three-day workshop). **Collaboration:** Successfully conducted by ABU in collaboration with **WorldDAB and ASBU**, demonstrating effective cross-regional partnership.

This three-day online technical workshop provided an in-depth, practical training session, covering a broad range of topics essential for DAB+ deployment. The content included the business case, technical standards, network design with a strong focus on **Single Frequency Networks (SFN)**, headend systems, cost analysis, and valuable real-world case studies from countries like **Switzerland**. The event saw remarkable participation, with a total of **167 participants** joining the sessions, including **32 attendees representing 11 ABU member organisations** out of 51 participating organizations overall.

The active engagement and meaningful discussions underscored a strong regional interest in adopting DAB+ for modern broadcasting needs, particularly its robust capabilities in delivering **national emergency warning systems**. The workshop successfully benefitted both technical and managerial staff involved in planning and deploying DAB+ digital radio systems, strengthening the ABU's support for digital transition initiatives.

- **AI Forum - AI EXCHANGE (PANEL): Tech Innovation with a Conscience - The Sustainable Broadcasting**

Date and Location: July 23, 2025, at the Grand Skylight Hotel Royal in Beijing, China.

This event marked the successful launch of the **first ABU AI Forum**, gathering international experts, broadcasters, technology innovators, and policymakers to deliberate on AI's revolutionary influence across broadcasting, media, and communication. The Technical Department played a crucial role in curating the panel session, which focused on broadcasting technology within the crucial framework of **sustainability** and ethical adoption.

The panel, titled *Tech Innovation with a Conscience - The Sustainable Broadcasting*, was moderated by **Nabilah Doyle (UNGCMYB)** and featured a diverse group of experts: **Damian Surin (Sunway University), Nusrat Akter Lovely (Axle.ai), Ahmad Moradi (NETSTAIRS), and Samuel Yip (AsiaSat)**. The discussion was structured to address specific, high-impact topics: **AsiaSat** addressed energy-efficient systems in satellite communications; **Axle.ai** discussed challenges in scaling sustainable AI solutions; **NETSTAIRS** explored systemic changes for responsible AI adoption; and **Sunway University Malaysia** focused on educating future media professionals about AI and sustainability. This strategic session successfully kickstarted the discussion on responsible AI and green innovation across the membership.

- **Webinar Series on Members' Innovation: Powering Simless Remote Evolving Media Integration (REMI) TV Production**

Date and Format: 31 July 2025, online. **Presentation:** The session was presented by **Ir. Ts. Ahmad Shafiq Mirza from RTM Malaysia**.

This webinar, part of our Members' Innovation series, was a high-value session that explored how **5G technology is transforming large-scale event production**. The session successfully gathered **66 participants from 9 ABU member organisations**, demonstrating keen interest in next-generation production models. The presentation highlighted Malaysia's leadership in developing **hybrid 5G broadcast solutions** in its capacity as ASEAN Chair in 2025, offering a valuable case study for the region.

The core of the discussion focused on the **Remote Integration Model (REMI)**, detailing how this advanced model leverages 5G and Wi-Fi networks to centralize production, significantly reduce on-site costs, and support high-quality, real-time content delivery. Practical examples showcased the use of a hybrid REMI setup to connect **12 broadcast locations** via the International Broadcast Centre (IBC) during five major ASEAN events. This webinar provided a proven, sustainable blueprint for modern, efficient, and high-quality broadcasting.

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Technical Bureau Annual Meeting Report, 4 September, Online

The ABU Technical Department successfully organized the **ABU Technical Bureau (TB) Annual Meeting 2025**, held online on **4 September 2025**. The meeting was chaired by **Mr. Masashi Kamei** from NHK-Japan, Chairperson of the ABU Technical Committee. It opened with a welcome address by **Dr. Veysel Binbay**, Director of ABU Technology, followed by remarks from Mr. Kamei, who expressed his sincere appreciation to all Bureau members for their active participation.

Following the opening, Bureau members engaged in discussions on the progress and activities of their respective organizations. Updates highlighted recent initiatives, ongoing technical developments, and challenges faced in the rapidly changing media and broadcasting environment. Members emphasized the importance of regional collaboration in advancing innovation, building capacity, and addressing practical needs.

Dr. Veysel Binbay then presented the **Activity Report**, which outlined progress made on TB tasks and activities since the TB Mid-Year Meeting in April. New initiatives included the **ABU-CCBN Nexus Event**, **ABU-DRM Webinar on DRM Developments & Implementation**, **BroadcastAsia 2025**, **WorldDAB-ABU-ASBU Workshop**, **AI Forum**, and the **Member Innovation Webinar hosted by RTM**.

A notable proposal was presented by **Mr. Kazım Pektaş**, who introduced the idea of establishing an **ABU Innovation Hub**. He clarified that the initiative was not meant to compete with existing ABU projects or study groups, but rather to serve as a communication platform among technical staff from different departments, ranging from maintenance to planning. He noted common challenges faced by Public Service Media (PSM) organizations, including financial limitations and shortages of highly skilled staff. With broadcasting technology rapidly evolving—from analog to digital, IP-based systems, and now artificial intelligence—technical teams face increasing workloads and complexity. The proposed hub would enable engineers and staff to exchange ideas, share solutions, and collaborate more effectively on both innovative and practical issues.

Dr. Veysel also provided an update on the upcoming **Technical Bureau elections**, scheduled to take place during the Technical Committee Meeting in Mongolia. He explained that the Bureau consists of 18 seats distributed among associate, lower category, and full members, and is re-elected every two years. To date, 11 members have confirmed interest in re-election, with 14 nominations received. Members who had not

yet confirmed were reminded to do so promptly. He stressed that Bureau seats belong to organizations, while chair and vice-chair positions belong to individuals, with a limit of two consecutive terms. Dr. Binbay also noted that **PTV Pakistan** and the **Saudi Broadcasting Authority** are ineligible this term due to participation requirements. Additionally, vice-chair positions from **TRT** and **Prasar Bharati** will become vacant after completing their maximum terms, while the vice-chair role from **RTPRC** remains open following Shang Ji Fan's retirement, though RTPRC is still eligible to nominate. Members were encouraged to review the circulated documents and submit nominations to ensure a strong, committed Bureau.

Another key agenda item was the introduction of the **draft AI Principles document**, developed as a cross-departmental effort within ABU to provide a unifying framework for addressing AI's impact on broadcasting. Dr. Binbay explained that, unlike other technologies, AI affects workflows across all areas—news, sports, programming, and technology. The document is not a prescriptive guideline but a set of adaptable principles or a "skeleton" that members can customize to their own circumstances. Drawing from international references such as the **EU AI Act** and **ITU documentation**, the framework emphasizes safeguarding audience trust while responsibly embracing AI. Members were invited to provide feedback by **10 September**, before the draft is presented to the Programme Steering Group (PSG) and then the Administrative Council.

Mr. Kamei welcomed the initiative, noting NHK's strong interest in AI. After reviewing the draft, he observed that while the **principles** section was clear, the section labeled "guidelines" consisted mostly of examples and use cases, such as newsroom automation, audience analysis, and content distribution. He suggested renaming this section to "use cases" or "applications of AI" to avoid confusion with prescriptive rules. Dr. Binbay acknowledged the feedback and confirmed that the terminology would likely be revised to better reflect the content.

Dr. Veysel Binbay also provided updates on the **Digital Broadcasting Symposium (DBS) 2026**, scheduled for **30 March – 2 April in Kuala Lumpur**. He explained that the new dates avoid a clash with Ramadan, and that several structural improvements have been made in response to feedback. Notably, parallel workshops and conference sessions will no longer run simultaneously, allowing better engagement and outcomes. The four-day event will continue to feature exhibitions, workshops, conferences, and masterclasses, but with refined scheduling, more sessions, and innovations in speaker arrangements. Final details will be circulated after the ABU General Assembly.

The meeting continued with a review of the **updated questionnaire** circulated beforehand by the Chairperson, which gathered insights on TV and radio broadcasting practices among ABU members. This initiative aimed to encourage experience-sharing and the identification of best practices, further strengthening collaboration and mutual learning within the union.

The session concluded with **closing remarks from Mr. Kamei**, who extended his heartfelt thanks to all participants for their contributions, collaboration, and active engagement. He emphasized the importance of collective efforts in shaping the future of

broadcasting in the region and expressed appreciation to ABU Technology for hosting a productive and meaningful meeting.

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ABU AI Principles Document

Asia-Pacific Broadcasting Union (ABU)

Principles on the Use of Artificial Intelligence in Broadcasting

Background and Introduction

Artificial Intelligence has rapidly expanded over the past two years, significantly transforming how industries use technology for productivity and operational efficiency. Machine learning and generative AI applications continue to multiply, especially in media and broadcasting. Over the last year, many broadcasters have demonstrated AI's role in content development, archiving, newsrooms, and delivery platforms. Conferences and workshops have highlighted these solutions, with members sharing how AI has improved usability and automation. Both large and small broadcasters are increasingly adopting these technologies throughout their operations.

Experts have noted widespread adoption of AI-based tools in forums and discussions, expressing concern over inadequate screening for safety, security, and ethics. Many of these tools, especially those in use in broadcast facilities, are freely available but lack thorough testing and certification. Despite potential risks such as data breaches, security exposures, and legal or ethical issues, their use continues to grow without full understanding of these implications. Many international organisations have developed regulatory frameworks and recommendations to guide the use of these tools. Broadcasters, including our sister unions such as the EBU, ASBU, NABA, and AUB, have organised AI-focused events to share experiences and promote proper use. They have published guidelines to help broadcasters implement these technologies appropriately and share best practices within the industry.

Noting the above developments and the expanding use of AI tools within broadcast and media organisations, including among many of our members, the ABU Secretariat together with the support of many of our members, industry partners, sister unions and the international community have developed the below 'Principles on the use of Artificial Intelligence in Broadcasting and Media organisations'. The principles, recommendations and best practices listed herein are non-binding and simple guiding principles that our members and other broadcasters and media organisations can consider using when developing their own regulatory frameworks within their organisations.

Preamble

Recognizing the rapid advancement of Artificial Intelligence (AI) technologies and their transformative impact on the broadcasting industry, the Asia-Pacific Broadcasting Union (ABU) aims to provide a responsible and structured approach for AI adoption in broadcasting and media practices. These guidelines are intended to support member broadcasters in embracing AI technologies while ensuring that ethical considerations, transparency, and sustainability are upheld. Given the unprecedented pace at which AI is evolving, this document should be considered dynamic and subject to periodic revisions to remain relevant and effective.

Recalling the essential role that broadcast, and media organisations play in delivering accurate, unbiased, and timely information to the public, it is imperative to integrate AI technologies in ways that enhance these responsibilities without compromising information integrity and public trust.

Considering the vast potential of AI to improve content creation, production processes, distribution methods, audience engagement, and operational efficiency, broadcasters must adopt these technologies but with careful consideration to uphold the trust and integrity with the audience. This involves being mindful of challenges related to data privacy, AI bias, and transparency.

Noting the growing presence of AI in broadcast and media workflows—from automated workflows, content creation, and transcription to personalised recommendation systems and audience analytics—AI serves as both a valuable tool and a source of unethical considerations. It is crucial for broadcasters to balance innovation with accountability.

Emphasising the need for capacity building, ongoing training, and upskilling within the broadcasting industry to ensure media professionals are equipped to work alongside AI technologies, maintaining oversight over automated systems, and adapting to new developments as they arise.

Acknowledging that this working document is only intended as a living guideline and non-binding, with further revisions to be published when necessary to keep pace with technological advancements and evolving regulatory landscapes. Broadcasters are encouraged to actively participate in this ongoing process, contributing insights and experiences to refine and improve these guidelines as needed.

Work on the ABU Principles and its Intent

The basic founding principle which this document is based upon is on **safeguarding public trust** with broadcasters and media organisations, specially for public service broadcasters. The implementation and use of AI technologies and solutions should in no way compromise the accuracy, integrity and credibility of information delivered by the broadcaster which is crucial in safeguarding and preserving public trust.

The principles, recommendations and best practices listed in this document are **non-binding and is provided only as a guideline** to help our members and other broadcast and media organisations when considering using AI applications and its implementation within their operations and workflow.

Considering the increasing use of AI solutions among our members and in line with similar efforts by sister unions and other international entities, the ABU secretariat is of the view that the ABU should commit to guiding its members in this complex area through a holistic approach. These principles are intended to inform members about the various aspects of these tools, including their technologies, potential challenges, security and safety considerations, and industry best practices. Its purpose is to offer direction on the appropriate use of AI technologies and tools within broadcast environments and operations across all relevant areas.

The listed principles will address AI applications in three main areas:

- **Technology and Security**
  Understanding AI's technology is challenging but essential for effective implementation. A lack of clarity can lead to issues like unauthorised data use, limited content control, and security risks. Since AI solutions vary in quality, organisations must identify where AI adds genuine value. Focusing on high-impact areas, reviewing industry metrics, and assessing compatibility, data models, provider stability, and credibility are important before adopting AI tools. Some of the most common areas of AI use cases have been in multilingual applications, accessibility, archives management and workflow automation.

- **Governance and Legal**
  Effective governance and legal frameworks are essential for implementing AI solutions. Without comprehensive mechanisms, organisations are testing various approaches, from reactive to restrictive methods, depending on each country's regulatory environment. For many, these frameworks remain under development and require expert input and guidance.

- **Ethical and best practices**
  Although many international organisations and entities have developed relevant guidelines, ensuring ethical and responsible use of AI remains one of the commonly raised questions. There are several considerations when it comes to ethics, including safeguarding and respect for intellectual property, liability and attribution, data protection and terms of use. The need for human oversight and control is essential to overcome and mitigate any risk of biases and credibility. It is important to make audiences aware when AI based solutions are used in content creation, to maintain the trust and integrity which should never be compromised.

Since it is still a fast-developing area the above maybe further expanded in the future and the guideline will be treated as a living document with the possibility of revisions being published on an annual basis (or more frequent if necessary).

General Principles for the Use of AI in Broadcasting

1. **Data, Security and Sustainability**
    - Given AI's reliance on data, broadcasters adhere to stringent data privacy standards. Safeguarding user data and complying with regional and international data protection regulations is non-negotiable.
    - Regular audits of AI systems are necessary to ensure user data is not misused or vulnerable. This includes assessing data storage practices, access controls, and encryption methods.
    - Transparency with audiences about how their data is collected, used, and protected fosters trust and aligns with ethical practices.
    - Implement robust cybersecurity measures to protect against data breaches and unauthorised access.
    - Broadcasters consider the environmental impact of AI technologies, including energy consumption in training models and cloud services. Adopt sustainable practices to minimise carbon footprints.
    - Regularly assess and report on the environmental impact of AI operations to identify areas for improvement.

2. **AI for Diversity and Inclusion**
    - Broadcasters leverage AI to enhance diversity in content production and representation, ensuring content reflects the diversity of the audience.
    - Monitoring AI tools is essential to avoid exclusionary practices or biased outputs that could misrepresent groups.
    - Encourage the development of AI applications that promote inclusive storytelling and give voice to underrepresented communities.
    - Collaborate with diverse teams in the development and implementation of AI systems to mitigate unconscious biases.

3. **Ethics, Transparency and Accountability**
    - AI systems should operate transparently, providing clear explanations of their impact on content generation, recommendations, and editorial decisions. This transparency builds trust with audiences and stakeholders.
    - Maintaining accountability for AI-generated content is essential. Human oversight must be integrated throughout the workflow to prevent misinformation, manipulation, or bias introduced by AI.
    - Establish mechanisms to audit AI systems regularly, ensuring they adhere to ethical and professional standards.
    - AI tools should be developed and implemented with strong ethical guidelines, prioritising fairness, accuracy, and impartiality in news reporting and content creation and distribution.
    - Addressing and mitigating bias in AI systems is crucial. Algorithms should be tested and monitored to ensure they do not reinforce stereotypes or marginalise any group.
    - All content that is generated or substantially altered by AI should be clearly labelled at the time of broadcast to avoid misleading the audience and to ensure transparency in editorial practices.

4. **Human Oversight and Intervention**
    - AI systems should assist rather than replace human decision-making *at the final stage*. Content creators, editors, and journalists retain control over final outputs to ensure accuracy and integrity.
    - Protocols for human intervention should be established when AI-generated content does not meet editorial standards or ethical guidelines.
    - Training programs should be implemented to help staff effectively collaborate with AI tools, understanding both their capabilities and limitations.
    - Encourage a culture where employees feel empowered to question and override AI decisions when necessary.

Practical Use Cases and Best Practices for AI in Broadcasting

We recommend the following practices for member broadcasters

1. **Editorial Applications of AI**
    - Utilise AI tools to streamline content workflows, such as automated transcription, video summarisation, and content indexing. Human oversight is crucial to maintain editorial quality.
    - Implement AI-driven recommendation engines that promote diverse viewpoints, avoiding echo chambers and polarisation.
    - Consider AI for fact-checking and verification processes to support journalists in ensuring accuracy.
    - Use AI to analyse audience feedback and trends to inform editorial decisions.

2. **AI in Audience Analytics**
    - Employ AI to gain insights into audience preferences while maintaining transparency about data collection and usage.
    - Use analytics tools to enhance audience engagement through personalised content, without manipulating user preferences for commercial gain.
    - Respect user privacy by anonymising data and providing opt-out options for data collection when possible.

3. **Automated Content Creation and Distribution**
    - Apply AI in tasks like generating localised content, subtitling, or dubbing in multiple languages, ensuring cultural sensitivity and accuracy.
    - Implement AI-driven distribution to optimise content delivery across platforms, reaching diverse audiences effectively.
    - Stay vigilant about the potential for AI-generated deepfakes or misleading content, establishing safeguards to prevent their dissemination.
    - Experiment with AI-generated interactive content to engage audiences in new ways.

4. **Training and Capacity Building**
    - Invest in continuous training for staff on AI technologies, including algorithmic processes, data management, and ethical considerations.
    - Foster partnerships with AI research institutions to develop broadcasting-specific AI tools.
    - Encourage interdisciplinary collaboration within teams to bridge gaps between technical and editorial staff.
    - Provide resources and support for employees to stay updated on the latest AI developments relevant to broadcasting.

5. **AI in Emergency Broadcasting**
    - Enhance emergency warning systems with AI to ensure timely, accurate dissemination of critical information during crises.
    - Collaborate with governmental and international organisations to develop AI-enhanced systems for real-time emergency broadcasting.
    - Test and update these systems regularly to ensure reliability during actual emergencies.
    - Utilise AI to monitor and analyse real-time data from various sources to anticipate and respond to emerging crises.

6. **Cross-Industry Collaboration**
    - Encourage collaboration among broadcasters, AI developers, and regulatory bodies to establish common standards for AI usage in media.
    - Participate in industry forums and working groups to share best practices and stay updated on emerging trends.
    - Engage with policymakers to contribute to the development of regulations that balance innovation with public interest.

7. **Continuous Monitoring and Ethical Auditing**
    - Regularly monitor AI systems for compliance with ethical guidelines, data protection laws, and broadcasting standards.
    - Conduct periodic audits to identify potential risks or biases, taking corrective measures to align AI systems with organisational values and legal obligations.
    - Establish feedback mechanisms for audiences to report concerns related to AI-generated content.
    - Stay informed about advancements in AI ethics and adjust practices accordingly.

Conclusion

In embracing AI technologies, broadcasters are encouraged to adopt a proactive yet cautious approach. The ABU underscores the importance of responsible innovation, ethical AI practices, and preserving public trust. As AI continues to evolve, these guidelines will be revisited and updated to reflect new insights and developments, ensuring they remain relevant and effective. References and Further Readings.

1. **ISO/IEC TR 24028:2020 - Overview of Trustworthiness in Artificial Intelligence**
   Provides an overview of aspects related to the trustworthiness of AI systems. ISO/IEC TR 24028:2020

2. **IEEE P7000 Series - Standards for Ethically Aligned Design**
   A set of standards addressing ethical considerations in system design, including AI. IEEE P7000 Series

3. **UNESCO Recommendation on the Ethics of Artificial Intelligence (2021)**
   Provides a global normative framework for the ethical use of AI. UNESCO AI Ethics

4. **ISO/IEC 27001:2013 - Information Security Management Systems**
   Specifies requirements for establishing, implementing, maintaining, and continually improving an information security management system.ISO/IEC 27001:2013

5. **ISO/IEC TR 24027:2021 - Bias in AI Systems and AI Aided Decision Making** Discusses sources of bias in AI systems and methods to address them. ISO/IEC TR 24027:2021

6. **ITU-T X.1058 - Privacy Engineering Guidelines and Tools**
   Outlines best practices for ensuring privacy in the design and implementation of ICT systems. ITU-T X.1058

7. **ITU-T L.1470 - Greenhouse Gas Emissions of ICT Systems**
   Methodology for assessing the environmental impact of ICT systems, including AI. ITU-T L.1470

Doc T-25/7

Report on DISTRIBUTION TOPIC AREA

Topic Chairman : Hirokazu Kamoda (NHK)

Period of Report : October 2024 to August 2025

The Distribution Topic area comprises four projects, each addressing technological aspects of digital broadcasting. These projects undertake the study and investigation of digital terrestrial television broadcasting, digital satellite broadcasting, and digital sound broadcasting. This topic area encompasses research related to Integrated Broadcast-Broadband (IBB) and Over-the-Top (OTT) services.

1. Digital Terrestrial Television Broadcasting (D/DTTB)

1.1 Second-Generation Digital Terrestrial Television Broadcasting Systems
1.2 Terrestrial Multimedia Broadcasting Systems for Mobile Reception
1.3 Latest Topics on Next-Generation DTTB in Japan
1.4 Latest Topics on Next-Generation DTTB in Korea
1.5 Other Topics

See Annex 1 for the project report.

2. Integrated Broadcast-Broadband and OTT (D/IBBOTT)

2.1 Studies on Integrated Broadcast-Broadband Systems
2.2 Technological Trends on Video Streaming Services
2.3 Progress of ChinaDRM Technical Standards and Industrialization
2.4 Cybersecurity

See Annex 2 for the project report.

3. Satellite Broadcasting (D/SB)

3.1 ITU-R Documents Related to Satellite Broadcasting Systems
3.2 Latest Topics on Satellite Broadcasting in Japan

See Annex 3 for the project report.

4. Digital Sound Broadcasting Systems (D/DSBS)

4.1 Digital Sound Broadcasting Systems within Frequency Range 30-3000 MHz
4.2 Digital Sound Broadcasting Systems below 30 MHz
4.3 Recent Standardization Activities and Trends

See Annex 4 for the project report.

Annex 1

Digital Terrestrial Television Broadcasting (D/DTTB)

Project Manager: **Dr. Shingo Asakura** (NHK, Japan)
Co-project Manager: **Dr. Jeon Sungho** (KBS, Korea)

This Annex reports the current status of the next generation television broadcasting systems and the recent updates on relevant technologies and standardizations.

1.1 Second-Generation Digital Terrestrial Television Broadcasting Systems

1.1.1 Overview (Recommendation ITU-R BT.1877-3)

The evolution of digital terrestrial television broadcasting (DTTB) has reached a pivotal stage with the emergence of second-generation systems, designed to meet the growing demands for higher data capacity, improved spectral efficiency, and robust mobile reception. These systems—DVB-T2, ATSC 3.0, and DTMB-A—represent significant advancements over their first-generation predecessors, offering enhanced flexibility, performance, and service diversity.

DVB-T2

Developed primarily for Europe and other regions, DVB-T2 supports both fixed and mobile reception through two profiles: T2-Base and T2-Lite. It utilizes multiple Physical Layer Pipes (PLPs), allowing service-specific modulation and coding. DVB-T2 is highly configurable, supporting bandwidths from 1.7 MHz to 10 MHz, and is compatible with the GE06 spectrum planning agreement. It enables hierarchical transmission of SDTV, HDTV, and UHDTV, and is well-suited for Single Frequency Networks (SFNs) and mobile broadcasting scenarios.

ATSC 3.0

ATSC 3.0, developed by the Advanced Television Systems Committee, is a non-backward-compatible system designed for the U.S., Canada, Korea, and other regions. It integrates IP-based delivery, enabling interactive services, personalized content, and advanced emergency alerting. The system supports robust mobile reception and high-capacity fixed services, with layered architecture (Physical, Protocol, Application) that allows broadcasters to tailor configurations. ATSC 3.0 is also positioned to complement 5G ecosystems through hybrid broadcast-broadband integration.

DTMB-A

As an evolution of China's DTMB standard, DTMB-A enhances transmission robustness and efficiency. It supports a wide range of services including UHDTV, HDTV, SDTV, and multimedia data, across both fixed and mobile environments. DTMB-A employs advanced channel coding and modulation techniques, and is optimized for high-performance delivery in complex urban and rural terrains. It is also designed to support future extensions and flexible deployment strategies.

Common Features and Strategic Importance

All three systems leverage modern error correction (e.g., LDPC, BCH codes), OFDM modulation, and adaptive frame structures. They are engineered to withstand multipath interference, impulse noise, and varying reception conditions. Importantly, these systems enable broadcasters to deliver high-quality content to both fixed and mobile devices, supporting handheld services and portable reception—key for future media consumption trends.

As administrations and broadcasters consider upgrades or new deployments, the selection among these systems depends on regional spectrum policies, service goals, infrastructure readiness, and consumer needs. The Recommendation ITU-R BT.1877-3 provides detailed guidelines to help evaluate and select a specific system.

1.1.2 Recent Standardization Activities

ISDB-T3

Advanced ISDB-T (Integrated Services Digital Broadcasting - Terrestrial) is a next-generation digital terrestrial television broadcasting system developed to enhance transmission capacity, flexibility, and service diversity. Building upon the original ISDB-T standard widely used in Japan and parts of South America, Advanced ISDB-T introduces significant improvements in segment structure, modulation, error correction, and service adaptability [1]. Unlike ISDB-T's 13-segment structure, Advanced ISDB-T divides a channel into 35 segments, with 9 central segments forming a "partial reception band" for mobile services. This allows mobile receivers to access content efficiently while maintaining high-quality service for fixed reception. The Advanced IDSB-T has been standardized as ISDB-T3 in Japan (ARIB STD-B80) in March 2025. The drafting for the revision of Recommendation ITU-R BT.1877-3 to include ISDB-T3 is underway at WP 6A.

Reference:

[1] Hiroaki MIYASAKA, et al., "The Transmission Systems for Advanced Terrestrial Broadcasting," The Journal of IEICE, Vol.107, No.1, pp.48-54, 2024.

TV 3.0 (Brazil)

TV 3.0 is Brazil's next-generation digital terrestrial television system, designed to merge traditional broadcasting with the flexibility of digital streaming. It builds on the legacy of ISDB-T_B (TV 2.0) and introduces ultra-high-definition (4K/8K) video, immersive MPEG-H audio, and advanced interactivity. The system integrates Over-the-Air (OTA) and Over-the-Top (OTT) delivery using IP-based protocols and ROUTE/DASH transport layers. Key technologies include VVC and LCEVC video codecs for efficient bandwidth use, ATSC 3.0 for the physical layer, and support for HDR formats and VR/AR experiences [2].

Following extensive evaluations by the SBTVD Forum, the Brazilian government is finalizing the adoption of ATSC 3.0 as the physical layer standard. Pilot stations in São Paulo and Brasília will begin broadcasting in August 2025, with testing continuing through 2026. A prototype reference receiver is expected by August 2025, followed by commercial models in 2026 [3].

References:

[2] A. S. S. Chaubet, et al., "TV 3.0: an overview," IEEE Transactions on Broadcasting, Vol. 71, No. 1, Mar. 2025.

[3] https://forumsbtvd.org.br/tv3_0/

1.2 Terrestrial Multimedia Broadcasting Systems for Mobile Reception

Mobile reception using handheld devices requires specialized technical design due to unique propagation conditions and device constraints such as small antennas, limited screen size, low power consumption, and reduced processing capabilities.

1.2.1 User Requirements (Recommendation ITU-R BT.1833-5)

To ensure effective mobile multimedia broadcasting, the following user requirements are considered:

- Delivery of high-quality multimedia content (video, audio, data)
- Flexible configuration of diverse services (AV, auxiliary data)
- Content protection via conditional access and DRM
- Seamless access across different networks
- Fast channel acquisition and service switching
- Efficient power usage and compact device compatibility
- Stable and reliable reception in various environments
- Support for interactivity and return channel capabilities
- Efficient transport mechanisms
- Interoperability between broadcast and telecom networks (e.g., IP-based

services)

1.2.2 Technical Systems (Recommendation ITU-R BT.2016-4)

ITU-R BT.2016-4 defines multiple systems suitable for mobile reception via handheld devices in VHF/UHF bands. These systems include Systems A, F, H, I, T2, etc., and are characterized by the following technical components:

a. Modulation and Error Correction

- Modulation: QPSK, 16QAM, 64QAM, DQPSK, etc.
- Error correction: Convolutional codes, Turbo codes, LDPC + BCH
- Interleaving: Time and frequency interleaving for robustness

b. OFDM-Based Transmission

- Subcarrier configurations: 1k to 32k modes
- Guard intervals: Configurable from 1/128 to 1/4
- Symbol durations: Ranging from hundreds of microseconds to several milliseconds

c. Frame Structure and Synchronization

- Frame duration: Up to 250 ms, depending on system
- Synchronization: Pilot carriers, guard intervals, P1/P2 symbols

d. Data Rates

- Net data rates: Vary from hundreds of kbps to tens of Mbps depending on modulation, coding rate, and system configuration

Table 1-1: Representative systems

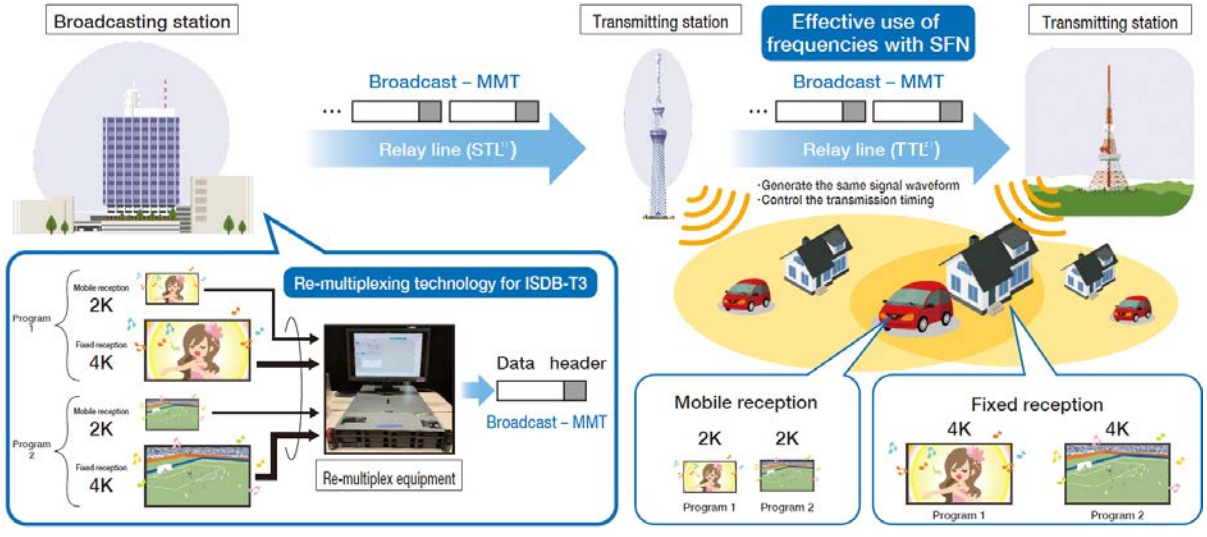
System	Standard / Origin	Modulation	Coding	Bandwidth	Max Data Rate	Key Features
A (T-DMB / AT-DMB)	Korea / DAB-based	DQPSK, BPSK/QPSK over DQPSK	Convolutional + Turbo	1.712 MHz	Up to 2.88 Mbps	Backward compatible with T-DMB
F (ISDB-T)	Japan	DQPSK, QPSK, 16QAM, 64QAM	Convolutional	6/7/8 MHz	Up to 2.38 Mbps per segment	Hierarchical transmission
I (DVB-SH)	Europe	QPSK, 16QAM	Turbo Code	1.7–8 MHz	Up to 17.26 Mbps	Satellite + terrestrial hybrid
H (DVB-H)	Europe	QPSK, 16QAM, 64QAM	Convolutional + MPE-FEC	5–8 MHz	Up to 23.82 Mbps	IP datacast, MPE-FEC
T2 (DVB-T2 Lite)	Europe	QPSK, 16QAM, 64QAM	LDPC + BCH	1.7–8 MHz	Up to 4 Mbps	Optimized for mobile

R (RAVIS)	Russia	QPSK, 16QAM, 64QAM	LDPC + BCH	100-250 kHz	Up to 900 kbps	Low Bitrate Channel and Reliable Data Channel apart from Main Service Channel
S (ATSC 3.0)	USA	QPSK to 4096-NUC	LDPC + BCH	6–8 MHz	Up to 77.2 Mbps	Bootstrap, LDM multiplexing, IP multicast
L (5G Broadcast)	3GPP / LTE	QPSK to 256QAM	Turbo	1.4–20 MHz	Up to 24.8 Mbps	Supports DASH, CMAF, HLS, IP-based services
N (5G NR MBS)	3GPP / NR	QPSK to 256QAM	Polar + LDPC	5–40 MHz	Up to 55.7 Mbps	Seamless unicast/broadcast switching
M (DTMB-A)	China	QSPK to 256APSK	LDPC + BCH	6–8 MHz	Up to 51.7 Mbps	Time-domain synchronous ODFM

1.3 Latest Topics on Next-Generation DTTB in Japan

1.3.1 Introduction

In March 2025, the transmission system for advanced digital terrestrial television broadcasting based on Integrated Services Digital Broadcasting for Terrestrial Television Broadcasting, 3rd generation (ISDB-T3) was standardized by the Association of Radio Industries and Businesses (ARIB) [4]. As well as the current ISDB-T system, ISDB-T3 provides a single-frequency network (SFN) that contributes to spectral efficiency. For the SFN construction, an IP-based re-multiplexing scheme for ISDB-T3 was developed as Broadcast - MPEG Media Transport (MMT) as a scheme.



1) Studio to Transmitter Link
2) Transmitter to Transmitter Link

Figure 1-1: Overview of re-multiplexing technology and SFN for ISDB-T3

Figure 1-1 shows an overview of re-multiplexing technology and the effective use of frequencies with the SFN for ISDB-T3. Multiple programs are multiplexed into a single packet stream on the basis of the Broadcast - MMT format. To construct an SFN, the Broadcast - MMT scheme enables multiple modulators to generate the same signal waveform. The Broadcast - MMT scheme and verification are briefly introduced in the report.

1.3.2 Process of Re-multiplexing Equipment and ISDB-T3 Modulator

Figure 1-2 shows the process of the re-multiplexing equipment in the broadcasting station and ISDB-T3 modulator in the transmitting station with the Broadcast - MMT scheme, which is the IP-based signal format. In the broadcasting station, each program including coded video, audio, and other data is input to the re-multiplex equipment through an MMT protocol (MMTP) packet over Ethernet. The length and bit rate of the MMTP packet are variable. In the re-multiplex equipment, each MMTP packet is arranged in an Orthogonal Frequency Division Multiplexing (OFDM) frame of frequency division multiplexing (FDM) or time division multiplexing (TDM), the length of which is constant. The control-information packet including Transmission and Multiplexing Configuration Control (TMCC) and transmission timing is added to the beginning of each frame. The output of the re-multiplex equipment, i.e., Broadcast – MMT, is transmitted to the ISDB-T3 modulator with a constant bit rate. In the transmitting station, the ISDB-T3 modulator configures the transmission parameters with the control information packet and generates an OFDM frame on the basis of the received Broadcast – MMT. The ISDB-T3 modulator also adjusts the transmission timing to construct an SFN.

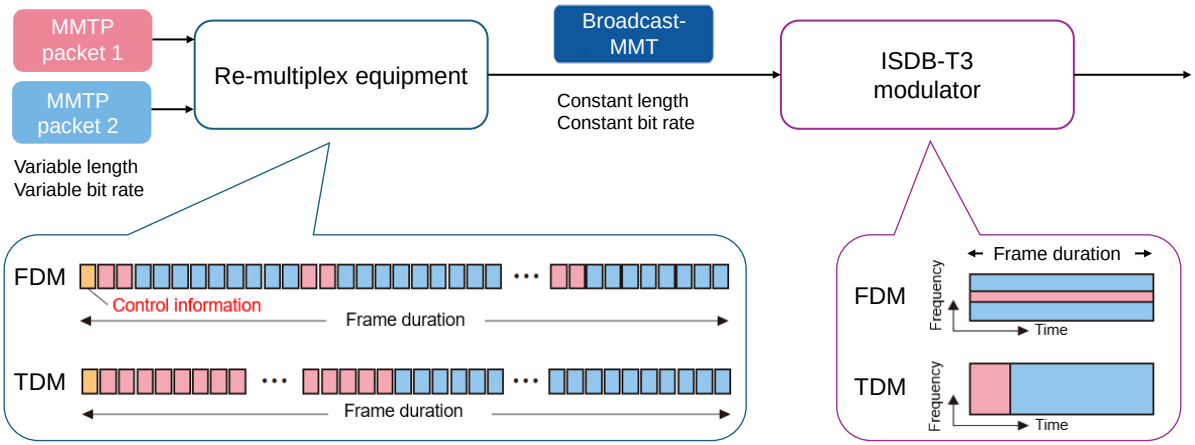


Figure 1-2: Process of re-multiplexing equipment and ISDB-T3 modulator

1.3.3 Verification

The Broadcast - MMT format was installed on the interface of the re-multiplex equipment and ISDB-T3 modulator, and the feasibility was verified through a laboratory test. Two 4K programs for fixed reception and two 2K programs for mobile reception were compressed using a VVC/MPEG-H encoder and input to the re-multiplex equipment. Assuming an SFN with two transmitters, the re-multiplex equipment and two modulators were connected by Ethernet. The transmission timing of modulator 2 was set to 10−μs delay compared with that of modulator 1. The output OFDM waveforms of both modulators in the intermediate-frequency band were combined, and it was confirmed by monitoring the delay profile that the transmission timing was set properly. The SFN signal was then received by the demodulator and two 4K and 2K programs were output to displays.

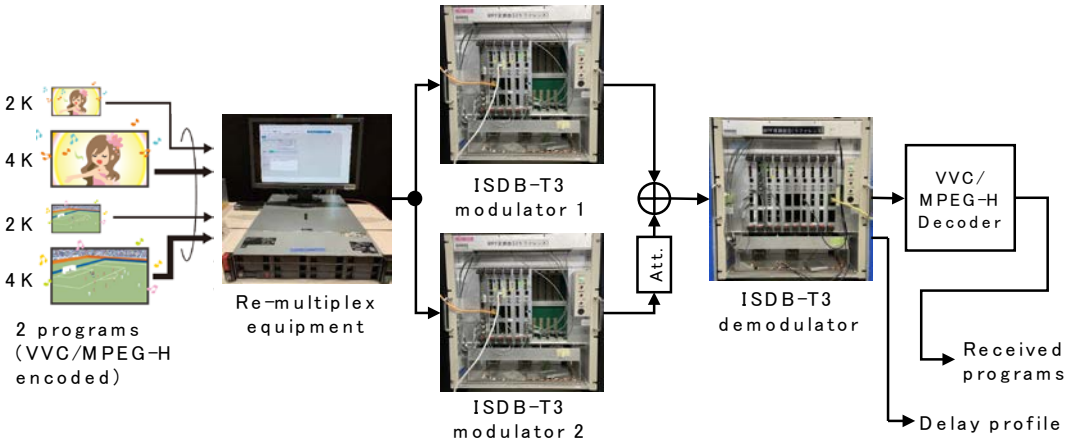


Figure 1-3: Block diagram of laboratory test

Program multiplexing and transmission technologies for next-generation terrestrial broadcasting with Broadcast - MMT was demonstrated at STRL Open House 2025 [5]. Figure 1-4 shows the exhibition booth. It was confirmed that the Broadcast - MMT enables the synchronization of multiple modulators and construction of an SFN.

1.3.4 Conclusion

NHK developed an IP-based re-multiplexing scheme from a broadcasting station to transmitting stations as the Broadcast – MMT scheme. The feasibility of SFN construction with the Broadcast – MMT was confirmed through a laboratory test with prototype equipment.

Figure 1-4: Demonstration of Broadcast - MMT

References:

[4] ARIB standard: “Transmission system for advanced digital terrestrial television broadcasting based on ISDB-T3,” ARIB STD-B80 ver.1.0, Mar. 2025.

[5] https://www.nhk.or.jp/strl/english/open2025/tenji/16/index.html

Acknowledgements:

Part of this research was conducted as part of the “Survey and Studies on Technical Conditions of Broadcasting Networks for Effective Use of Broadcasting Frequencies” for the Technical Examination Services Concerning Frequency Crowding of the Ministry of Internal Affairs and Communications.

1.4 Latest Topics on next-generation DTTB in Korea

1.4.1 Performance Comparison of Antenna Diversity for SFN Reception

1.4.1.1 Background

The rapid advancement of autonomous vehicle technologies has significantly increased the demand for reliable in-car entertainment services. Broadcast networks, particularly those utilizing the Advanced Television Systems Committee (ATSC) 3.0 standard, are crucial for delivering such services, as they perform effectively even

under weak signal conditions. Single Frequency Networks (SFNs), commonly used in mobile environments, enhance broadcast efficiency in challenging scenarios.

Previous research has predominantly focused on single-antenna systems, which are vulnerable to significant signal degradation. Utilizing multiple antennas for diversity reception has been shown to improve signal reliability. Traditional stick-type magnetic antennas, typically mounted on vehicle roofs, are functional but may be visually unappealing for consumer vehicles. This study compares the reception performance of more aesthetically appealing patch-type transparent antennas with conventional stick-type magnetic antennas in SFN environments through extensive field testing.

<Diversity receivers(Div Rx) and measurement equipment>


<Customized test vehicle>

Figure 1-5: Test vehicle setup for field test

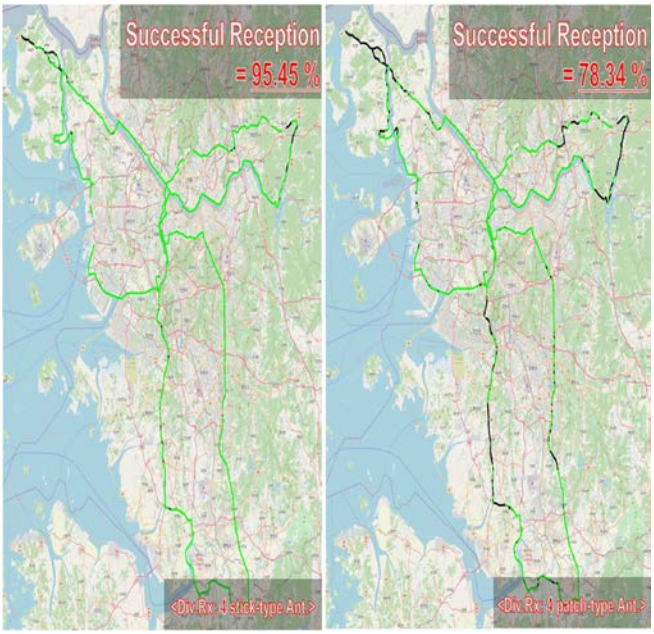


Figure 1-6: Test routes and reception success/failure with transparent-patch vs. stick antennas (Green: Successful decoding, Black: Decoding failure)

1.4.1.2 Field Test Setup

The test vehicle was equipped with both stick-type magnetic and patch-type transparent antennas (Figure 1-5). Four stick-type magnetic antennas (3 dBi gain, passive) were installed at the corners of the vehicle roof, while four patch-type transparent antennas (1.5 dBi gain, active with a 20 dB Low Noise Amplifier (LNA)) were mounted on the front and rear windshields. Two GPS-synchronized ATSC 3.0

diversity receivers, utilizing Maximal Ratio Combining (MRC), were used, one for each antenna type.

Table 1-2: Physical layer configuration for field trials

Center Frequency		768 MHz (Channel 56)	
Preamble Parameters	FFT Size	8k	
	Guard Interval	1536 (222 us)	
	Pilot Pattern	SP_Dx = 4	
	L1-Basic	Mode 1	
	L1-Detail	Mode 1	
		Subframe 0 (PLP-0)	Subframe 1 (PLP-1)
Payload Parameters	FFT Size	8k	32k
	Guard Interval	1536 (222 us)	1536 (222 us)
	# of Payload Symbols	46	32
	Pilot Pattern	SP_Dx = 4, SP_Dy = 2	SP_Dx = 8, SP_Dy = 2
	Frequency Interleaver	On	On
	Time Interleaver	CTI depth of 512	CTI depth of 1024
	FEC Type	BCH + 16K LDPC	BCH + 64K LDPC
	Code Rate	6/15	9/15
	Modulation Order	64-NUC	256-NUC
	Data Rate	2.82 Mbps	17.09 Mbps
	Required CNR (AWGN)	9.29 dB	16.82 dB

1.4.1.3 Field Test Results

Field tests were conducted near the Korean Broadcast System (KBS) Channel 56 in South Korea, focusing on mobile reception with a physical layer pipe (PLP)-0 configuration. The 450 km route included areas with challenging reception conditions.

The reception success rates were as follows:

- Stick-type magnetic antennas: 95.45%
- Patch-type transparent antennas: 78.34%

Despite the lower success rate, the patch-type antennas provided acceptable reception for mobile environments, balancing performance with aesthetic considerations.

Factors influencing the reception rates include:

- Installation Location:
- Roof-mounted stick-type antennas minimized signal blockage.
- Windshield-mounted patch-type antennas were more susceptible to signal reflections and absorption.
- External vs. Internal Environment:
- External stick-type antennas received signals omni-directionally without interference from vehicle components.
- Internal patch-type antennas faced interference due to the vehicle's glass and metal components.

Patch-type transparent antennas offer durability and aesthetic advantages, making them particularly suitable for high-end vehicles where appearance is a key consideration.

1.4.2 Field Verification of ATSC 3.0 Channel Bonding

1.4.2.1 Background

The growing demand for high-quality video and data services has led to significant advancements in broadcast systems. ATSC 3.0's channel bonding and Multiple-Input Multiple-Output (MIMO) technologies address spectrum limitations and increase

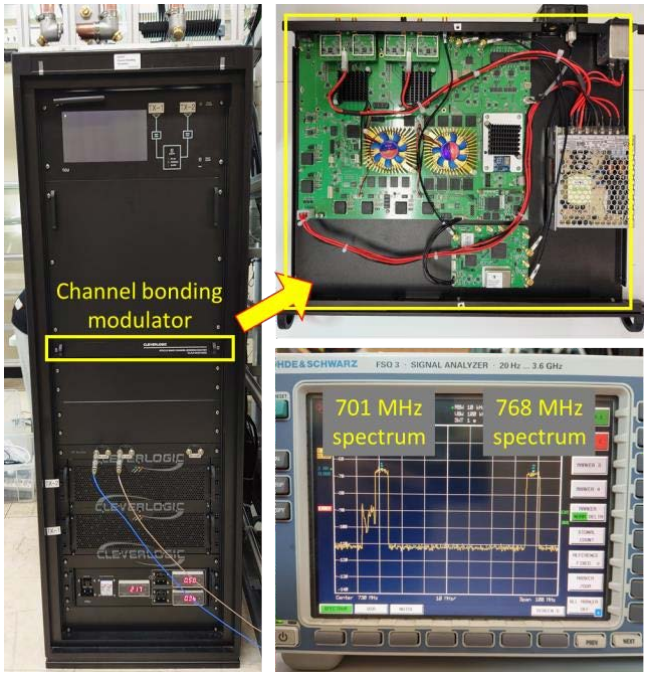


Figure 1-7: The implemented channel bonding transmitter and modulator and the received signal spectrum measured at the transmission site.

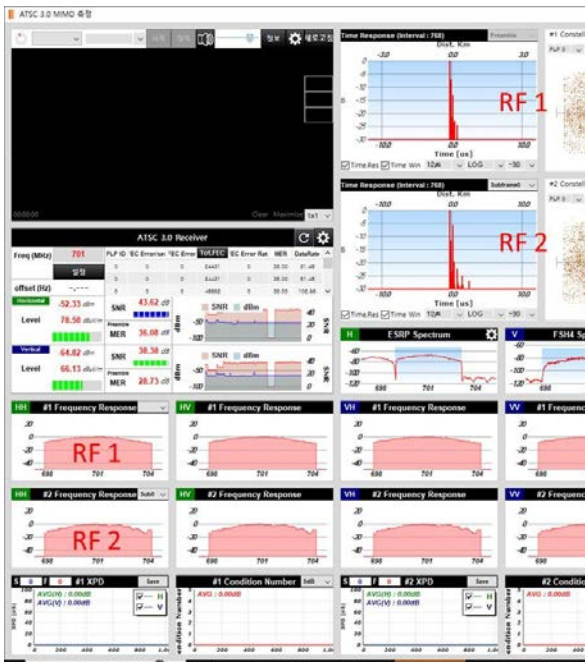


Figure 1-8: The screenshot of the measurement software for the channel bonding field verification.

system capacity. Channel bonding combines two RF channels, with plain and SNR-averaged modes offering distinct benefits. This study evaluates the performance of these modes in a real-world environment using FPGA-based systems.

1.4.2.2 Implementation and Field Verification

Real-world tests were conducted at the KBS Gyeonggi Gamak experimental transmission site, using a system fully compliant with ATSC 3.0 (A/322) and utilizing two 6 MHz RF channels at 701 MHz and 768 MHz. The test assessed the performance of plain and SNR-averaged channel bonding for the delivery of 8K UHD content at approximately 100 Mbps.

The results indicated that SNR-averaged channel bonding outperformed plain bonding, particularly when one channel experienced signal loss. SNR-averaged channel bonding efficiently utilized the stronger channel, ensuring reliable performance under adverse conditions.

Table 1-3: Physical layer configuration for field trials

Parameters	Configuration 1	Configuration 2
FFT Size	32k	16k
Guard Interval	GI4_768 (111.111 us)	GI4_768 (111.111 us)
Pilot Pattern	SP16_2	SP8_2
Time Interleaver	CTI (1024)	CTI (1024)
Outer Code	BCH	BCH
Inner Code	LDPC (64800) 12/15	LDPC (64800) 4/15
Constellation	4096 NUC	QPSK
Data rate	102.9 Mbps	5.37 Mbps
Required SNR	30.7 dB	-2.63 dB

1.4.2.3 Features and Applications

SNR-averaged channel bonding provides improved reception reliability by leveraging frequency diversity. However, it requires synchronization between RF channels and identical physical layer parameters across both channels. This mode is particularly suitable for delivering 8K-UHD content and for emergency broadcasts, where service reliability is most important.

Plain channel bonding, on the other hand, offers greater flexibility in resource allocation and is backward-compatible with legacy receivers. It is suitable for dynamic scheduling and the efficient distribution of resources in varying conditions.

Table 1-4: Measurement data for each measurement point and channel bonding modes

Point No.	Modes	Plain Channel Bonding		SNR averaged Channel Bonding	
	RF #	RF 1	RF 2	RF 1	RF 2
1 (LP) for Config.1	ACI [dBm]	-84.59	-87.04	-84.59	-87.04
	RSS [dBm]	-40.14	-47.1	-40.03	-49.7
	ToV [dB]	41.94	34.89	39.91	30.65
	mRSS [dBm]	-58.22	-65.28	-63.29	-70.65
2 (LP) for Config.1	ACI [dBm]	-97.44	-97.36	-97.44	-97.36
	RSS [dBm]	-55.24	-57.44	-54.59	-57.85
	ToV [dB]	35.31	33.21	34.76	31.92
	mRSS [dBm]	-64.25	-66.24	-67.13	-69.65
2 (Omni) for Config.1	ACI [dBm]	-93.72	-95.83	-93.72	-95.83
	RSS [dBm]	-43.3	-55.66	-43.59	-56.24
	ToV [dB]	Fail	Fail	47.49	35.18
	mRSS [dBm]	Fail	Fail	-52.33	-64.82
3 (LP) for Config.1	ACI [dBm]	-99.99	-99.99	-99.99	-99.99
	RSS [dBm]	-35.08	-37.82	-35.38	-38.98
	ToV [dB]	34.48	32.66	36.9	31.34
	mRSS [dBm]	-60.89	-63.71	-64.49	-67.87
4 (Omni) for Config. 2	ACI [dBm]	-95.25	-94.78	-95.25	-94.78
	RSS [dBm]	-46.34	-59.37	-48.08	-64.08
	ToV [dB]	15.64	0.87	11.41	-5.17
	mRSS [dBm]	-86.47	-95.94	<-100	<-100

1.4.3 Conclusion

Antenna diversity and channel bonding significantly enhance the reception and capacity of ATSC 3.0 broadcasts. Patch-type transparent antennas offer a balance between performance and aesthetics, making them a suitable choice for consumer vehicles. SNR-averaged channel bonding delivers superior performance in fluctuating signal conditions, ensuring reliable, high-quality service delivery.

1.5 Other Topics

1.5.1 Latest Activities at ITU-R

1.5.1.1 DTT Planning (Report ITU-R BT.2485)

MISO technology that can reduce transmission degradation in single frequency networks is being discussed at WP 6A meetings. The revised report (Report ITU-R BT.2485) is being drafted.

1.5.1.2 Multimedia Mobile Broadcasting (Report ITU-R BT.2526)

WP 6A meeting had been drafting the revised report for Report ITU-R BT.2526 to outline how to plan for LTE-based 5G broadcast. Field experiment results of 5G NR MBS conducted in Wuhan, China had also been added to the revision. The revision was approved at Study Group 6 in March 2025.

1.5.1.3 UHDTV Field Transmission Experiment (Report ITU-R BT.2343)

WP 6A meeting had been drafting the revision of Report ITU-R BT.2343 (Collection of field trials of UHDTV over DTTB networks) regarding the information on the verification of an ATSC 3.0 and 1.0 integrated MATV system in Korea and the 4K terrestrial transmission experiment with Brazilian TV 3.0 Project. The draft revision was approved at Study Group 6 in March 2025.

Annex 2

Integrated Broadcast-Broadband and OTT (D/IBBOTT)

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Mr. Wang Lei (ABS, China)

This annex describes recent updates on Integrated Broadcast-Broadband (IBB) and Over-the-Top (OTT) standards and related technologies. It also covers recent updates on standards and technologies of content protection and cybersecurity in broadcasting industry.

2.1 Studies on Integrated Broadcast-Broadband Systems

2.1.1 Studies in ITU-R

ITU-R Working Party 6B (WP 6B) is conducting studies on IBB systems. The working party has been studying harmonization of IBB systems by comparing Hybridcast (Japan), HbbTV2.0 (Europe), TOPSmedia (South Korea) and Ginga (Brazil). It is also studying the system architecture of a global platform for broadcasting to enable interoperability between broadcast and broadband. Additionally, WP 6B addresses content provenance to ensure authenticity and traceability of media content.

At its meeting held in April 2019 in Geneva, the WP 6B developed a comparison of the application life-cycles and application transition among the IBB systems, and revised Report ITU-R BT.2267 “Integrated broadcast-broadband systems” to add a new part on the harmonization of applications among different IBB systems. Harmonizing the IBB systems and ensuring compatibility of applications and interoperability between systems is essential for enabling the exchange and deployment of services across regions using different IBB systems.

At the same meeting, WP 6B revised Report ITU-R BT.2342 to replace information on TTML Text and Image Profiles for Internet Media Subtitles and Captions 1.0 (IMSC1.0) with the updated IMSC1.1. It also updated the list of EBU specifications pertinent to the content of the Report.

At its meeting held in July 2019 in Geneva, WP 6B revised Report ITU-R BT.2267 to add a companion application that enables the execution of IBB applications on receivers. The working party also developed new use cases of IBB systems, where object-based sound services are provided via MPEG-DASH streams.

WP 6B also developed the “global platform”. The working party revised Report ITU-R BT.2400 “Usage scenarios, requirements and technical elements of a global platform for the broadcasting service” to add the specific reference to the ATSC 3.0 standard and some examples to show its Internet Protocol-based capabilities to integrate broadcast and broadband services. New digital terrestrial transmission standards such as ATSC 3.0 system can help effectuate a converged broadcast and broadband platform, which is an important aspect of a global platform for broadcasting services.

At its meeting held in October 2020, WP 6B revised Recommendation ITU-R BT.2075 “Integrated broadcast-broadband system” to update the application execution mechanism of Hybridcast, which introduced a feature that allows a companion device to send a command to a receiver to tune to a designated channel and launch a Hybridcast application.

At its meeting held in March 2021, WP 6B prepared a revised draft report of Recommendation BT.2075 by adding information regarding commonality among IBB systems and equivalency of their functions as described in Report BT.2267 Part 3. The working party also prepared a draft revision to report BT.2267 on IBB systems to align with Recommendation ITU-T J.208 on harmonization of applications between IBB systems.

At its meeting held in September 2022, WP 6B revised Recommendation ITU-R BT.2075 “Integrated broadcast-broadband system” and Report ITU-R BT.2267 “Integrated broadcast-broadband systems” to add a Broadcast-independent managed application, which is an application that can be launched when broadcast services are not selected but is still authenticated by broadcasters.

At its meeting held in May 2023, WP 6B:

- revised Recommendation ITU-R BT.2075-5 “Integrated broadcast-broadband system” to add broadcast-independent managed applications.

At its meeting held in March 2025, WP 6B:

- prepared a preliminary draft new Report BT[GP] “High-level system architecture for content delivery and reception on a global platform for broadcasting” to describe the overall architecture and functional blocks of a global broadcasting platform.
- prepared a preliminary draft revision of Report ITU-R BT.2400-4 “Usage scenarios, requirements and technical elements of a global platform for the broadcasting service” to update usage scenarios and technical requirements.
- prepared a preliminary draft new Report ITU-R BT.[APPBASEDTV] “Application-oriented television broadcasting” to describe frameworks and requirements for application-driven TV services.

- prepared a working document towards a preliminary draft new Report ITU-R BT.[PROVENANCE] “Content provenance for programme production, international exchange and distribution of content” to address methods for ensuring authenticity and traceability of media content.

2.1.2 Studies in ITU-T

ITU-T Study Group 9 (SG9) is also conducting studies on IBB system applied to Cable Digital TV. At its meeting held in November 2018 in Bogota, Colombia, the Study Group started to revise IBB system Recommendation (Recommendation ITU-T J.207 “Specification for integrated broadcast and broadband digital television application control framework”) to add the function of device collaboration with companion devices in Hybridcast. Recommendation ITU-T J.207 is a twin of IBB system Recommendations in ITU; Recommendation ITU-R BT.2075 is another twin on this topic. Therefore, the Study Group continues to revise the Recommendation ITU-T J.207 in line with the revision of Recommendation ITU-R BT.2075. The Study Group is studying smart TV operating systems for hybrid cable Digital TV services including IBB DTV services provided by cable television operators and third-party providers. At the Bogota meeting, the Study Group made progress the work on the architecture of smart TV operating system. The Study Group consented to the Recommendation of “The functional requirements of smart TV operating system” as Recommendation ITU-T J.1201.

At the meeting held in June 2019 in Geneve, the SG9 consented to Recommendation ITU-T J.207 to add the function of device collaboration in Hybridcast. The Study Group also made progress the work of drafting new Recommendation “Harmonization of Integrated Broadcast-Broadband DTV application control framework”. As for the smart TV operating system, the Study Group consented to the Recommendation of “The architecture of smart TV operating system” as Recommendation ITU-T J.1202. In addition, the Study Group has begun developing a new Recommendation for the specification of smart TV operating systems.

At the meeting held in November 2023,SG9 reached the AAP consent for the draft new Recommendation ITU-T J.1206. It has been approved and is now part of the set of already approved Recommendations as follows:

- J.1201: Functional requirements of a smart TV operating system
- J.1202: The architecture of a smart TV operating system
- J.1203: The specification of a smart TV operating system
- J.1204: The security framework of a smart TV operating system
- J.1205: The hardware abstract layer application programming interface of a smart TV operating system

- J.1206: The application programming interface of a smart TV operating system

SG9 also consented to new Recommendation ITU-T J.208 "Harmonization of Integrated Broadcast-Broadband DTV application control framework" at its November 2020 meeting. The recommendation was created based on Report ITU-R BT.2067 which defined the methods to harmonize IBB systems by identifying commonalities across the IBB systems.

At its meeting held in October 2024, SG9 approved new Recommendation ITU-T J.1207 “Smart television operating system – Conformance test” to specify conformance testing for smart TV operating systems based on J.1201 to J.1206.

A new Study Group 21 (SG21) was established in WTSA-24 (October 2024) as a consolidation of SG9 and SG16. SG21 is responsible for studies previously covered by SG9, including integrated broadcast-broadband systems and smart television operating systems.

2.1.3 Standardization of Integrated Broadcast-Broadband System in Japan

IPTV Forum Japan standardizes the specifications of Hybridcast in Japan. The technical specification of Hybridcast is composed of two technical standards and one operational guideline, as listed below. These latest versions were published in January 2022.

- IPTVFJ STD-0010 ‘Integrated Broadcast-Broadband System Specification’, version 2.4
- IPTVFJ STD-0011 ‘HTML5 Browser Specification’, version 2.7
- IPTVFJ STD-0013 ‘Hybridcast Operational Guideline’, version 2.10

In the November 2020 revision, several new features were added to the Hybridcast technical specifications. Major updates were as follows:

- Addition of the new application type named “Broadcast-independent managed application”
  An application of this type runs in the state that no broadcast channel is being tuned so that service providers can offer application services regardless of their broadcasting area.
- Enhancement to the streaming video playback function
  The CMAF[*1] is added as a supported container format of streaming video, including low-latency playback features. Support for stream event delivery mechanisms such as an ‘event message’ (emsg) box and an ‘Event’ XML element of MPEG DASH[*2] are also added.
- Enhancement to the companion device function

UHDTV broadcasting services, i.e. 4K and 8K satellite broadcasting in Japan, are added to the available channels for tuning from a companion device.

- Addition of the three-dimensional audio codec support
  The enhanced AC-3[*3] is added to the available audio codecs for video streaming.

*1 ISO/IEC 23000-19 “Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media”.

*2 ISO/IEC 23009-1 “Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats”.

*3 ETSI TS 102 366 “Digital Audio Compression (AC-3, Enhanced AC-3) Standard”.

In the January 2022 revision, several features related to discontinued VOD services were removed from the Hybridcast technical specifications.

2.2 Technological Trends on Video Streaming Services

When video streaming over the Internet first began around 1998, the mainstream approach was push-type delivery from dedicated servers to viewing devices using video delivery protocols such as Microsoft Media Server Protocol (MMSP), Real Time Streaming Protocol (RTSP), and Real Time Messaging Protocol (RTMP). Around 2006, a shift to HTTP streaming, a pull-type approach, began, instead of using these video delivery protocols. HTTP streaming uses the Hypertext Transfer Protocol (HTTP), the same protocol used to deliver text and images that make up web pages. This approach not only eliminates the need for dedicated video delivery servers, but also allows for the use of Content Delivery Networks (CDNs), which are used to speed up and scale websites. This approach enabled lower-cost, larger-scale delivery than traditional video streaming systems. Furthermore, around 2008, a new approach called HTTP adaptive streaming began to be used, which dynamically adjusts video quality based on network congestion, ensuring stable delivery. Today, the most popular international standards are MPEG-DASH (MPEG Dynamic Adaptive Streaming over HTTP) and HLS (HTTP Live Streaming) developed by Apple Inc. The emergence of these technologies has led to the explosive growth of today's video streaming services.

However, these methods also have their drawbacks, the most significant of which is increased latency. While UDP (User Datagram Protocol)-based delivery methods such as RTSP were capable of delivering content with a latency of approximately one second, when the transition to HTTP adaptive streaming was first made, latency of several tens of seconds was commonplace. Even today, typical "real-time" streaming services typically experience latency of 10 seconds or more. While some argue that this is not a concern because the same video is not viewed simultaneously on different media platforms, such as television and the Internet, it is not uncommon for viewers to find out the results of a sports game online before they see it, due to cheers from a neighbor or a social media post. This could be said to lead to a loss of communication opportunities between users watching on different media platforms. Furthermore, as we strive to deliver reliable information to all audiences using a variety of transmission paths, reducing latency, in addition to ensuring video and audio quality, is an extremely important issue.

Meanwhile, on the internet, dis/misinformation such as fake news are spreading on social media, becoming a social problem. In particular, during national elections and large-scale natural disasters, a large amount of content containing false and misleading information is distributed, forcing users to discern true information from the vast amount of information available online. Furthermore, generative AI can easily be used to create fake videos impersonating broadcasters. Since the internet is open and anyone can become a source of information, it is difficult to identify the source, making it important to ensure the reliability of content broadcasters publish.

This report outlines the latest trends in technologies for stabilizing and reducing latency in video streaming and ensuring the reliability of content, as technological elements needed to realize a video streaming service that reliably delivers information as reliable as broadcasting.

(This section is based on the article published in NHK STRL R&D No.200 in 2025, available at https://www.nhk.or.jp/strl/publica/rd/200/3.html (in Japanese))

2.2.1 Stabilizing and Reducing Latency in Video Streaming

This section discusses technological trends related to stabilizing and reducing latency in video streaming. First, an overview is provided of the currently mainstream MPEG-DASH and HLS, including explanations of the causes of latency and methods for its mitigation. Trends in adaptive bitrate control technology, which is important for stabilizing viewing, are also introduced. In addition, push-based low-latency

distribution methods, which are expected to further reduce latency, are discussed, along with trends in video player technology.

2.2.1.1 Overview of MPEG-DASH and HLS

MPEG-DASH and HLS are conceptually similar. They consist of video files called "segments," which are encoded video files divided into several-second chunks, and a "manifest file," a metadata file containing information necessary for streaming playback, such as video encoding parameters (e.g., encoding method and bitrate) and segment information (e.g., segment division unit and URL). Figure 2-1 shows an overview of adaptive streaming. Video service providers generate multiple videos of different qualities (resolution and bitrate) from a single video source, divide them into segments at time intervals, and generate a manifest containing information about all the videos. These files are provided to a web server. The viewing device first obtains the manifest from the web server and understands the segment structure (Figure 2-1(1)). It then selects and receives segments of a quality appropriate for the internet traffic and viewing environment (e.g., the device's screen resolution) (Figure 2-1(2)), and then splices and plays them back in the order in which they were split (Figure 2-1(3)). Repeating this process allows for uninterrupted viewing, even under constantly changing internet congestion conditions.

MPEG-DASH commonly uses the ISO Base Media File Format (ISO-BMFF) (also known as the MP4 format) for its segments. Initially, HLS only used the MPEG-2 Transport Stream (TS format), but in 2016, it added support for MP4. Furthermore, the Common Media Application Format (CMAF) was standardized in 2018, based on MP4, to standardize segment formats and reduce latency. Currently, CMAF can be used with both MPEG-DASH and HLS. CTA-WAVE, an industry group dedicated to improving the interoperability of video streaming services, specifies encoding and segmentation methods for CMAF to ensure interoperability between MPEG-DASH and HLS. However, in actual streaming environments, HLS still often uses the TS format to ensure compatibility with older operating systems. The manifest for MPEG-DASH is in an XML (Extensible Markup Language) format called MPD (Media Presentation Description), while for HLS it is in a text format called m3u8. Although the two formats are not compatible, they can describe similar information in many cases.

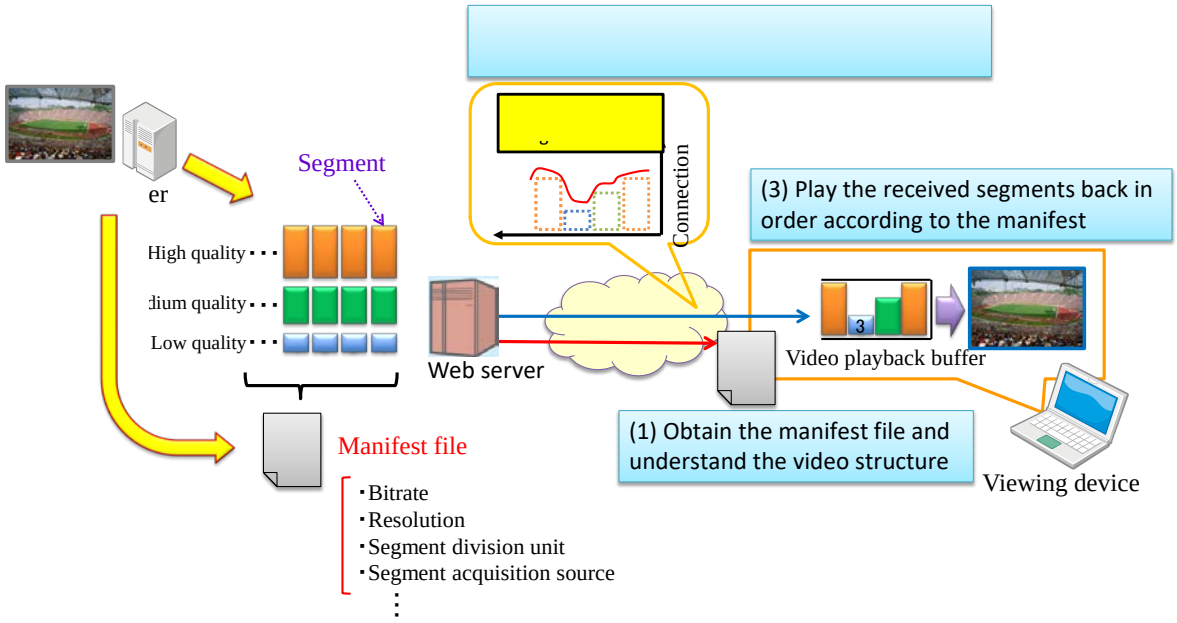


Figure 2-1: Overview of the adaptive streaming operation

2.2.1.2 Causes of Delays and How to Deal with Them - CMAF, HTTP Chunk Transmission, Fetch –

The causes of delays and methods for improving them are explained by dividing the components of live streaming shown in Figure 2-2 into three stages: (1) stream generation, (2) transmission/relay, and (3) reception.

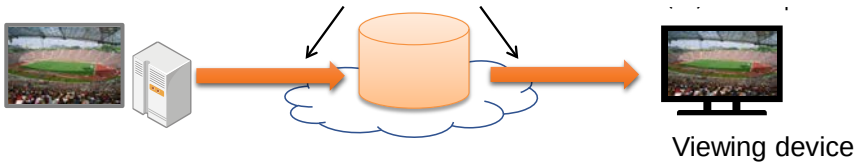


Figure 2-2: Live streaming components

(1) Stream generation

As shown in Figure 2-3, the MP4 format used for segments has a format called a Box structure, which concatenates the "data size, data type, and data" from the beginning. Therefore, the "size" at the beginning of the Box is not determined until the data is completely created, and transmission is not possible. This is the root cause

of delays, and the larger the data, the longer the waiting time. In other words, delays can be reduced by reducing the "data." Figure 2-4 shows two methods for reducing the size of data.

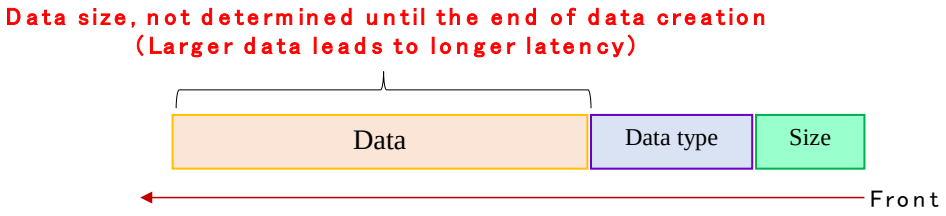


Figure 2-3: Basic MP4 format

Figure 2-4(1) shows a method for finely dividing the segment file itself. For example, dividing a 6-second segment into three 2-second files can reduce latency by one-third. However, because segments are generally composed of GOPs (Group of Pictures), the GOP size must also be reduced. Reducing the GOP size leads to a degradation of image quality, so a practical minimum is approximately 0.5 seconds, the same as in broadcasting. Furthermore, the increased number of segment files increases the number of HTTP requests from viewing devices, which can increase the load on the CDN and lead to reduced viewing stability. Figure 2-4(2) shows a method for finely dividing the contents of segment files. CMAF was standardized with this type of operation in mind. While segment files are still composed of GOPs, the data can be handled in a format called "CMAF chunks," which divides the GOPs into smaller units, such as frames. This allows transmission of CMAF chunks without waiting for the entire segment file to be completed, potentially reducing the delay in live stream generation to the level of a few frames. Furthermore, because the number of segment files remains the same, a decrease in viewing stability due to an increase in the number of requests from viewing devices can be avoided.

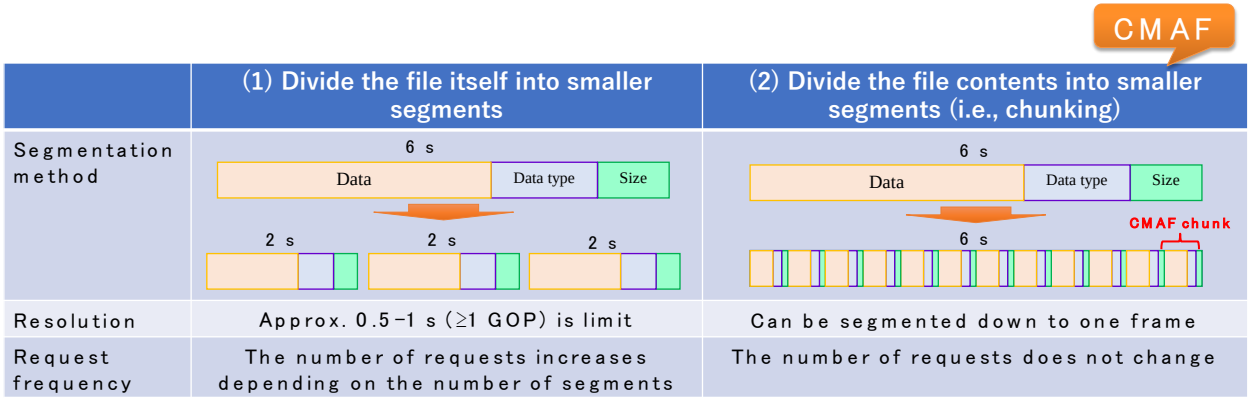


Figure 2-4: Comparison different data segmentation methods

(2) Transmission / relay

The HTTP data structure consists of an HTTP header, which is metadata, and a message body, which corresponds to the data to be transmitted. Normally, the HTTP header specifies the overall "size" of the data, as shown in Figure 2-5(1). Therefore, even if the data is divided into CMAF chunks, it cannot be transmitted until the entire segment is complete. To address this, the HTTP chunk transmission method (CTE: Chunked Transfer Encoding) is used, which sets the HTTP header parameter Transfer-Encoding to "chunked" (Figure 2-5(2)). This method allows for multiple transmissions of "chunks" consisting of "size" and "data" in a single chunk, even after an HTTP connection is established. This method is highly compatible with CMAF chunk-based transmission. By transmitting HTTP chunks consistently from the encoder to the CDN and viewing device, this method enables delivery with the lowest possible latency.

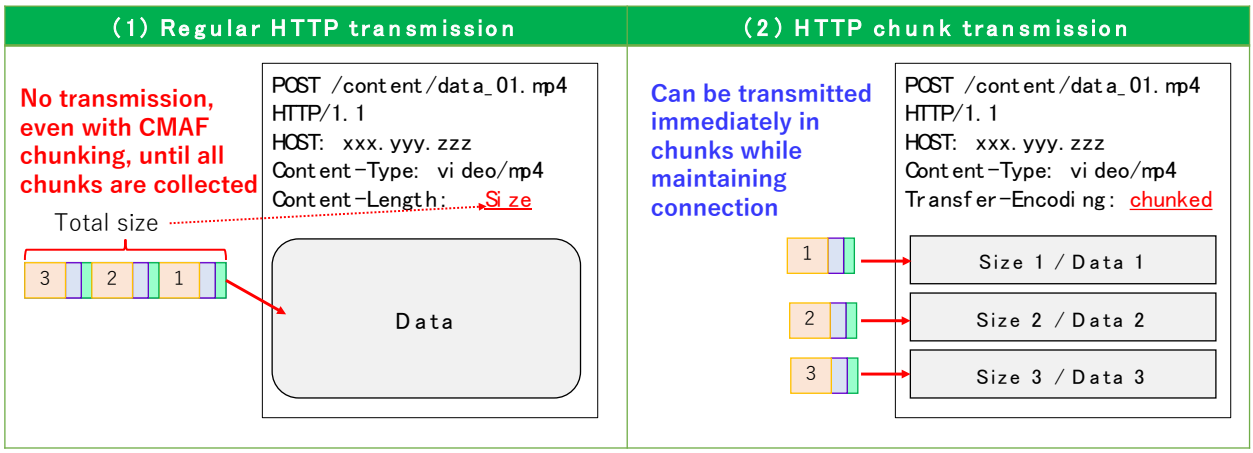


Figure 2-5: Comparison between HTTP transmission and relay methods

(3) Reception

The XMLHTTPRequest API (Application Programming Interface), which has long been used for HTTP communication in JavaScript that constitutes web applications, is designed to not process received data until the entire file has been received. As a result, even if data is transmitted one chunk at a time, as shown in Figure 2-6(1), data cannot be input into the receive buffer until the entire segment file has arrived. In contrast, the Fetch API, which was introduced around 2015, is designed to process data in smaller increments, allowing data to be input into the buffer sequentially by CMAF chunk, as shown in Figure 2-6(2). This not only shortens the wait time before playback begins, but also eliminates unnecessary wait time and allows data to be continuously input into the buffer. This eliminates the need to store unnecessary segments in the buffer in case of buffer depletion, thereby further reducing latency.

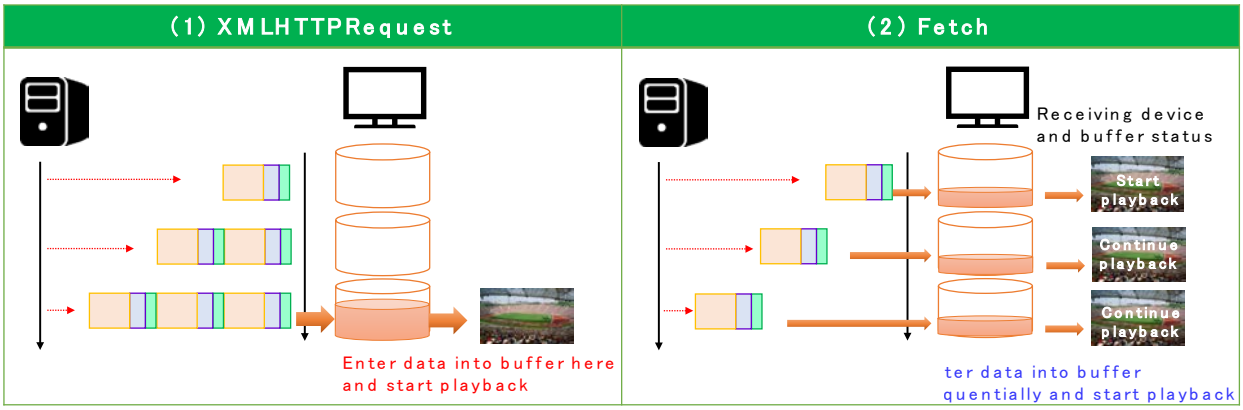


Figure 2-6: Comparison between the HTTP communication API and the receiving device buffer status

The combination of these three elements is called CMAF-ULL (Ultra Low Latency) and can be used with MPEG-DASH and the community-based HLS implementation, called LHLS. With standard streaming, segments are accessible only once they are fully created on the server. However, servers that support CMAF-ULL also allow access to segments while they are being created. The manifest is identical to standard streaming, except for a statement that allows access to the URLs of segments being created. The frequency of manifest updates is unaffected by the number of CMAF chunks. This allows for low latency depending on the granularity of the CMAF chunks. Viewing devices that do not support CMAF-ULL can still receive the stream as if it were a standard stream.

Meanwhile, Apple has developed a low-latency specification for HLS called LLHLS (Low Latency HLS). With this method, in addition to the URLs for segments, the manifest also contains the URLs for each CMAF chunk, and viewing devices must make individual HTTP requests for each CMAF chunk in order to receive the content with low latency. Since the number of CMAF chunks increases, the number of manifest updates and viewing device requests increases, meaning that chunking cannot be performed as finely as with CMAF-ULL. However, this method enables low-latency delivery even on servers that do not support CMAF-ULL, and by making requests on a segment-by-segment basis, viewing devices that do not support LLHLS can receive the content as normal HLS.

CMAF-ULL has been used in a service that delivers video from different angles to smartphones and PCs with the same latency as broadcast, enabling users to view broadcast and online video in tandem. NHK STRL is experimentally applying it to a cloud-based linear distribution system. This system is capable of delivering 4K video end-to-end, from encoding to viewing device, with a latency of about 2 seconds,

making it a transmission method with sufficient low latency to be used for simultaneous distribution between broadcast and the Internet.

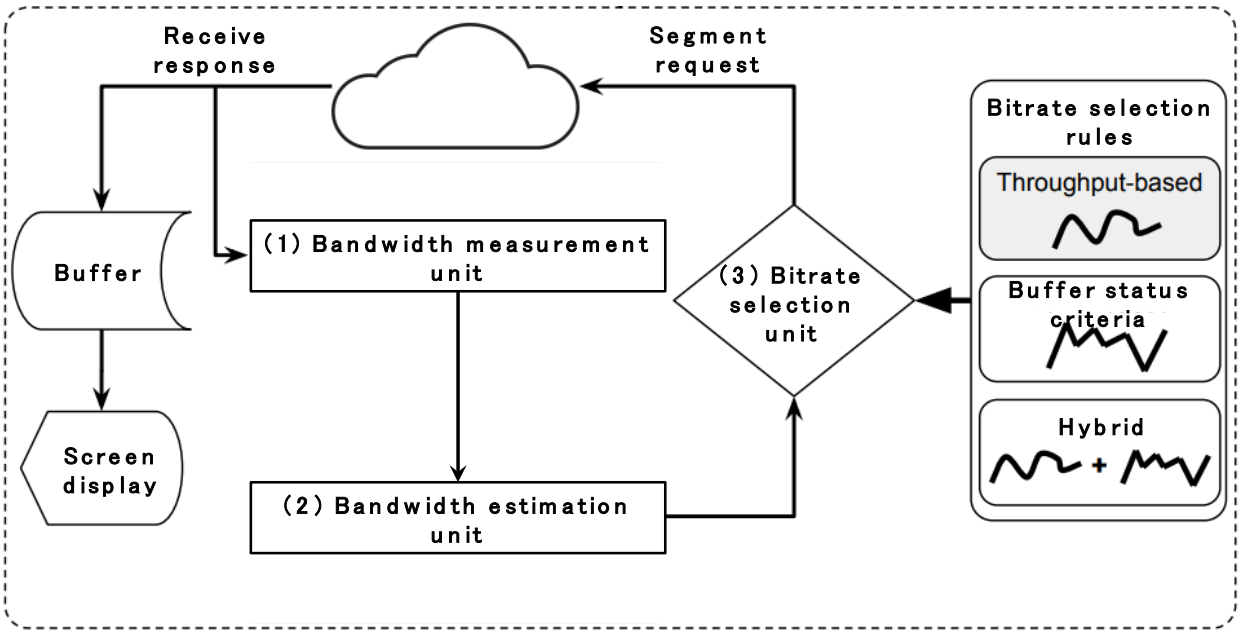
2.2.1.3 Adaptive Bitrate Control Technology

Adaptive bitrate (ABR) control technology is an extremely important feature that determines video quality and the smoothness of interruptions on viewing devices. The reason viewing devices require large buffers is because, due to factors such as network congestion, there is no guarantee that segments will arrive on time. For example, if six seconds pass while receiving a six-second segment, it is difficult to decide whether to wait a little longer until the segment is complete or to give up and cancel the current segment and request a new segment with a lower bitrate for the same time slot. Therefore, the current practice is to start playback with several segments buffered, thereby improving stability at the expense of low latency. This often occurs because segments with a higher bitrate are requested than the available network bandwidth is available. Conversely, as long as the available network bandwidth is properly understood and segments with a lower bitrate are received, segment arrival times will be stable and viewing will be uninterrupted, allowing for minimal buffering. In other words, improved stability and low latency are synonymous.

Various ABR control technologies have been proposed. As shown in Figure 2-7, their basic configuration consists of a bandwidth measurement unit (Figure 2-7(1)) that measures the currently available network bandwidth; a bandwidth estimation unit (Figure 2-7(2)) that uses the bandwidth measurement results to predict the available network bandwidth for the next request; and a bitrate selection unit (Figure 2-7(3)) that determines which bitrate to request from the estimated bandwidth among the multiple bitrates offered as ABR. When watching pre-recorded videos such as VoD (Video on Demand), the Transmission Control Protocol (TCP) maximizes the available bandwidth when receiving segments. Therefore, available bandwidth can be calculated relatively easily from the relationship between the "data volume" of a segment and the "time from the start of reception to arrival." However, the situation is different for low-latency live streaming. For example, it takes six seconds to encode a six-second segment, so it also takes six seconds to receive it. When bandwidth is estimated using the same method as VoD, if the encoding bitrate is 6 Mbps, the available bandwidth will be calculated as 6 Mbps, and if it is 0.5 Mbps, it will be calculated as 0.5 Mbps. Therefore, an ARB control algorithm for low-latency live streaming, which differs from VoD, is needed, and various proposals have been made. Based on the method shown in Figure 2-7 (1) and (2), which measures bandwidth while taking into account the short latency between chunks in segment transmission, thereby improving the accuracy of bandwidth measurement and bandwidth prediction

compared to segment-level measurement, another method has been proposed, shown in Figure 2-7(3), which introduces a neural network-based algorithm based on bandwidth measurements, delay, buffer size, and QoE (Quality of Experience) values, and controls buffer size by controlling playback speed. Furthermore, a method has been proposed that selects bitrates using online convex optimization based on delay and buffer size without explicitly measuring or estimating bandwidth. These algorithms have been incorporated into the open-source MPEG-DASH player dash.js and HLS player hls.js for evaluation, and the evaluation environment has been made public.

As another approach, given the difficulty of accurately grasping network conditions on viewing devices, discussions have begun at the Internet Engineering Task Force (IETF), which promotes the standardization of Internet technologies, on how to securely notify viewing devices of network conditions. Various studies are expected to continue in the future to provide a comfortable viewing experience.



（Source) https://doi.org/10.1145/3304112.3325611

Figure 2-7: Basic ABR control configuration

2.2.1.4 Push-based Low-latency Delivery Method: WebRTC, Media over QUIC

WebRTC

Web Real-Time Communication (WebRTC), which enables real-time video and audio communication between web browsers, is an effective technology for reducing latency. The IETF has standardized the communication protocol, and the World Wide

Web Consortium (W3C), a web standards organization, has standardized the web browser API. It enables transmission with a latency of just a few hundred milliseconds and has been widely used in web conferencing tools such as Zoom, Microsoft Teams, and Google Meet in recent years. NHK STRL has also developed a system that enables interactive viewing of 360-degree streaming content on television. It processes video in response to user input in a cloud renderer and transmits the content to the television with low latency using WebRTC. While this system was previously considered unsuitable for large-scale distribution due to its inability to utilize a standard CDN, it has been demonstrated to reach tens of thousands of users by connecting multiple servers using a Selective Forwarding Unit (SFU) function to relay media streams. On the other hand, because the implementation of the web browsers used as viewing devices is specialized for real-time two-way communication, issues arise that depend on the implementation, such as the phenomenon of skipping immediately when there is a delay. Stability issues have also been pointed out, such as the difficulty of controlling the quality of presentation to the user when used for video viewing, which is one-way communication.

QUIC

Additionally, progress is being made in standardizing communication protocols utilizing QUIC (Quick UDP Internet Connections), which combines low latency and reliability by incorporating a TCP-like control mechanism into UDP, which is fast but does not guarantee data delivery. QUIC speeds connection establishment, encrypts communications using Transport Layer Security (TLS), and prevents head-of-line blocking (HoL), a phenomenon in which missing IP packets in TCP prevent subsequent data from being processed even if it arrives. To incorporate these advantages into HTTP, the IETF standardized HTTP/3, the third major version of HTTP, which replaces TCP with QUIC as the transport layer, in 2022. Similarly, the IETF and W3C are working on standardizing WebTransport, which is based on HTTP/3 and enables low-latency bidirectional communication, with the aim of leveraging the benefits of QUIC for WebSocket, a standard for bidirectional communication between web browsers and servers.

NHK STRL low-latency delivery technology using WebTransport

NHK STRL is developing a low-latency delivery technology that combines push-based delivery using WebTransport with server-side delivery quality control. Figure 2-8 shows the experimental system configuration. In this system, a live encoder converts video streams of multiple qualities into CMAF chunks on a frame-by-frame basis and transmits them to an origin server in the cloud using CTE. The origin server immediately relays the received CMAF chunks to the streaming server connected to

the viewing device, which then pushes them to the viewing device using WebTransport, achieving low-latency delivery. By incorporating the origin server's relay function into a Pub/Sub messaging model, which can dynamically increase or decrease the number of data destinations, a configuration has been created that allows the number of streaming servers to be increased or decreased depending on the scale of delivery. Another unique feature of this system is that, unlike the method using application layer parameters described in Section 2.2.1.3, they attempt to improve estimation accuracy by using QUIC layer communication parameters for network bandwidth estimation in server-side quality control. This method estimates the available transmission bandwidth based on QUIC congestion control information when transmitting key frames, which contain the largest amount of information within a video GOP, and selects and distributes the video stream with the highest quality below the estimated value, thereby achieving stable, high-quality distribution. Using the configuration shown in Figure 2-8, they conducted a distribution experiment by setting the receive buffer time of Device 1 to 300 ms and periodically applying bandwidth restrictions to the network. As shown in Figure 2-9, they confirmed that the delay from the camera video to the viewing screen was approximately 400 ms. Furthermore, as shown in Figure 2-10, they confirmed that the bandwidth estimate calculated by the server was close to the bandwidth restriction value, and that the distribution quality could be controlled to the maximum quality that did not exceed the bandwidth estimate.

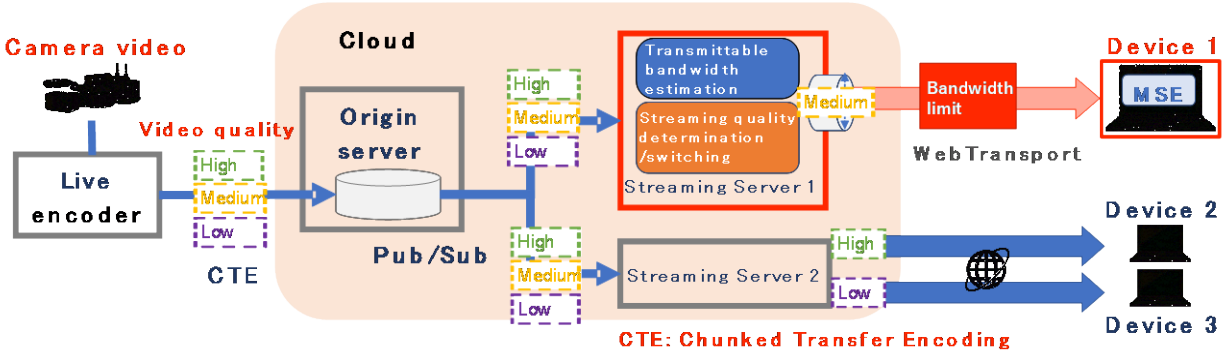


Figure 2-8: Configuration of the low-latency streaming system (NHK STRL)

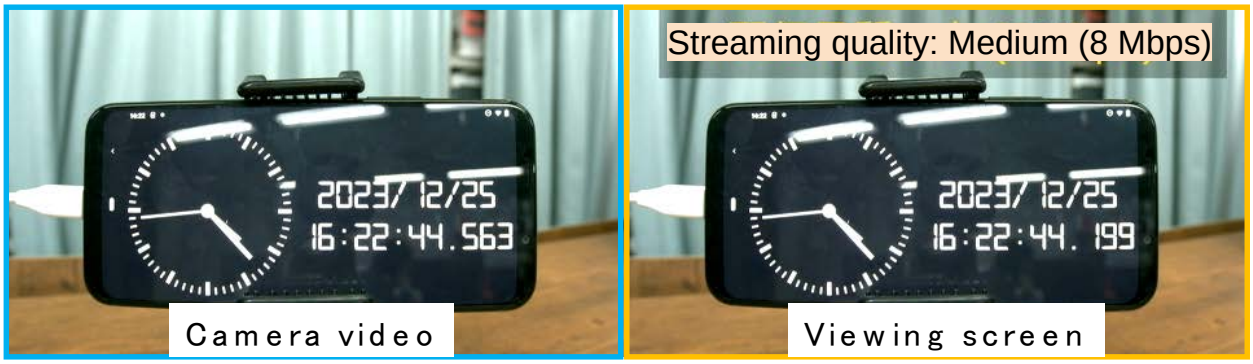


Figure 2-9: Camera video and viewing screen (NHK STRL)

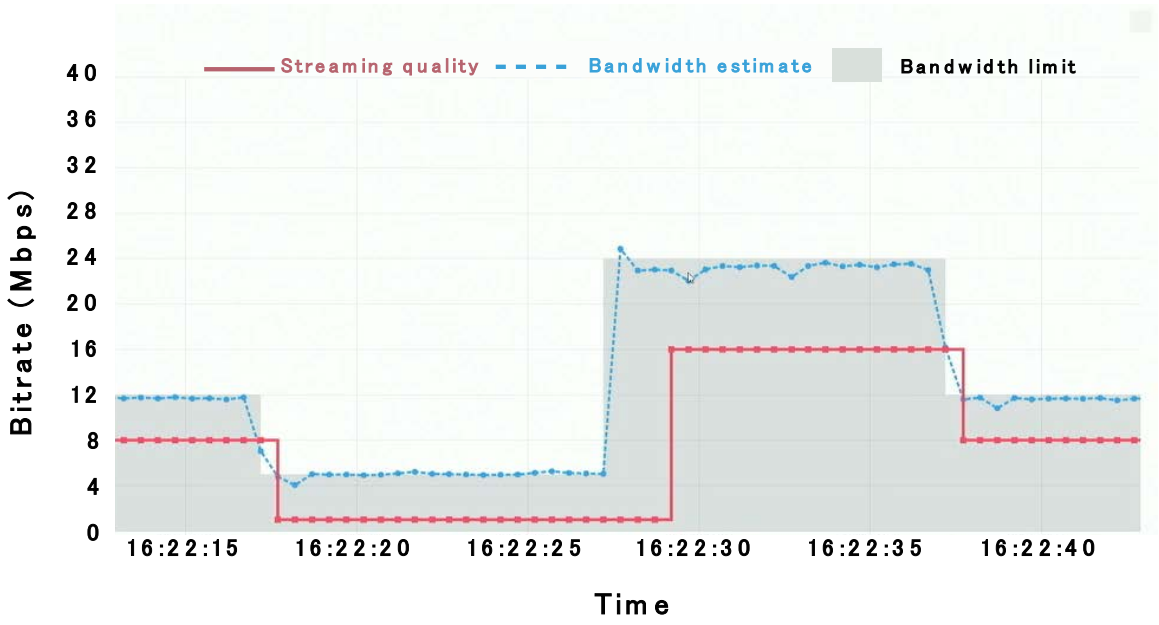


Figure 2-10: Bandwidth estimate and delivery quality trends with time (NHK STRL)

Media over QUIC

Another notable trend is the progress in standardizing MOQ (Media over QUIC), a low-latency media distribution method for use cases such as live streaming, online games, and conferences. It utilizes QUIC for all flows, from uploading live video (Figure 2-11(1)), relaying between servers (Figure 2-11(2)), and distribution to devices (Figure 2-11(3)). MOQ is based on QUIC-based protocol proposals such as RUSH, a live video uploading method by Facebook (Meta), Warp, a low-latency live streaming method by Twitch, and QUICR, a data relay method between devices and servers by Cisco. Figure 2-12 shows the protocol stack. Currently, two separate drafts are underway: MOQT (Media over QUIC Transport), which defines media transport methods over QUIC and WebTransport, and WARP Streaming Format, which defines

streaming formats. Open-source implementation and testing are also underway. Video players will be developed using MSE (Media Source Extensions), a video playback control API also used in MPEG-DASH and HLS, and WebCodecs, an API capable of processing video frame-by-frame, currently being standardized by the W3C. However, features such as user presentation quality control will need to be designed, developed, and incorporated by the service provider. Open-source implementations incorporating these features are likely to emerge in the future. It will be interesting to see which will become the mainstream for media distribution: WebRTC, which has a 10-year track record despite its limited implementation flexibility, or MOQ, which has promising future developments.

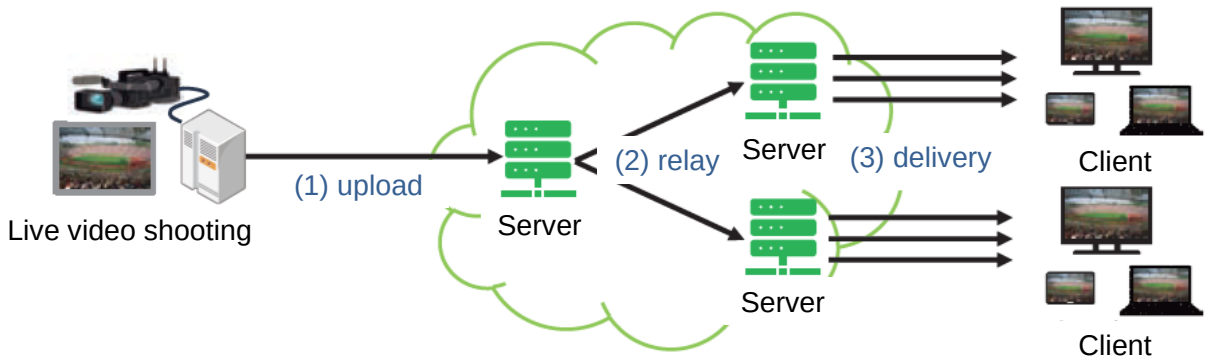
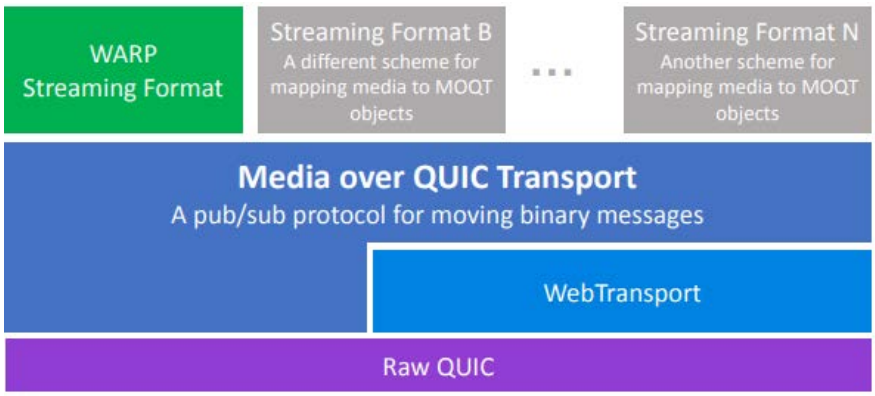


Figure 2-11: Components of Media-over-QUIC-based media delivery



（Source）https://datatracker.ietf.org/meeting/interim-2023-moq-08/materials/slides-interim-2023-moq-08-sessa-warp-streaming-format-00

Figure 2-12: Media over QUIC protocol stack

2.2.1.5 Video Player Technology - Media Source Extensions / Managed Media Source -

This section introduces trends in video playback technology for web browsers. Currently, most video streaming sites use MSE, a playback control API that began standardization at the W3C in 2013. MSE allows service providers to develop video players as web apps, potentially enabling a common viewing environment across a variety of devices, including PCs, smartphones, and TVs. However, among major devices, only the iPhone lacks MSE and instead implements a proprietary player via a web browser, preventing a common viewing environment. Apple cites high power consumption as the primary reason for not incorporating MSE. As this situation persisted, Apple announced a new API, Managed Media Source (MMS), in June 2023, which improves upon MSE. It claims to reduce power consumption by improving the network and memory control mechanisms in MSE and is available in iOS 17.2 and later. Although the two APIs have different names, their usage is similar, making it possible to make existing MSE-compatible video players compatible with MMS with only minor modifications. This has finally made it possible to create a common viewing environment that includes the iPhone (Figure 2-13). MMS has now been proposed to the Working Group that is considering the next version of MSE, and active discussions are underway toward standardization.

Figure 2-13: Overall structure of a video player that can be used across multiple devices using MSE/MMS

Until now, iPhones only supported HLS, but MMS has enabled support for a variety of video distribution formats, including MPEG-DASH. In fact, NHK STRL has confirmed that MPEG-DASH video playback on iPhones can be performed by adapting basjoo.js, their open-source MPEG-DASH video player, to MMS. They are also developing and testing a technology that inserts trigger signals (Media Timed Events: MTEs) into video streams at any timing and sends push notifications to viewing devices to instantly display emergency information. Utilizing MMS on iPhones will enable the testing of such technologies in the same way as on other devices, and it is expected to enable the proactive adoption of new technologies related to video viewing control.

2.2.2 Ensuring the Reliability of Content

In the information space on the Internet, inaccurate or false information (fake news) can be intentionally or unintentionally disseminated. In particular, using generative AI, anyone can easily create fake videos impersonating broadcasters. Advances in generative AI technology have improved the quality of fake videos year by year, making it easy for anyone to create high-quality fake videos impersonating broadcasters. This has made it difficult to distinguish between accurate information provided by broadcasters and false information. As a result, users are spreading fake videos on social media, believing them to be true. While it is easy to identify the sender of a message using traditional broadcasting services over radio waves, the Internet is an open world where anyone can become a sender, making it difficult to identify the sender. For this reason, ensuring the reliability of content has become a key issue for Internet services provided by broadcasters. This section explains “content provenance technology”, one means of solving this problem.

2.2.2.1 Content Provenance Technology

Content provenance technology, which embeds provenance information (such as the source and production process) into content and presents it to users, began to be considered around 2018. For broadcasters and other content providers, this information serves as proof of their origin, allowing users to determine the reliability of the content. For provenance information to be effective in combating disinformation and misinformation, widespread adoption of provenance information attachment technology is required, and provenance information must be attached to a wide range of content circulating online. To address this issue, the Coalition for Content Provenance and Authenticity (C2PA), an international standards organization for content origin and authenticity, was established with the aim of formulating and disseminating common technical specifications for content provenance technology, and the technical specifications have been made public. As shown in Figure 2-14, in C2PA, content creators attach provenance information and digital signatures to content at each stage of the process, such as capturing, editing, and publishing. Users can verify the digital signatures to check for tampering with the content and provenance information, and determine the authenticity of the content based on the provenance information and signer information.

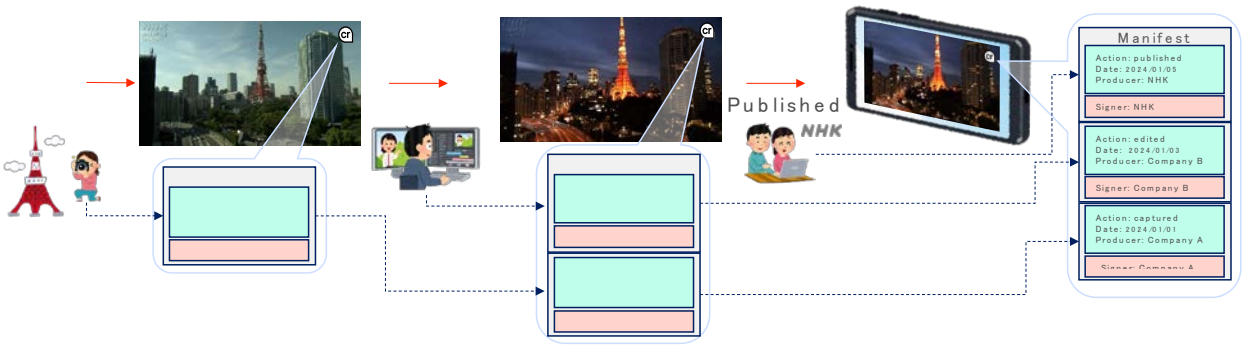


Figure 2-14: Flow of attaching and presenting provenance information

2.2.2.2 Overview of C2PA

C2PA is an international standards organization established in February 2021 by Adobe, Microsoft, the BBC, and others to develop standards for content origin and authenticity. Two organizations served as the foundation for C2PA's founding. The first was the Content Authenticity Initiative (CAI), established by Adobe, Twitter, and others. The aim was to develop tools that display content origin (creator), editing history, copyright, and other attribution information throughout the content's lifecycle, from capturing to viewing, thereby providing users with information to assess its authenticity. Currently, CAI are developing tools based on the C2PA standard and providing open-source software to promote the adoption of C2PA standard technology. The other is Project Origin, established by the BBC, Microsoft, and others. The aim is to eliminate disinformation and misinformation on social media by verifying the origin (sender) of news content and ensuring that the content has not been altered from its origin to viewing. These efforts were integrated and C2PA was established as one of the standardization projects of the Joint Development Foundation, an umbrella organization of The Linux Foundation. Its participants include many domestic and international companies involved in content production and distribution, such as broadcasters, camera manufacturers, and IT companies, all of which are interested in providing reliable information over the Internet. C2PA develops technical specifications based on the requirements and use cases established by CAI and Project Origin, and these three organizations have a close relationship.

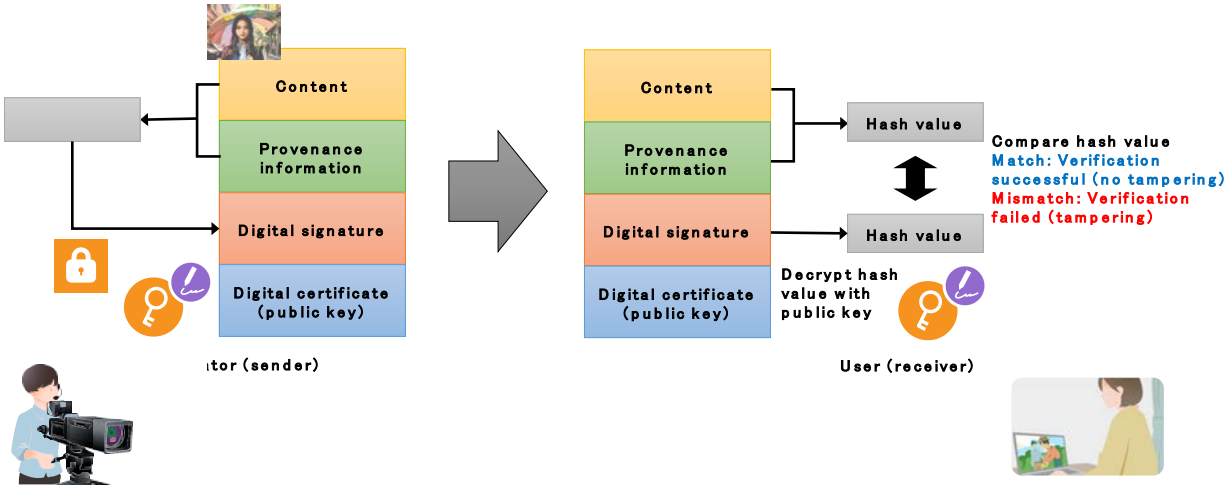


Figure 2-15: Procedure for attaching and verifying provenance information using a digital signature

The C2PA technical specifications stipulate methods for attaching, verifying, and presenting provenance information. Digital signatures are used to embed metadata into the content in a tamper-resistant format, that records who performed actions on the content, such as capturing, editing, and publishing, and when. When new actions are performed on content with provenance information, newly generated provenance information can be added, providing the user with provenance information showing the entire process of the content until it reaches the user. The provenance information includes the public key certificate used to generate the digital signature, allowing users to detect tampering with the content and provenance information by verifying the signature with the public key included in the certificate (Figure 2-15). The C2PA specification ensures that the content and provenance information have not been tampered with and that the person or organization that attached the provenance is genuine (no impersonation or other fraudulent activity) by verifying the digital signature. However, the presence or absence of provenance information does not determine the reliability of the content itself or the trustworthiness of the person or organization that attached the provenance; users must make their own judgment.

2.2.2.3 C2PA Research and Development Examples

To implement the C2PA system, each hardware or software of content producers, distributors and users viewing the content must be C2PA-compatible. Sony Corporation is developing a mirrorless single-lens camera that complies with the C2PA standard. This camera adds signed provenance information to still images in real time as they are captured, and the provenance information can be verified and displayed on a verification website provided by Sony. While this currently only supports still images, support for video is expected in the future. Adobe is developing Premiere Pro, a video editing software that complies with C2PA. When video content

is edited using this software, provenance information indicating the editing process is added to the content. Furthermore, content edited using the generative AI tool “Adobe Firefly” is also added with provenance information indicating the use of generative AI. In this way, an environment is being established in which C2PA provenance information can be added to content at each stage of the content production workflow, including capturing and editing. Meanwhile, it is also important to establish an environment in which provenance information can be verified and displayed when users view content with provenance information. To identify issues in the entire ecosystem and each element based on C2PA, and to investigate and verify the important factors for users to actually determine the trustworthiness of content, NHK STRL developed a prototype system that attaches C2PA-compliant provenance information to streaming video content, as well as a prototype video player that verifies and presents provenance information in real time while the content is playing. For the provenance information attachment system, they implemented a function to add provenance information to streaming video content in MPEG-DASH format using a Rust library published by CAI. For the video player, they incorporated a provenance information verification function into their MPEG-DASH video player, basjoo.js, using a JavaScript library published by CAI. They also added a process to present the verification results to the user. For the user presentation process, they incorporated the following four functions to provide easy-to-understand information on factors for determining the trustworthiness of content. This player can be run on both PCs and smart TVs.

- Visual indication of the presence or absence of provenance information

When playing content with provenance information, the official C2PA icon, the cr icon, is displayed in the upper right corner of the screen to indicate to the user that provenance information is available (Figure 2-16(a)). When playing content without provenance information, the cr icon is not displayed, allowing the user to see at a glance that the content does not have provenance information.

- Display of verification results using the seek bar

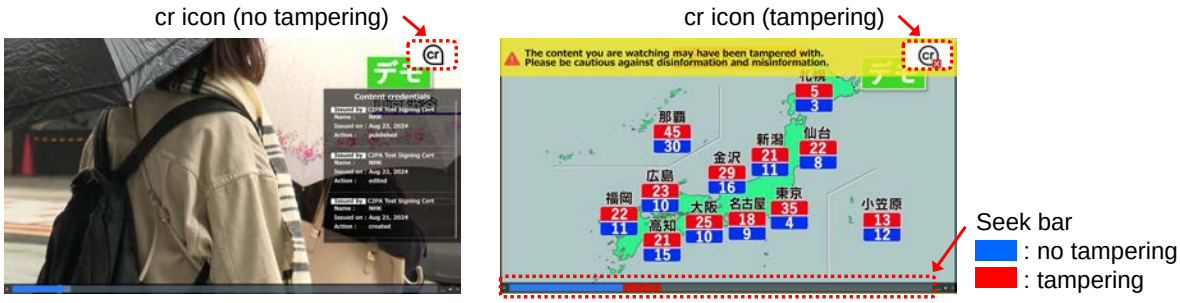
The verification results for whether the video content has been tampered with can be confirmed on the seek bar (Figure 2-16(b)). The prototype player is capable of detecting tampering for each MPEG-DASH segment and presents the verification results to the user in an easy-to-understand manner by displaying segments that were successfully verified in blue, segments where tampering was detected in red, and unplayed segments in gray. In addition, the player also has a function that notifies the user of the tampering in advance when it loads a tampered segment, even before playback, allowing the user to remain calm and take appropriate action.

- Providing provenance information

Upon user request (by clicking the CR icon or pressing a button on the remote control), the provenance information of the currently playing content can be presented (Figure 2-16(a)). By actually checking the provenance information that has been successfully verified, the source and production process of the content can be understood, and this can be used as information to determine the reliability of the content.

- Detecting and alerting to tampering

If segment tampering is detected, the user will be notified using text and the CR icon (Figure 2-16(b)). If the content being played has been tampered with, the user will be notified that the information may be fake or incorrect, which can encourage them to watch the content carefully or stop watching.



(a) CR icon and provenance information (b) Seek bar and warning

Figure 2-16: Example of a C2PA-compliant video-player screen

2.3 Progress of ChinaDRM Technical Standards and Industrialization

2.3.1 Standardization Status of ChinaDRM Technology

To promote high-security-level copyright protection for audiovisual content, the National Radio and Television Administration of China has issued a digital rights management standard system for audiovisual content distribution, releasing six industry standards. These standards cover multiple aspects including technical requirements, system integration, testing methods, and compliance testing, providing comprehensive technical support for digital rights management in audiovisual content distribution. The published standards are as follows.

- GY/T 277-2019 Technical specification of digital rights management for video audio content distribution

- GY/T 333-2020 Digital rights management for video audio content distribution— Digital rights management system integration for digital cable television
- GY/T 334-2020 Digital rights management of video audio content distribution— Digital rights management system integration for OTT TV
- GY/T 246-2020 Digital rights management for video audio content distribution— Digital rights management system integration for IPTV
- GY/T 335-2020 Digital rights management for video audio content distribution— Standard compliance test
- GY/T 336-2020 Digital rights management of video audio content distribution— System compliant requirements

On the basis of the aforementioned standards, to guide industry entities such as audiovisual content providers, service providers, smart terminal equipment and chip manufacturers, and DRM technology providers in accelerating the application and implementation of DRM technical standards, as well as strengthening copyright protection for audiovisual content, the National Radio and Television Administration issued the "Implementation Guidelines for Digital Rights Management (DRM) Technology in Audiovisual Content Distribution (2023 Edition)" on December 4, 2023. These guidelines provide direction for audiovisual content providers and service providers to achieve encrypted distribution and secure authorization of audiovisual content, as well as for smart terminal equipment and chip manufacturers to integrate and develop DRM client functionalities that comply with industry standards.

- As of 2025, the ChinaDRM-related technical standards have been approved and published by ITU-T, specifically:
- ITU-T J.1040 Digital rights management for video and audio content distribution - Requirements (https://handle.itu.int/11.1002/1000/16192).
- ITU-T J.1041 Digital rights management for video and audio content distribution - System Architecture (https://handle.itu.int/11.1002/1000/16262).
- ITU-T J.1042 Digital rights management for video and audio content distribution - Client (https://handle.itu.int/11.1002/1000/16263).

2.3.2 Industrial Application Status of ChinaDRM

In the industrialization and application of ChinaDRM technical standards, China has established a comprehensive industrial support system encompassing four key aspects: research and development production, security evaluation, service certification, and key management.

In terms of research and development production, the ChinaDRM Laboratory of the Academy of Broadcasting Science has developed a unified DRM client SDK to facilitate the rapid deployment of DRM across various smart terminals. Regarding security evaluation, the ChinaDRM Laboratory conducts assessments of DRM technologies and products to ensure their compliance with standards and interoperability. For key management, ChinaDRM has established a DRM Trust Management Center, which ensures mutual trust between DRM servers and clients through legal agreements and a unified digital certificate technical framework. In the area of service certification, the Service Certification Center of the Academy of Broadcasting Science carries out Digital Rights Management (DRM) service certification to guarantee the secure and effective deployment of DRM technical standards across the industry.

Currently, the Chinese market has 29 DRM server products, 28 DRM client chips, and 22 DRM client devices that comply with the standards. Over 260 million terminal devices, including smart TVs, smart set-top boxes, mobile terminals, and in-vehicle entertainment systems, have integrated DRM functionality. Seven audiovisual equipment manufacturers have built DRM systems that meet industry standards and have passed the Digital Rights Management (DRM) service certification.

2.3.3 Next Steps and Recommendations

In the context of the global audio-visual industry's digitalization and ultra-high-definition development, while new technologies and business models are driving the prosperous development of the global audio-visual industry, audio-visual piracy is also showing new and diversified trends. The digitalized, networked, and globalized black-industry piracy is the biggest challenge to global copyright protection. New types of audio-visual consumption models such as short video editing, re-creation, and the application of generative artificial intelligence, have sparked new copyright disputes, which are accelerating the erosion of the copyright interests of the professional, high-quality audio-visual content creation and distribution industry chain. The end-to-end DRM ecosystem for global audio-visual content still exhibits shortcomings and weaknesses. The deployment of DRM technology at low security levels is a particularly vulnerable spot for piracy attacks. Driven by the profits of piracy, DRM cracking techniques continue to be explored and become more and more sophisticated.

Faced with the development of new technologies and business models, all parties in the global media industry chain should jointly explore solutions. We should adhere to the principles of openness, cooperation, and mutual benefit, take copyright protection as the core goal, and prioritize the healthy development of the global audio-visual

industry chain. Together, we should safeguard the international audio-visual copyright protection ecosystem.

In the future, all parties in China's audio-visual copyright protection industry chain will continue to deepen exchanges and cooperation with their international counterparts. China will discuss the evolution of DRM technology, strengthen its implementation, and explore the path of international audio-visual copyright protection ecosystem evolution, which features continuous technological innovation, improving security levels, and expanding protection scopes. China will contribute to building an open, trustworthy, cooperative, and mutually beneficial international digital copyright protection ecosystem.

2.4 Cybersecurity

As broadcast infrastructures become increasingly software-based and interconnected, the importance of robust cybersecurity measures has grown significantly. Broadcasters should now prioritize cybersecurity not only to protect content and operations but also to maintain public trust and regulatory compliance.

2.4.1 Major Cybersecurity Guidelines and Frameworks

To address the growing cybersecurity challenges, a range of influential guidelines and frameworks have been developed globally. These resources help broadcasters implement effective security measures, ensure regulatory compliance, and protect critical infrastructure. Developed by international broadcasting unions, industry-specific working groups, and standardization organizations, these frameworks reflect diverse regional and operational needs. The following table 2-1 highlights key guidelines and frameworks that can serve as reference points for ABU members seeking to strengthen their cybersecurity.

Table 2-1: Major guidelines and frameworks for cybersecurity

Organization	Overview of guidelines/Frameworks
World Broadcasting Unions (WBU)	**WBU Cybersecurity Recommendations for Media Vendors' Systems, Software and Services** Developed through a collaboration of major broadcast unions (including the EBU, NABA, and ABU), these recommendations provide a set of security requirements that broadcasters should expect from their vendors. They are widely referenced as an international standard for procurement. https://worldbroadcastingunions.org/wp-content/uploads/2024/11/WBU-Cyber-Security-Recommendations-for-Media-Vendors-2018-01-22-FINAL.pdf
European Broadcasting Union (EBU)	**EBU R 143: Cybersecurity Recommendation** This is one of the most widely recognized recommendations in the industry. It defines minimum security requirements for

	media systems and services, and is regularly updated to reflect modern trends like the shift to IP-based systems and the use of cloud (SaaS) products. It covers a broad range of topics, from vulnerability management to access control. https://tech.ebu.ch/publications/r143
North American Broadcasters Association (NABA)	**Essential Guide to Broadcast Cybersecurity** This guide provides practical advice for North American broadcasters. It addresses specific regional concerns, offering best practices for securing the Emergency Alert System (EAS) and concrete recommendations for using cloud services (SaaS/PaaS/IaaS). https://www.nab.org/cybersecurity/broadcasterResources.asp
ICT-ISAC Japan	**ICT-ISAC Broadcast Equipment Cybersecurity Guidelines** ICT-ISAC Japan has developed specialized cybersecurity guidelines for broadcast equipment through its Broadcast Equipment Cyberattack Countermeasure Working Group (WG). These guidelines, first published in 2018, address the unique challenges of securing broadcasting systems, which prioritize high availability and often operate on legacy or isolated infrastructure. The framework emphasizes practical, incremental security measures tailored to broadcasting environments, such as secure network segmentation, endpoint protection, and vulnerability management for systems running general-purpose OS like Windows and Linux. https://www.soumu.go.jp/main_content/000859328.pdf
ISO/IEC	**ISO/IEC 27001, ISO/IEC 27002** The ISO/IEC 27001 standard provides companies of any size and from all sectors of activity with guidance for establishing, implementing, maintaining and continually improving an information security management system. https://www.iso.org/standard/27001 ISO/IEC 27002 provides best practices to implement the management system defined by ISO/IEC 27001 focused on cybersecurity. https://www.iso.org/standard/75652.html
National Institute of Standards and Technology (NIST)	**NIST Cybersecurity Framework (CSF)** While not specific to broadcasting, the NIST CSF is the foundational framework for cybersecurity risk management across critical infrastructure sectors worldwide. It provides a common language and a systematic approach by organizing activities into five core functions: **Identify, Protect, Detect, Respond, and Recover**. Many broadcasters use the CSF as the basis for building and evaluating their own security programs. https://www.nist.gov/cyberframework
Center for Internet Security (CIS)	**CIS Controls** The CIS Controls are a set of practical, prioritized guidelines published by the non-profit organization, the Center for Internet Security (CIS). They provide a list of concrete actions that are most effective against cyberattacks, which has the advantage of making it clear where to start. The controls are also designed to be implemented in phases, allowing organizations to tackle them incrementally according to their size and maturity level. https://www.cisecurity.org/controls

2.4.2 Recent Incidents at Media Organizations

In late July 2025, the South African Broadcasting Corporation (SABC) and major media house eMedia were targeted in a business email compromise (BEC) phishing attack. The incident originated from a compromised SABC email account belonging to a manager responsible for stakeholder relationships and partnerships.

Phishing emails containing a PDF attachment were sent to various contacts, including a senior executive at eNCA, a subsidiary of eMedia. The email urged recipients to open the PDF, which displayed a blurry image resembling a bank statement along with a link to access the full document. This link redirected users to a malicious website designed to steal email credentials. Once compromised, these credentials were used to further spread the phishing email to contacts in the victim's address book.

eMedia confirmed that one of its senior executives at eNCA was affected, but stated that the situation was swiftly contained. The company reported that the initial malicious email was sent from the compromised SABC account after an eNCA employee interacted with it. Both organizations promptly implemented measures to secure their IT environments and strengthen cybersecurity protocols.

As of this writing, no disruption to broadcasting services has been reported. This incident reflects a growing trend of BEC attacks targeting South African businesses.

Sources:
https://mybroadband.co.za/news/broadcasting/605080-two-south-african-broadcasters-hit-by-cyberattack.html
https://news.broadcastmediaafrica.com/2025/08/04/south-africa-sabc-and-emedia-experience-massive-cyber-attack/

2.4.3 Global Cybersecurity Outlook in 2025 (the World Economic Forum's Report)

The Global Cybersecurity Outlook 2025 highlights a rapidly evolving and increasingly complex cyber landscape. Key drivers include geopolitical tensions, sophisticated cybercrime, fragmented regulations, and the accelerated adoption of emerging technologies like AI and quantum computing. These factors are deepening cyber inequity, especially for small organizations and developing regions, which often lack the resources to build resilience.

AI is both a risk and an opportunity: while 66% of organizations expect AI to significantly impact cybersecurity, only 37% have safeguards in place for secure

deployment. GenAI is enabling more advanced phishing and fraud, lowering barriers for cybercriminals. Supply chain vulnerabilities and third-party risks are also major concerns, with 54% of large organizations citing them as top challenges.

The cyber skills gap continues to widen, with only 14% of organizations confident in their talent pool. Regulatory fragmentation adds further complexity, making compliance difficult across jurisdictions. To address these challenges, the report calls for stronger public-private collaboration, investment in cyber resilience, and leadership engagement. Cybersecurity must be treated as a strategic priority, with economic incentives and inclusive solutions to protect the entire digital ecosystem.

Source: https://www.weforum.org/publications/global-cybersecurity-outlook-2025/

Annex 3

Satellite Broadcasting (D/SB)

Project Manager: **Mr. Masashi KAMEI** (NHK, Japan)

This annex describes technologies on the latest satellite systems for UHDTV broadcasting and specifications of the latest satellite broadcasting systems. It also describes the latest topics on advanced satellite broadcasting technologies.

3.1 ITU-R Documents Related to Satellite Broadcasting Systems

3.1.1 Radio Regulations

ARTICLE 23 Section 2 “Broadcasting-satellite services”

APPENDIX 30 “Provisions for all services and associated Plans and List for the broadcasting-satellite service in the frequency bands 11.7-12.2 GHz (in Region 3), 11.7-12.5GHz (in Region 1) and 12.2-12.7 GHz (in Region 2)

APPENDIX 30A “Provisions and associated Plans and List for feeder links for the broadcasting-satellite service (11.7-12.5GHz in Region 1, 12.2-12.7 GHz in Region 2 and 11.7-12.2 GHz in Region 3) in the frequency bands 14.5-14.8 GHz and 17.3-18.1 GHz in Regions 1 and 3, and 17.3-17.8 GHz in Region 2

RESOLUTION 506 “Use by space stations in the broadcasting-satellite service operating in the 12 GHz frequency bands allocated to the broadcasting-satellite service of the geostationary-satellite orbit and no other”

RESOLUTION 507 “Establishment of agreements and associated plans for the broadcasting-satellite service”

RESOLUTION 528 “Introduction of the broadcasting-satellite service (sound) systems and complementary terrestrial broadcasting in the frequency bands allocated to these services within the range 1-3 GHz.”

RESOLUTION 536 “Operation of broadcasting satellites serving other countries.”

RESOLUTION 548 “Application of the grouping concept in Appendices 30 and 30A in Regions 1 and 3”

RESOLUTION 552 “Long-term access to and development in the frequency band 21.4-22 GHz in Regions 1 and 3”

RESOLUTION 553 “Additional regulatory measures for broadcasting-satellite networks in the frequency band and 21.4-22 GHz in Regions 1 and 3 for the enhancement of equitable access to this frequency band”

RESOLUTION 554 “Application of pfd masks to coordination under No. 9.7 for broadcasting-satellite service networks in the band 21.4-22 GHz in Regions 1 and 3”

RESOLUTION 555 “Additional regulatory provisions for broadcasting-satellite service networks in the frequency band 21.4-22 GHz in Regions 1 and 3 for the

enhancement of equitable access to this frequency band”

RESOLUTION 557 “Consideration of possible revision of Annex 7 to Appendix 30 of the Radio Regulations”

3.1.2 Recommendations (https://www.itu.int/rec/R-REC-BO/en)

BO.1213 “Reference receiving Earth station antenna pattern for the broadcasting-satellite service in the 11.7-12.75 GHz band”

BO.1408 “Transmission system for advanced multimedia services provided by integrated services digital broadcasting in a broadcasting-satellite channel”

BO.1443 “Reference BSS earth station antenna patterns for use in interference assessment involving non-GSO satellites in frequency bands covered by RR Appendix 30”

BO.1516 “Digital multiprogramme television systems for use by satellites operating in the 11/12 GHz frequency range”

BO.1659 “Mitigation techniques for rain attenuation for broadcasting-satellite service systems in frequency bands between 17.3 GHz and 42.5 GHz”

BO.1696 “Methodologies for determining the availability performance for digital multi-programme BSS systems, and their associated feeder links operating in the planned bands”

BO.1724 “Interactive satellite broadcasting systems (television, sound and data)”

BO.1774 “Use of satellite and terrestrial broadcast infrastructures for public warning, disaster mitigation and relief”

BO.1784 “Digital satellite broadcasting system with flexible configuration (television, sound and data)”

BO.1900 “Reference receive earth station antenna pattern for the broadcasting-satellite service in the band 21.4-22 GHz in Regions 1 and 3”

BO.2063 “Alternative BSS earth station antenna radiation pattern for 12 GHz BSS bands with effective apertures in the range 55-75 cm”

BO.2098 “Transmission system for UHDTV satellite broadcasting”

3.1.3 Reports (https://www.itu.int/pub/R-REP-BO/en)

BO.2007 “Considerations for the introduction of broadcasting-satellite service of high-definition television and ultra-high-definition television systems in the band 21.4-22 GHz”

BO.2071 “Broadcasting-satellite service system parameters between 17.3 GHz and 42.5 GHz and associated feeder links”

BO.2101 “Digital satellite broadcasting system (television, sound and data) with flexible configuration”

BO.2102 “Multiple-feed BSS receiving antennas”

BO.2397 “Satellite transmission for UHDTV satellite broadcasting”

BO.2497 “Characteristics and effectiveness of frequency sharing criteria for the broadcasting-satellite service in Regions 1 and 3 subject to RR Appendix 30”

3.2 Latest Topics on Satellite Broadcasting in Japan

3.2.1 Development of Layered Division Multiplex Transmission for Satellite Broadcasting

NHK STRL is developing a satellite broadcasting system with layered division multiplex (LDM) that multiplexes multiple modulation signals in the same channel with different power levels with the aim of providing services with flexibility in accordance with changes in the receiving environment due to rain attenuation, etc. as a next-generation satellite broadcasting system. The LDM transmission consists of an upper layer (UL) with high power and a lower layer (LL) with low power, and it enables signals to be transmitted with different bitrates and robustness in the same channel. It is useful for broadcasters to maintain broadcasting services provided by UL signal with a robust transmission parameter during heavy rainfall.

Advanced satellite broadcasting system for 8K program with LDM transmission and multi-layer coding of VVC

NHK STRL has developed an LDM-based modulator and demodulator for satellite broadcasting in the 21-GHz band. The 21-GHz-band satellite broadcasting allocated to the frequency band of 21.4–22.0 GHz in ITU-R Regions 1 and 3 is expected to be utilized as transmission channels for new broadcasting services with large capacity. Then, two 300-MHz-class wideband transponders are assumed in the 21-GHz band and a wideband LDM-based modulator and demodulator with the nominal symbol rate of 250 Mbaud were developed shown in Fig. 3-1.

Modulator Demodulator Spectrum

Figure 3-1: Wideband LDM-based modulator and demodulator

Versatile Video Coding (VVC), the latest standard in video coding technology, enables multi-layer coding for efficiently encoding multiple videos. It can encode low-resolution and high-resolution videos together, with the former as a base layer (BL) and the latter as an enhancement layer (EL). This enables spatial scalability, i.e., low-resolution image decoding by partial reception and high-resolution video decoding by full reception. Using this function to decode the required part of the bitstream makes it possible to display at a resolution suitable for each receiver. When

considering 8K resolution video coding, it can obtain the BL that includes information for 4K resolution and the EL that includes information for 8K resolution based on the prediction with BL.

An advanced satellite broadcasting system in which the BL with 4K resolution and EL with 8K resolution in multi-layer coding of VVC are assigned to the UL and LL of the LDM transmission, is effective as a countermeasure for degradation of receiving condition due to rainfall as explained in Fig. 3-2. Programs with 8K resolution are normally shown by receiving both the UL and LL correctly, while programs with 4K resolutions can be shown during heavy rainfall by correctly receiving only the UL.

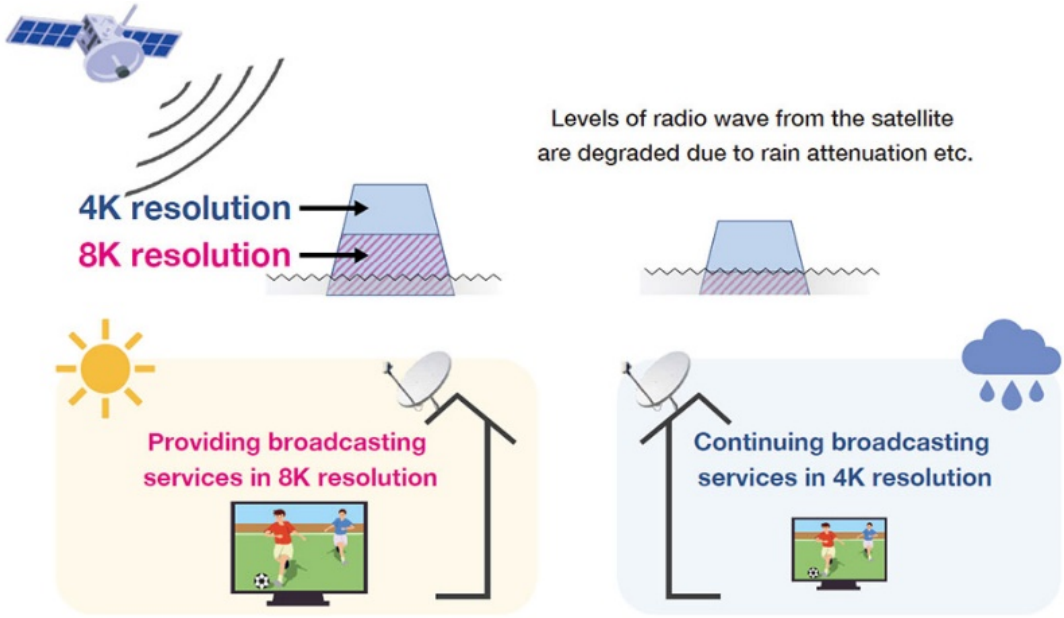


Figure 3-2: Image of advanced satellite broadcasting system for 8K program with LDM transmission and multi-layer coding of VVC

NHK STRL examined its indoor demonstration at NHK STRL Open House 2024 shown in Fig. 3-3. The modulation scheme of the UL and LL signals were set to QPSK and 8PSK, respectively.

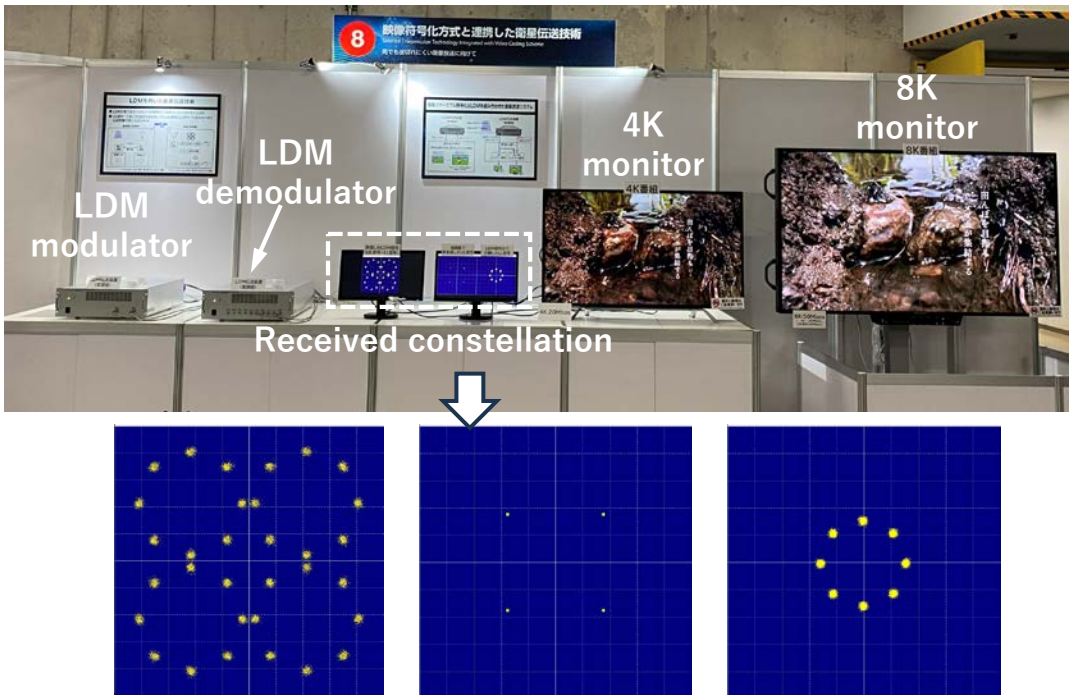


Figure 3-3: Indoor demonstration at NHK STRL Open House 2024

Improvement of LDM transmission performance by phase rotation of the LL signal

The parameters of the UL and LL signals in LDM transmission can be configured individually and flexibly. The constellations of the LDM signals can be shifted in accordance with the amounts of the rotation of the LL signal. Fig. 3-4 shows its case when QPSK modulation is used for both the UL and LL signals with the 2-dB power difference.

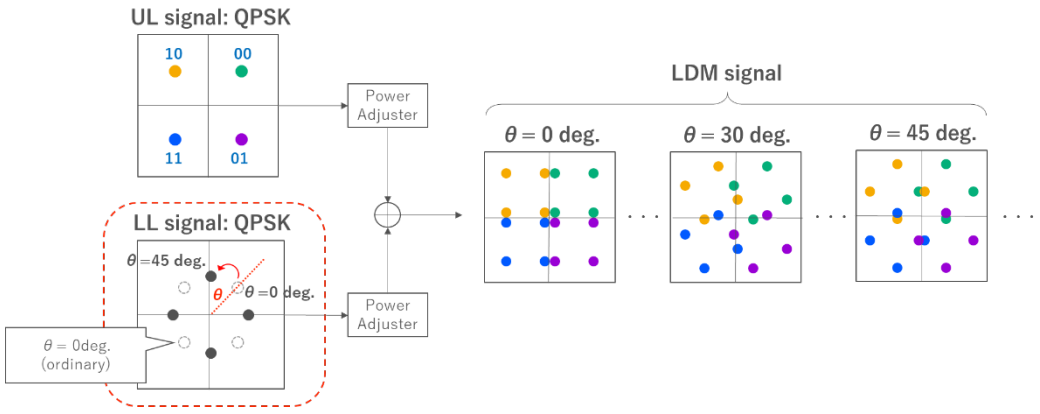


Figure 3-4: Constellation shift of LDM signal by phase rotation of LL signal

The simulation results of the transmission performance of the UL signal are shown in Fig. 3-5 when LDPC code rate of 1/2 is applied. It shows that the performance of the UL signal is changed according to the phase rotation of the LL signal and the C/N to obtain the BER of 1x 10^{-11} can be decreased to 7.9 dB for 45-degrees rotation compared to 9.3 dB for ordinary in this transmission parameters.

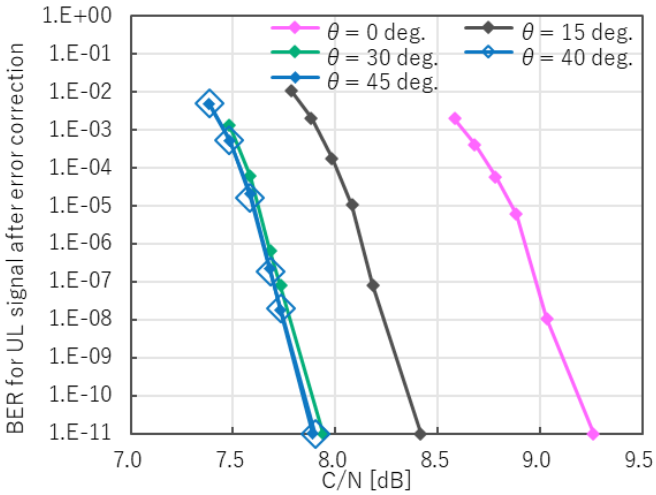


Figure 3-5: Improvement of transmission performance of UL signal by phase rotation of LL signal

Annex 4

Digital Sound Broadcasting Systems (D/DSBS)

Project Manager (tentative): **Dr. Hirokazu KAMODA** (NHK, Japan)

This Annex reports the current standards for digital sound broadcasting systems, latest developments in the standardization, and trends.

4.1 Digital Sound Broadcasting Systems within Frequency Range 30-3000 MHz

The Recommendation ITU-R BS.1114-12 describes several systems for terrestrial digital sound broadcasting (DSB) to vehicular, portable, and fixed receivers within the frequency range 30-3000 MHz. It details the main features of these systems, including source coding, channel coding, modulation, transmission structure, and quality of service thresholds. The Radiocommunication Sector aims to ensure rational, equitable, efficient, and economical use of the radio-frequency spectrum for radiocommunication services.

Table 4-1: Overview of global systems

System	Region	Standard	Key Features
A (DAB)	Europe, Australia	ETSI EN 300 401	COFDM, DQPSK, up to 64 services, robust in multipath
F (ISDB-T SB)	Japan	ISDB-T SB	BST-OFDM, hierarchical transmission, MPEG-2 AAC
C (IBOC)	USA	NRSC-5	Hybrid/all-digital, OFDM, HD Codec, FM band reuse
G (DRM)	Europe	ETSI ES 201 980	DRM+, VHF support, AAC, advanced data services
H (CDR)	China	GY/T 268.1-2013	Simulcast/all-digital, DRA+, LDPC, SFN-ready
I (RAVIS)	Russia	GOST R 54309-2011	Digital-only, immersive audio/video/data

The ITU Radiocommunication Assembly recognizes a growing global interest in terrestrial DSB for local, regional, and national coverage within the 30-3000 MHz frequency range. It highlights prior Recommendations ITU-R BS.774 and BO.789 for DSB system requirements, noting the benefits of complementary terrestrial and satellite systems and advocating for common receivers to enable mass production

and lower costs. The Recommendation ultimately suggests that Digital Systems A, F, C, G, H, and/or I should be used for terrestrial DSB services and encourages administrations to evaluate their merits. It also invites radio-receiver manufacturers to develop economical, portable, multiband, and multi-standard receivers that can adapt to different systems and allow for software upgrades.

4.1.1 Technical Highlights

Audio Quality & Codecs

- Bitrates: 8–800 kbit/s
- Codecs: MPEG-2 Layer II, MPEG-4 HE-AAC v2, DRA+, HD Codec
- Multichannel Support: Most systems support 5.1 surround sound

Spectrum Efficiency

- All systems outperform FM in spectral use
- Modulation schemes: OFDM, COFDM, QAM
- Support for single frequency networks (SFNs)

Robustness

- Designed for multipath and shadowing environments
- Use of time/frequency interleaving, on-channel repeaters

Receiver Flexibility

- Dynamic multiplex reconfiguration
- OSI model compliance
- PAD (Programme Associated Data), EPG, traffic info
- Emphasis on low-cost, multiband, multi-standard receivers

4.1.2 System-Specific Insights

4.1.2.1 Digital System A (DAB) – Eureka 147

- Purpose & Features: Designed for satellite and terrestrial broadcasting with a focus on low-cost, multi-service digital radio. It supports vehicular, portable, and fixed reception, with strong performance in urban multipath environments using on-channel repeaters. Offers high-quality audio, data services, and conditional access. Efficient in spectrum and power usage via OFDM and error correction.
- Standardization: ETSI EN 300 401.
- Audio Coding: Initially MPEG Layer II, now DAB+ with MPEG-4 HE-AACv2 (8–384 kbit/s).
- Modulation & Channel Coding: DQPSK OFDM with convolutional coding; UEP for MPEG-2, uniform for MPEG-4.
- Interleaving: Time (16 frames) and frequency interleaving.
- Program Associated Data: 0.33–64 kbit/s for dynamic labels, HTML, JPEG.

4.1.2.2 Digital System F (ISDB-TSB)

- Purpose & Features: Japanese system for robust, flexible multimedia broadcasting over terrestrial networks. Uses BST-OFDM, 2D interleaving, and concatenated error correction. Shares physical layer with ISDB-T and transport layer with MPEG-2 systems. Supports TMCC for receiver control and low-power portable devices.
- Standardization: Japan.
- Audio Coding: MPEG-2 Layer II, AC-3, MPEG-2 AAC (CD quality at 144 kbit/s).
- Modulation & Channel Coding: OFDM with DQPSK, QPSK, 16-QAM, 64-QAM; RS (204,188) + punctured convolutional codes.
- Interleaving: Byte, bit, symbol-wise time, and frequency interleaving.

4.1.2.3 Digital System C (IBOC)

- Purpose & Features: Enables analogue-digital simulcasting in FM band for smooth transition. Offers improved multipath performance and CD-quality audio. Supports data-casting and flexible bit allocation. Operates in Hybrid (analogue + digital) or All Digital modes. Uses Diversity Delay for seamless analogue-digital switching and supports SFN with GPS sync.
- Standardization: NRSC-5 (USA).
- Audio Coding: HD Codec (HDC), supports multichannel.
- Modulation & Channel Coding: OFDM with convolutional codes (2/9 to 4/5).
- Interleaving: Time and frequency interleaving tailored to channel use.
- Program Associated Data: Opportunistic, no audio quality loss.

4.1.2.4 Digital System G (DRM)

- Purpose & Features: Digital-only system for all analogue sound broadcasting bands. Supports smooth analogue-digital transition and defines DRM+ for VHF. Offers CD-quality audio, data services, and dynamic multiplexing. Uses FAC, SDC, and MSC for service management and seamless frequency switching.
- Standardization: ETSI ES 201 980.
- Audio Coding: MPEG-4 AAC with SBR, PS, MPS.
- Modulation & Channel Coding: Punctured convolutional codes with 4-QAM/16-QAM; supports EEP and UEP.
- Interleaving: Cell interleaving for time-frequency robustness.
- Program Associated Data: Text messages, packet delivery with FEC.

4.1.2.5 Digital System H (CDR)

- Purpose & Features: Chinese system for FM band digital transition. Supports simulcast and post-analogue switch-off modes. Offers CD/5.1

audio, data services, and SFN. Flexible spectrum modes (100/200 kHz) and supports spectrum sharing with FM.

- Standardization: GY/T 268.1-2013 (China).
- Audio Coding: DRA+, HE-AAC, AVS audio.
- Modulation & Channel Coding: OFDM with LDPC for MSD; convolutional for SDI/SI. Supports QPSK, 16QAM, 64QAM.
- Interleaving: 2D frequency-time, block bit, and sub-carrier interleaving.
- Program Associated Data: Dynamic labels, EPG, advanced text services.

4.1.2.6 Digital System I (RAVIS)

- Purpose & Features: Russian system for high-quality sound and multimedia in VHF bands. Digital-only, supports video, images, EPG, and localized SFN broadcasting. Designed for mobile reception up to 200 km/h and offers short delay and high-quality AV services.
- Standardization: GOST R 54309-2011 (Russia).
- Audio/Video Coding: HE-AAC (SBR, PS, MPS); H.264/AVC, H.265/HEVC.
- Modulation & Channel Coding: OFDM; MSC uses QPSK/16QAM/64QAM; Low Bitrate Channel uses QPSK; Reliable Data Channel uses BPSK. BCH + LDPC coding.
- Interleaving: Bit, cell, block, and frequency interleaving.
- Program Associated Data: Video, audio, images, traffic, EPG.

4.1.3 Deployment Considerations

System Selection: Based on regional needs, spectrum availability, and receiver market

Transition Strategy: Hybrid modes (System C, H) support gradual migration

Interoperability: Systems like F and G align with TV broadcasting standards

Receiver Design: Multi-standard, upgradable, low-cost devices encouraged

4.2 Digital Sound Broadcasting Systems below 30 MHz

Recommendation ITU-R BS.1514-3 defines the technical basis for terrestrial digital sound broadcasting (DSB) systems operating below 30 MHz, aiming to support the transition from analogue AM broadcasting to digital systems. It evaluates system performance, spectrum efficiency, compatibility, and robustness under various propagation conditions.

Two systems are recognized:

- **DRM**: Designed for global use in long-wave (LF), medium-wave (MF), and short-wave (HF) bands.

- **IBOC DSB**: Primarily developed for use in North America, especially in the MF band.

4.2.1 Digital Radio Mondiale (DRM) System

Digital Radio Mondiale (DRM) is a fully digital broadcasting system designed for operation below 30 MHz, including LF, MF, and HF. It uses steep spectral shoulders to confine its signal within a 9 or 10 kHz channel, enabling efficient spectrum use and minimizing adjacent channel interference. The system supports multiple modes, making it adaptable for different frequency bands and propagation conditions. DRM employs advanced audio coding (xHE-AAC and AAC+SBR) to deliver high-quality sound even under challenging conditions. It uses OFDM and QAM modulation combined with forward error correction and time interleaving to ensure robust transmission. The system is modular and scalable, allowing for wider bandwidths and flexible allocation between audio and data services. DRM also includes Emergency Warning Functionality (EWF), which supports alarm signaling, automatic frequency switching, and text-based alerts via Journaline.

4.2.2 IBOC DSB System

IBOC DSB is designed to operate in the MF band and supports both hybrid and all-digital modes. In hybrid mode, it allows simultaneous transmission of analogue and digital signals within the same channel, facilitating a smooth transition from analogue to digital broadcasting. The system uses AAC with SBR for audio coding, offering FM-like stereo quality. Its layered codec structure enables graceful degradation and extended coverage through a blend function that switches seamlessly to analogue or backup digital signals when needed. IBOC DSB employs OFDM and QAM modulation with advanced error protection and interleaving. It supports data broadcasting at rates between 4 and 16 kbit/s, with flexible trade-offs between audio and data quality. The system is compatible with existing AM transmitters and does not require new spectrum allocations, making it highly efficient and practical for gradual deployment.

4.3 Recent Standardization Activities and Trends

4.3.1 ITU-R

At the ITU-R Working Party 6A and Study Group 6 meetings in March 2025, the revision of recommendation ITU-R BS.1114 was discussed and approved. The latest HD Radio (IBOC DSB) system definitions for advanced service modes with increased service capacity have been incorporated. These advanced service modes offer higher capacity than standard service modes by employing higher-order modulation schemes and modifying channel encoding and interleaving techniques.

4.3.2 Thailand's Frequency Planning for DAB+

Thailand's DAB+ digital radio implementation plan initially considered allocating frequencies based on its 77 provinces, but for higher spectrum efficiency, the country reorganized this into 10 regions and 34 allocation areas. Each allocation area consists of one to six provinces, and the frequency range is set at 174–230 MHz. The system adopted is DAB+ (MPEG-4 HE AAC v2), with each area allocated 5–6 frequency blocks. The first two blocks are adjacent and reserved for national or wide-area networks. Infrastructure sharing is mandatory, with measures in place for interference mitigation.

The recommended transmission power is up to 10 kW in metropolitan areas, up to 4 kW in other regions, and up to 1 kW in border zones and gap fillers. Interference assessment follows Recommendation ITU-R BS.1660-9.

In terms of capacity planning, the DAB+ ensemble net bitrate is 1152 kbps, with a recommended bitrate of 64 kbps per channel, supporting up to 18 channels. According to NBTC (National Broadcasting and Telecommunications Commission) regulations, the bitrate is not fixed, allowing broadcasters to select higher quality (e.g., 128 kbps) or lower rates (e.g., 32–48 kbps) depending on their service requirements.

Regulations categorize broadcasting services into national, regional, and local tiers, and the frequency plan supports all of these. NBTC has already published technical standards for transmitters and receivers, with licensing expected to begin between late 2025 and 2026.

Source: S. Suansook, "Frequency planning for digital radio network in Thailand," ABU Technical Review, issue 301, 2025.

4.3.3 DRM Adopted as a Chinese Industry Standard

According to the release from the Digital Radio Mondiale Consortium, on August 1, 2025, China's National Radio and Television Administration (NRTA) publicly announced the release of the official industry standard GY/T 423-2025, titled "Technical Specifications for Medium and Short-Wave Digital Sound Broadcasting", which had been officially issued on July 29, 2025.

Sources:
https://www.drm.org/drm-standard-adopted-for-domestic-short-and-medium-wave-radio-broadcasting-as-a-national-chinese-industry-standard/
https://std.samr.gov.cn/hb/search/stdHBDetailed?id=3BAE9D1ABE9A1E81E06397BE0A0A8E76

Doc T-25/8

REPORT OF TOPIC CHAIPERSON SPECTRUM TOPIC AREA

Chairperson: **Dr. Li Leilei (NRTA)**
Period of Report: **Oct. 2024 to Aug.2025**
Date of Report : **Aug.2025**

Introduction about scope of the work:

This report is on the Topic Area Spectrum Issues which includes the related WRC-27 Agenda Items concerning broadcasting service and ABU spectrum issues.

Project Topic 1: **To consider a possible new primary allocation to the fixed-satellite service (space-to-Earth) in the frequency band 17.3-17.7 GHz and a possible new primary allocation to the broadcasting-satellite service (space-to-Earth) in the frequency band 17.3-17.8 GHz in Region 3, while ensuring the protection of existing primary allocations in the same and adjacent frequency bands, and to consider equivalent power flux-density limits to be applied in Regions 1 and 3 to nongeostationary-satellite systems in the fixed-satellite service (space-to-Earth) in the frequency band 17.3-17.7 GHz, in accordance with Resolution 726 (WRC-23); (WRC-27 AI 1.4)**

Project Manager:
Co- Project Manager: **Mr. Rajeev Kumar**
Time Period: **Oct. 2024 to Aug.2025**

The following tasks were considered for this project:
1. Follow developments of studies in WP 4A to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting service in the Asia-Pacific Area.

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This report was provided by Dr. Li Leilei

1 Background
Working Party 4A has been designated as a "Responsible group" for WRC-27 Agenda Item 1.4. The tasks of Working Party 4A are shown as follows:

−studies on sharing and compatibility between the FSS (space-to-Earth), the BSS (space-to-Earth) and the FSS (Earth-to-space) designated by No. 5.516 in order to consider a possible new primary allocation to the FSS (space-to-Earth) in the frequency band 17.3-17.7 GHz for Region 3 and to the BSS (space-to-Earth) in the frequency band 17.3-17.8 GHz for Region 3, while ensuring the protection of existing primary allocations in the same and adjacent frequency bands, and without adversely affecting the existing allocations to the FSS (Earth-to-space) designated by No. 5.516, including assignments to the BSS feeder links contained in Appendix 30A.

−consideration of the applicability of Region 2 non-GSO FSS epfd limits (see noting e)) pertaining to the frequency band 17.3-17.7 GHz to Regions 1 and 3, so as to ensure the protection of GSO networks.

The results of Working Party 4A's May 2025 meeting at 4A/567, pertaining to WRC-27 Agenda Item 1.4 are detailed in Annex 7 - Working document on WRC-27 Agenda Item 1.4, Annex 8 - Elements for a working document towards draft CPM text for WRC-27 Agenda Item 1.4, and Annex 9 - Draft work plan for WRC-27 Agenda Item 1.4. The document of Annex 7 had reflected that during the discussion at this meeting, concerns and questions were raised regarding the studies and proposals to update of the epfd value in Table 22-1D to protect the potential new Region 3 BSS in the 17 GHz band as that would impose additional limitations to the non-GSO FSS. Those concerns and the clarification received are reflected in the working document to be further considered at future meetings. In addition, in response to the request at

the October 24 WP 4A meeting, BR has provided its suggestions and comments for WP 4A's future work in order to ensure the stability and integrity of RR Appendix 30A Plan.

2 Preliminary views

If this Agenda Item can promote the new satellite broadcasting service (space-to-Earth) in the 17.3-17.8 GHz band, it would significantly enhance the directive broadcasting satellite services in the Asia-Pacific region by additional frequency resource. The new spectrum will lay the foundation for business development and also facilitate more flexible transponders for subsequent directive broadcasting satellite systems. Therefore, it is necessary to pay attention to the positions and viewpoints of relevant countries in the world, carry out relevant compatibility analysis in a timely manner, and study the strategies and positions of participating in corresponding international and regional conferences.

Project Topic 2:	**to consider technical and regulatory measures for fixed-satellite service satellite networks/systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 42.5-43.5 GHz (Earth-to-space), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) for equitable access to these frequency bands, in accordance with Resolution 131 (WRC-23) (WRC-27 AI 1.6)**
Project Manager:	
Co- Project Manager:	**Mr. Rajeev Kumar**
Time Period:	**Oct. 2024 to Aug.2025**

The following tasks were considered for this project:

1. Follow developments of studies in WP 4A to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting service in the Asia-Pacific Area.

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This report was provided by Dr. Li Leilei

1 Background

Working Party 4A has been designated as a "Responsible group" for WRC-27 Agenda Item 1.6. The results of Working Party 4A's May 2025 meeting can be found at 4A/567 and are outlined below: **Annex 12**-Elements for a working document on WRC-27 Agenda Item 1.6; **Annex 13**- Elements of working document towards draft CPM text on WRC-27 agenda item 1.6, **Annex 14**-Draft work plan for WRC-27 Agenda Item 1.6.

On November 2024, WP6A sent a Laison Statement to WP 4A regarding AI 1.6, outlining the following three points:

−To date, Working Party 6A has no information on technical and operational characteristics and protection criteria for any Broadcasting services in these bands.

−The results from the recent ITU-R terrestrial BR IFIC indicated there are no terrestrial broadcast entries in the official MIFR between 40.5 GHz and 42.5 GHz.

−Working Party 6A would appreciate being kept informed of any requirements for additional support it can provide and of progress regarding WRC-27 Agenda Item 1.6.

The results of Working Party 4A's May 2025 meeting at 4A/567, pertaining to WRC-27 Agenda Item 1.6, are detailed in Annex 12-Elements for a working document on WRC-27 Agenda Item 1.6. But, there is little progress on this Agenda Item during this meeting as compared with the results of previous WP 4A's November 2024 meeting. All results are available at- 4A/567. This document was just still focusing on technical and regulatory measures to ensure equitable access for fixed-satellite service (FSS) networks/systems in the Q/V bands (37.5‑42.5 GHz, 42.5‑43.5 GHz, 47.2‑50.2 GHz, and 50.4‑51.4 GHz). Challenges include limited spectrum reserved under Radio Regulations (RR) Appendices 30/30A/30B, which favor "first-come, first-served" allocations, disadvantaging developing nations. Current statistics reveal dense orbital occupancy (e.g., 500+ GSO submissions with $\leq 2.1^{\circ}$ separations) and fast growing non-GSO systems (e.g., 10,000+ satellites), complicating equitable access. Proposed solutions include reserving orbital positions and 5 GHz bandwidth per ITU member, enabling national/regional coverage plans, and prioritizing submissions post-WRC-27. Protection of existing services (GSO/non-GSO) is emphasized, alongside technical hurdles in implementing regional plans (e.g., non-GSO global coverage conflicts). The document critiques past approaches (e.g., C/Ku-band plans) for inflexibility and suggests revising notification procedures. Final measures will be refined in following three WP 4A meetings, balancing equitable access with spectrum efficiency and existing service protection under Resolution 131 (WRC-23).

The next meeting of Working Party 4A will take place from October 27 to November 6, 2025, in Geneva, Switzerland.

2 Preliminary views

This Agenda Item pertains to the allocation of both satellite and terrestrial broadcasting services within the 40.5-42.5 GHz band, necessitating consideration of the positions and perspectives of relevant international countries.

Project Topic 3: **to consider appropriate regulatory actions to update Appendix 26 to the Radio Regulations in support of aeronautical mobile (OR) high frequency modernization, in accordance with Resolution 411 (WRC-23)(WRC-27 AI 1.9)**

Project Manager:
Co- Project Manager: **Mr. Rajeev Kumar**
Time Period: **Oct. 2024 to Aug.2025**

The following tasks were considered for this project:
1. Follow developments of studies in WP 5B to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting service in the Asia-Pacific Area.

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This report was provided by Dr. Li Leilei

1 Background
Working Party 5B has been designated as the "Responsible group" for WRC-27 Agenda Item 1.9. The tasks of Working Party 5B are outlined as follows:

−Conduct studies on the introduction of new technologies to enhance performance, including, but not limited to, new classes of emission, wideband systems (see recognizing c), d), and e)), for the aeronautical mobile (OR) service systems in the frequency ranges considered in Appendix 26.

−In order to fulfill the resolve to invite the ITU Radiocommunication Sector to complete the relevant work in time for the 2027 World Radiocommunication Conference, define the relevant technical and operational characteristics and conduct sharing and compatibility studies with existing aeronautical mobile (OR) service systems and other incumbent services allocated on a primary basis in the same or adjacent frequency bands.

−Based on ITU Radiocommunication Sector (ITU-R) studies, identify any potential modifications to Appendix 26 without altering the existing area allotments in recognizing f), and ensure that the current use of narrowband systems remains unchanged and is neither impacted nor precluded by the revision of Appendix 26.

The results of Working Party 5B's May 2025 meeting, pertaining to WRC-27 Agenda Item 1.9, can be found at 5B/315. With regard to AI 1.9, WP 5B agreed to develop one new Rec. ITU-R M. [AMRS_VDL] and one new [Recommendation/Report] ITU-R M. [Modernization of HF AM(OR)S].

In this meeting, Working Party (WP) 5B received a reply liaison statement from WP 5C. WG 5B had considered 2 contributions proposing modifications to the working document towards a preliminary draft new Report ITU-R M.[MODERNIZATION OF HF AM(OR)S]. The proposals were discussed and included in the working document when agreed. The main topics for discussion included the appropriate terminology for existing AM(OR)S systems, further explanation of how 4G ALE is expected to work for these systems, and review of the technical characteristics provided by other Working Parties. For the terminology discussion, the term "legacy" to describe AM(OR)S was not agreeable and the meeting was invited to consider alternative wording such as "analog" or "narrowband" or some other alternative. For the discussion on 4G ALE, there was a request to further expand on the usage of 4G ALE and to provide an explanation of how 4G ALE properly functions for AM(OR)S usage. Finally, regarding the review of technical characteristics, it was highlighted by the meeting that Appendix 27 was updated at the previous WRC-23 and AM(R)S could have channel bandwidths larger than 2.8 kHz, but no upper limit is specified. Due to this information, future should review all parameters in the relevant tables and confirm the information is documented properly.

The next meeting of Working Party 5B will take place from November 18 to 27, 2025, in Geneva, Switzerland.

2 Preliminary views
WP 5B was still engaged in this Agenda Item for developing the new Rec. ITU-R M. [AMRS_VDL] and the new [Recommendation/Report] ITU-R M. [Modernization of HF AM(OR)S], and currently, there is not the study from WP 5B on sharing and compatibility with broadcasting service.

Project Topic 4: **to consider developing power flux-density and equivalent isotropically radiated power limits for inclusion in Article 21 of the Radio Regulations for the fixed-satellite, mobile-satellite and broadcasting-satellite services to protect the fixed and mobile services in the frequency bands 71-76 GHz and 81-86 GHz, in accordance with Resolution 775 (Rev.WRC-23)(WRC-27 AI 1.10).**

Project Manager: **Dr. Li Leilei**
Co- Project Manager:

Time Period: **Oct. 2024 to Aug.2025**

The following tasks were considered for this project:
1. Follow developments of studies in WP 5C to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting services.

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This report was provided by Dr. Li Leilei

1 Background
Working Party 5C has been designated as a "Responsible group" for WRC-27 Agenda Item 1.10. The task of Working Party 5C is to complete the appropriate studies to determine power flux-density (pfd) and equivalent isotropically radiated power (e.i.r.p.) limits to be included in Article 21 for satellite services (fixed-satellite service (FSS), mobile-satellite service (MSS) and broadcasting-satellite service (BSS)) to protect the current and planned fixed and mobile services in the frequency bands 71-76 GHz and 81-86 GHz.

On November 2024, WP 6A sent the following liaison statement to WP 5C on AI 1.10, outlining the following three points:
−To date, Working Party 6A has no information on technical and operational characteristics and protection criteria for the Broadcasting services in these bands.
−The results from the recent ITU-R terrestrial BR IFIC indicated there are no terrestrial broadcast entries in the official MIFR between 74 GHz and 76 GHz.
−Working Party 6A would appreciate being kept informed of any requirements for additional support it can provide and of progress regarding WRC-27 Agenda Item 1.10.

The results of WP 5C's May 2025 meeting at 5C/206, pertaining to WRC-27 Agenda Item 1.10, was the Chairman Report's Annex 2.1-Working document on sharing studies under Agenda Item 1.10. In this document, WP 5C had updated the working document on sharing studies and the work plan on WRC 27 agenda item 1.10. The methodology aspects for sharing studies under this agenda item have yet to be fully discussed. Some initial discussions have taken place, and a comparative table of key assumptions and a list of questions and answers on the different input documents have been compiled to facilitate discussions at the next WP 5C meeting.

The next meeting of WP 5C will take place from November 17 to November 28, 2025, in Geneva, Switzerland.

2 Preliminary views
On the one hand, this Agenda Item will directly study and determine the power flux density and equivalent omnidirectional radiated power of satellite broadcasting services, and at the same time consider the protection of terrestrial broadcasting services. Therefore, it is necessary to pay attention to the positions and viewpoints of relevant countries in the world.

Project Topic 5: **to consider studies on possible new allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage, in accordance with Resolution 253 (WRC-23)(WRC-27 AI 1.13).**
Project Manager: **Dr. Li Leilei**
Co- Project Manager:
Time Period: **Oct. 2024 to Aug.2025**

The following tasks were considered for this project:
1. Follow developments of studies in WP 4C to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting services.

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This report was provided by Dr. Li Leilei

1 Background
Working Party 4C has been designated as the "Responsible group" for WRC-27 Agenda Item 1.13. The tasks of Working Party 4C are shown as follows:
−studies on possible allocations to the MSS in the frequency range between 694/698 MHz and 2.7 GHz, taking into account the IMT frequency arrangements addressed in the most recent version of Recommendation ITU-R M.1036.

−studies on spectrum requirements and on technical, operational and regulatory matters related to the implementation of the mobile-satellite service for direct connectivity to the IMT user equipment to complement the terrestrial IMT network coverage.

On October 22, 2024, WP 6A received a liaison statement WP 4C. In this letter, WP 4C agreed on the list of frequency bands to be used for sharing and compatibility studies in accordance with Resolution 253 (WRC-23) as contained in Table 1.

TABLE 1

List of the possible IMT frequency arrangements for MSS direct communication with IMT UE

Directionality	
Uplink (MHz)	**Downlink (MHz)**
807-849	852-894
880-915	925-960
832-862	791-821
698-716 776-798	716-746 746-768
698-748	753-803
1 427-1 470	1 475-1 518
1 920-1 980	2 110-2 170
1 710-1 785	1 805-1 880
1 850-1 920	1 930-2 000
1 710-1 780	2 110-2 180
2 000-2 020	2 180-2 200
2 010-2 025	1 880-1 920
2 305-2 320	2 345-2 360
2 500-2 570	2 620-2 690

For some of the bands in the table above, the directionality may not fully necessarily be in line with Recommendation ITU-R M.1036. Working Party 4C invites Working Parties (WPs) 3L, 3M, 4A, 4B, 5A, 5B, 5C, 6A, 7B, 7C and 7D to provide any additional information on technical and operational characteristics, protection criteria (which includes any methodology on how to apply it and performance objectives), with respect to systems operating in, or adjacent to, the frequency bands in Table 1, based on the terms of reference of each Working Party.

The results of Working Party 4C's May 2025 meeting at 4C/356, pertaining to WRC-27 Agenda Item 1.13, are detailed in Annex 6 - Working document on the possible description and functionality of MSS systems for direct connectivity between space stations and IMT user equipment, Annex 7 - Working document on sharing and compatibility studies under WRC-27 agenda item 1.13, Annex 8 - Work plan for WRC-27 agenda item 1.13, and Annex 9 - Terms of Reference for Working Party 4C Correspondence Group on WRC-27 agenda item 1.13.

Regarding the matters on sharing and compatibility studies, the discussion during this WP 4C meeting mainly focused on DC-MSS-IMT characteristics. Most of the orbital configuration, technical and operational characteristic items are agreed, and relevant proponents have provided information to most of these items to support future studies. However, views were also expressed that characteristics such as antenna patterns, especially for the adjacent band, ACLR, OOBE, and cross-border interference management still need further inputs and discussion. The following issues are identified that require further discussion:

1 Proper in-band / out-of-band antenna pattern
2 Out-of-band emission density distribution within the first adjacent channel, particularly at frequency offsets near the edge of the transmitted DC-MSS-IMT channel
3 Antenna polarization in individual sharing and compatibility studies
4 Mitigation techniques to deal with cross-border interference issues
5 How to use these parameters in sharing and compatibility studies

Regarding the matters the development of functionality and description for DC-MSS-IMT, the discussion mainly focused on the term of direct connectivity between space stations and IMT user equipment, and finally the meeting agreed on the term as Direct Connectivity between Mobile-Satellite Service space station and IMT UEs (DC-MSS-IMT). The working document consists of 5 sections and two ANNEXES and the contents in the sections and the ANNEXES were not discussed and agreed.

1 Terms and definitions
2 Introduction
3 General description of DC-MSS-IMT systems
4 [Operational Concept of the envisaged DC-MSS-IMT system / DC-MSS-IMT Operational Model]
5 Responsibilities of SNO/MNO and its corresponding administration
6 ANNEX 1: Technical Functionality
7 ANNEX 2: Managing and resolving interference scenarios that may arise from satellite network transmissions

Further extensive review is required on this above-mentioned document. In this regard, it was agreed by WP 4C to establish the Correspondence Group (CG) to continue the work on the document of description and functionality by holding two virtual meetings before WP 4C meeting in October 2025. However, since there was a notable concern raised during the Plenary about the short interval between #3 and #4 indicated in the ToR, the exact schedule will be decided considering this concern and will be circulated through the CG 1.13 emailing list once it is decided. The outcome of the meeting will be an updated Working Document, which will serve as a contribution for further discussions at the WP 4C meeting in October 2025.

In response to WP 5D's inquiries regarding beam management, the aggregate factor, duty cycle and related topics, while WP 4C extensively discussed the matters, it was agreed that WP 4C is still conducting its analysis and will provide a detailed response to WP 5D in due course. WP 4C agreed to send a liaison statement accordingly.
The following issues are to be addressed in future meetings of WP 4C:

- Sharing studies principles and methodologies that will be followed by the group
- Several parameters need to be clarified, updated and additionally agreed
- Definitions and functionality concepts of DC-MSS-IMT including responsibilities, authorization, definitions and other issues
- Beam management, aggregate factor and duty cycle to be clarified and send to WP 5D once available
- Harmonization of parameters including protection criteria with other agenda items

In discussion on AI 1.13, it was requested that the proponents of DC-MSS-IMT systems provide information on the ITU filings that may be associated with the systems. This would help the members understand the regulatory status around the systems, which may be useful in future discussion on AI 1.13.

The next meeting of WP 4C is planned for 15 October – 24 October 2025, in Geneva, Switzerland.

2 Preliminary views
This Agenda Item will explore the potential new allocation of satellite mobile services in the 694/698 MHz-2.7GHz band to enable direct connectivity between space radios and IMT user equipment, thereby supplementing IMT terrestrial network coverage. This involves the allocation of terrestrial broadcasting services in the 694-702MHz band. If approved, the issue will affect several services used by Asia-Pacific countries in this frequency band. Therefore, it is necessary to pay attention to the positions and viewpoints of relevant countries in the world, study the strategies and positions of participating in corresponding international conferences, and prevent the formation of adverse international restrictions on the development of terrestrial television services in the Asia-Pacific region.

Project Topic 6: **to consider regulatory provisions for receive-only space weather sensors and their protection in the Radio Regulations, taking into account the results of ITU Radiocommunication Sector studies, in accordance with Resolution 682 (WRC-23)(WRC-27 AI 1.17).**
Project Manager: **Dr. Li Leilei**
Co- Project Manager:
Time Period: **Oct. 2024 to Aug.2025**

The following tasks were considered for this project:
1. Follow developments of studies in WP 7C to identify and possible impact on Broadcasting Services.
2. Possible impact on broadcasting services.

This report was provided by Dr. Li Leilei

1 Background

Working Party 7C has been identified as the "Responsible group" for WRC-27 Agenda Item 1.17. The tasks of Working Party 7C are shown as follows:

−studies on spectrum needs and appropriate protection criteria for receive-only space weather sensors, as well as system characteristics, as appropriate, taking into account noting a).

−sharing and compatibility studies pertaining to potential new primary allocations to MetAids (space weather) in the following frequency bands for receive-only sensors, taking into account resolves 2: 27.5-28.0 MHz, 29.7-30.2 MHz, 32.2-32.6 MHz, 37.5-38.325 MHz, 73.0-74.6 MHz, 608-614 MHz.

−studies on possible regulatory provisions of the Radio Regulations to accommodate the possibility for an administration that desires to notify a receive-only space weather sensor station to be included in the Master International Frequency Register.

On November 2024, WP 6A sent a liaison statement to WP 7C regarding AI 1.17. In this letter, WP 6A shared its views and information for WP 7C.

With respect to the frequency band 608-614 MHz, WP 6A provided in Document 7C/32 information on the system characteristics, sharing methodologies, and other applicable reference documents for the 608-614 MHz band. Working Party 6A notes the Radio Regulations of 2024 recognise a number of provisions for radio astronomy in the 608-614 MHz band in a number of countries in Region 1 – RR Nos 5.306 and 5.307, and in Region 3 RR Nos 5.306 and 5.307. Otherwise, the band is deployed by many countries for terrestrial television broadcasting. With respect to deployment scenarios of terrestrial television in the 608-614 MHz band, the Attachment in Document 7C/32 provides information on the terrestrial broadcasting service allocated on a primary basis. The terrestrial IFIC can provide additional information on actually filed broadcasting stations in the 608-614 MHz band.

With respect to the frequency band 73.0-74.6 MHz, Working Party 6A has received advice with a search query across Regions 1 and 3, encompassing both northern and southern hemispheres, for example IFIC 3030; shows 206 entries which are recorded in the MIFR for Frequency Modulation sound broadcasting, notified in accordance with RR Article 11. The Broadcasting services Division of the BR Terrestrial Services Department has confirmed there are 206 terrestrial broadcast entries in the official MIFR between 73.0 to 74.6 MHz for Region 1. Review of the entries in IFIC 3030 indicate the latest such notifications were received in 2017 and 2023, which indicates use of the 73.0-74.6 MHz band. Further individual information on these filings is available in the MIFR. These MIFR filings for these Frequency Modulation sound broadcasting stations include locations, radiated powers and antenna heights for potential use in studies by WP 7C. Please note, there may be further instances of these stations which do not have any potential to cause terrestrial cross border interference and have not therefore been entered into the MIFR. Working Party 6A advises WP 7C to consider the following ITU-R Recommendations which should provide considerable information on the Terrestrial broadcasting service allocated on a primary basis, in the 73-74.6 MHz band, for technical and operational characteristics for the Broadcasting services, noting broadcasting stations are usually operational non-stop, for 24 hours a day.

Recommendation ITU-R	Title
BS.412	Planning standards for terrestrial FM sound broadcasting at VHF
BS.450	Transmission standards for FM sound broadcasting at VHF
BS.641	Determination of radio-frequency protection ratios for frequency-modulated sound broadcasting
BS.704	Characteristics of FM sound broadcasting reference receivers for planning purposes
BS.1195	Transmitting antenna characteristics at VHF and UHF

The up-to-date results of Working Party 7C's March 2025 meeting at 7C/236, pertaining to WRC-27 Agenda Item 1.17, were: Annex 5 - Working document towards a preliminary draft new Recommendation ITU-R RS.[RXSW_PROTECT_CRITERIA], Annex 6 - Working document towards a preliminary draft new Report ITU-R RS.[SW_STUDIES], Annex 7 - Proposed draft CPM text for WRC-27 Agenda Item 1.17, Annex 8 - Working document towards preliminary draft revised Report ITU-R RS.2456-1.

The next meeting of WP 7C will take place from September 16 to September 25, 2025, in Geneva, Switzerland.

2 Preliminary views

This Agenda Item relates to the allocation of terrestrial broadcasting services in the frequency bands 608-614 MHz and 73.0-74.6 MHz But, the studied service of space weather sensors on this Agenda Item is receive-only. Therefore, it is necessary to pay attention to the positions and viewpoints of relevant countries in the world, study the strategies and positions of participating in corresponding international conferences, and prevent the formation of adverse international restrictions on the development of terrestrial television services in the Asia-Pacific region.

ABU Activities Related to Training and Services

Reporting Period: November 2024 – August 2025

I. Outcome of the ABU Survey on Training Needs

- A new survey form on Training and Services has been circulated to ABU members.
- On 30 June 2025, ABU distributed the survey to all members.
- The survey results will be presented at the upcoming Technical Committee Meeting in Mongolia.

II. Training Activities Undertaken

1. Workshop on Cloud Service and Remote Tools for Broadcasters

- Date: 26–28 November 2024
- Venue: Dewan Cendekiawan, IPPTAR
- Overview: Introduced emerging cloud technologies to broadcasters.
- Participants: Over 35 attendees from RTM, government agencies, ABU members, and RTHK.

2. ABU-VYPA-NETSTAIRS Webinar – AI TV: The Future of Television!

- Date: 23 January 2025
- Platform: Zoom Webinar
- Overview: Focused on the future impact of AI in television broadcasting.
- Participants: 95 participants from 18 organizations.

3. Engineering Fundamentals for Broadcasters – Level 1

- Start Date: 17 March 2025
- Overview: Multi-level training program aimed at junior engineers and new entrants to broadcast engineering.
- Participants: 52 selected from 138 nominees across 14 ABU member organizations.
- Fee: Free and exclusively for ABU members.

4. ABU-DRM Webinar : DRM Latest Development and Aspect of Implementation

- Start Date: 6 May 2025
- Overview: The webinar brought together digital radio experts and regional broadcasters to explore the latest advancements in Digital Radio Mondiale (DRM) technology and its strategic implementation, particularly across the Asia-Pacific.
- Participants: **15 participants** attended the webinar, representing **7 member organisations**.
- Fee: Free and exclusively for ABU members.

5. ABU-ASBU-WorldDAB Technical Workshop – New Development for DAB+ Systems

- Start Date: 15-17 July 2025
- Overview: The webinar covered a broad range of topics, including the business case, technical standards, network design, and implementation strategies for DAB+ digital radio.
- Participants: A total of 66 participants joined the session from 9 ABU member organisations. **organisations**.
- Fee: Free for all

6. Webinar Series on Members' Innovation: Powering Simless Remote Evolving Media Integration (REMI) TV Production

- Start Date: 31 July 2025
- Overview: The webinar highlighted Malaysia's leadership in developing hybrid 5G broadcast solutions, especially in its role as ASEAN Chair in 2025.
- Participants: A total of 66 participants joined the session from 9 ABU member organisations. **organisations**.
- Fee: Free for all

III. Technical Advisory Service (TAS) Missions

- VOV-Vietnam has requested a workshop for the VOV Technical Staff and a workshop on "Using AI on producing radio programs".
- Still in discussion and waiting for confirmation date.

IV. Training Undertaken with ABU Media Academy (AMA)

- **Technology-Related Workshops/Webinar:**
  - Introduction to TV Production Styles – Hassan Jamalinik London TV Training (The UK) (143 Attendees)
  - Latest Techniques in TV Production – Hassan Jamalinik London TV Training (The UK) (85 Attendees)
  - Unlocking the Power of Data: Big Data, and Business Intelligence for Smarter Decisions – Dr. Didar Yedilkhan (Kazakhstan) (34 Attendees)
  - Enabling seemles broadcasting by APPEAR - Andy Rayner (The UK) (44 Attendees)
  - Next Generation Leaders Initiative - Shaping the Future of Media & Technology - Dr Veysel Binbay (ABU)(41 Attendees)
  - Lean and Ready: Smart Strategies for Cost-Conscious Production - David Balfour(Australia)(62 Attendees)

V. Collaborative Courses with Other Institutes

1. Institut Penyiaran dan Penerangan Tun Abdul Razak (IPPTAR)

- Workshop on Cloud Services and Remote Tools for Broadcasters (mentioned in Section II)
- Held in collaboration with IPPTAR from 26–28 November 2024 in Kuala Lumpur.
- 30 participants are from members among 71 attendees.

2. Digital Radio Mondiale (DRM) Consortium

- ABU-DRM Webinar on "DRM Latest Developments and Aspects of Implementation"

- Date: 6 May 2025 | Time: 3:00–5:00 PM (MYT)
- 15 participants from 7 ABU member organizations across 6 countries.

3.WorldDAB and ASBU

- ABU-DRM Webinar on "DRM Latest Developments and Aspects of Implementation"
- Date: 6 May 2025 | Time: 3:00–5:00 PM (MYT)
- A total of 167 participants joined the sessions, with 32 attendees representing 11 ABU member organisations out of the 51 organisations participating overall.

VI. Non-Technical and Managerial Training via AMA

- Please refer to the attached workshop list for detailed training sessions targeting non-technical and managerial staff.

Doc T-25/10

REPORT OF TOPIC CHAIRMAN
PRODUCTION TOPIC AREA

Topic Chairman	**: Kazim PEKTAS – TRT-Türkiye**
Period of Report	**: April 2025 to September 2025**
Date of Report	**: 11 September, 2025**

Reports from Project Managers in Topic on Production

A total of four projects are under the Production Topic Area, as below:

1. **Ultra High Definition TV and Advanced Immersive Sensory Media Systems P/UHDAISM**
2. **Systems for people with special needs P/SN**
3. **IT -based Production System and file-based workflows P/ITPS**
4. **Big Data, Personalisation and Artificial Intelligence P/BDAI**

For this reporting period I have received five contributions from NHK Japan:

Project topic: Ultra High Definition TV and Advanced Immersive Sensory Media Systems (P/UHDAISM)
Project Manager: ***Mr. Kimihiro Tomiyama***(NHK, Japan)

- **Harmonized Operation between Audio and Video Renderers for Presentation of Immersive Content**
- **Content-Driven AR Communication in the Coming Future**
- **3D Display Using Light Source Array Toward realizing 3D/2D switchable display**

Project topic: Systems for people with special needs(P/SN)
Project Manager: ***Ms. Reiko Takou*** (NHK, Japan)

- **Audio-Description Production Technology for Live TV Sports Programs**

Project topic: Big Data, Personalisation and Artificial Intelligence (P/BDAI)
Co Project Manager: ***Mr. Taro Miyazaki*** (NHK, Japan)

- **News Metadata Generation System**

Harmonized Operation between Audio and Video Renderers for Presentation of Immersive Content

1. Toward live-action immersive content where users can move freely looking around and listening

NHK has developed the technology for the harmonized operation between audio and video renderers, which enables users to watch videos and listen to audio from their preferred locations and orientations within a virtual space on a variety of devices. Figure 1 depicts the overview of the developed system. In the system, video data of immersive content is composed of scene description and video objects. Audio data of immersive content is composed of audio metadata and audio signals. A video renderer and an audio renderer process video data and audio data according to user's location and orientation, respectively. Then, the video and audio corresponding to user's location and orientation are produced. Additionally, by rendering video according to the display capabilities of each device, such as a head-mounted display (HMD) or tablet, users can enjoy immersive content on their preferred devices.

The utilized technologies in the system comply with the latest MPEG standards, including the scene description (ISO/IEC 23090-14, MPEG-I Part 14) to arrange video objects in a time-series space and the audio rendering method for Virtual Reality (VR) content (ISO/IEC 23090-4, MPEG-I Part 4). Furthermore, some features and functionalities have been independently expanded.

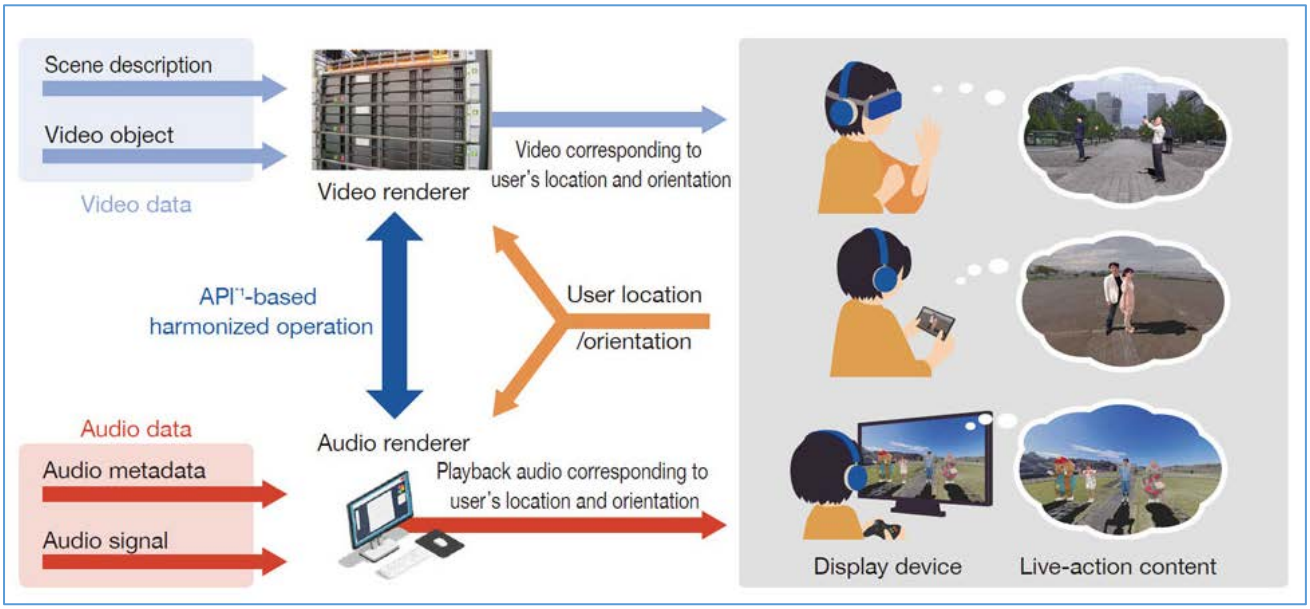


Figure 1: Overview of developed system

2. Developed technology for the harmonized operation between audio and video renderers

They have developed a mechanism to harmonize a video renderer and an audio renderer by having them share the user's position information to enable the presentation of the video and audio in a synchronized manner. Figure 2 shows the protocol among the audio renderer, video renderer, and user's device.

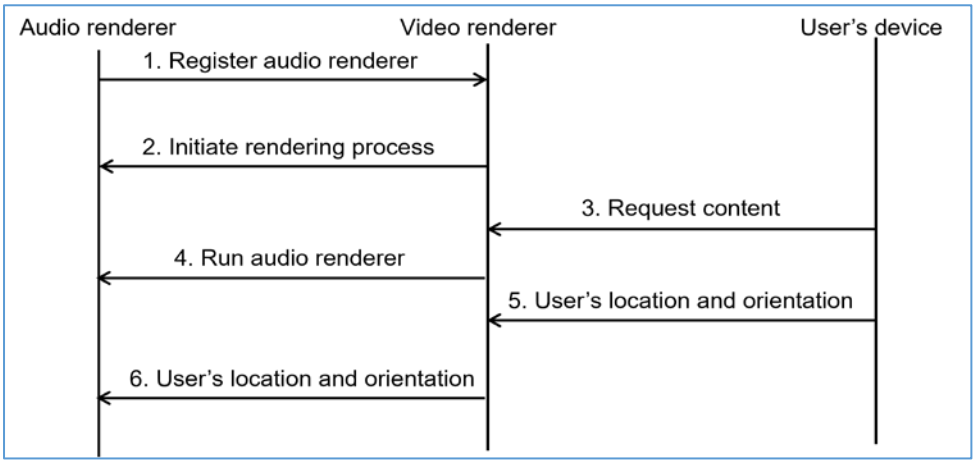


Figure 2: Protocol among audio renderer, video renderer, and user's device

1. The audio renderer registers itself to the video renderer. This allows the video renderer to identify the audio renderer with which it should be paired.

2. In response to the registration, the video renderer notifies the audio renderer that the rendering process to be initiated.
3. The user's device requests the content user want to enjoy to the video renderer. On the basis of the request, the video renderer initiates rendering the video data.
4. The video renderer runs the audio renderer while it starts playing.
5. The user's device continuously informs the video renderer of the user's viewing location and orientation.
6. The video renderer shares the user's location and orientation with the audio renderer.

Owing to this mechanism, the video and audio corresponding to the user's location and orientation are output from video renderer and audio renderer and they are presented at the user's device in synchronization with each other. Our implemented user's devices are shown in Figure 3.

(a) HMD with headphone

(b) Controller with headphone

(c) Tablet device with headphone

Figure 3: Implemented user's devices

Content-Driven AR Communication in the Coming Future

As a concept for future content, NHK STRL is introducing the image of content that expands spatially through AR glasses. You can experience how to operate the content, react to each scene, and communicate while watching the content.

Figure 4: AR communication in the near future to enjoy content together

- Sharing of the viewing experience beyond space
  You will be able to communicate beyond space while viewing the same content. Sharing each other's view will create conversations and discoveries, triggered by the content.
- Enhancement in the operability and convenience of video content
  New functions, such as gesture recognition, will make basic operations, such as playing back the scene you want to watch again and inputting your reactions, simpler while you enjoy content.

- Display of scene-linked information
  You will be able to see other viewers' reactions to the scene you are watching by displaying them around the content.

3D Display Using Light Source Array Toward realizing 3D/2D switchable display

NHK STRL is researching technology to display natural three-dimensional (3D) images according to the viewer's eye position. By using an electrically switchable light source array*1, a display that allows users to select and view 3D or two-dimensional (2D) images according to user preference has been developed.

3D images can be displayed through the reconstruction of light rays in various directions by displaying light source array images on an LCD panel for light-ray control. When a white image is displayed on the LCD panel and functions as a plane light source, 2D images can be displayed, enabling 3D/2D switching or 3D/2D simultaneous display according to user preference.

By estimating the viewer's eye position using a camera and generating elemental image array*2 in real time according to the eye position, a 3D image display with a wide viewing zone*3 has been developed.

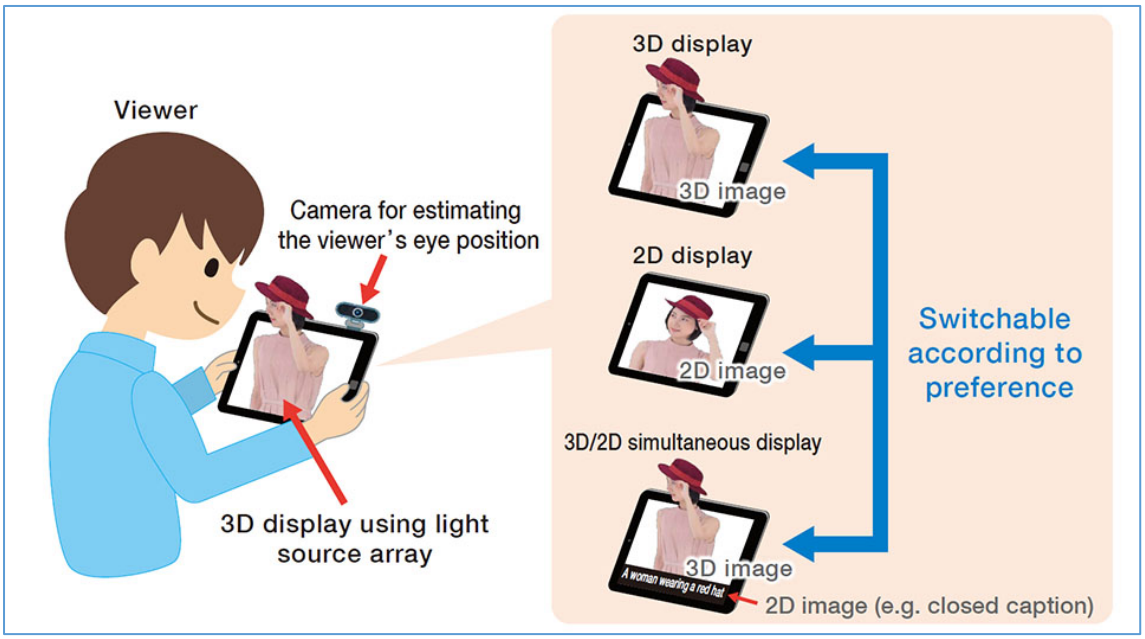


Figure 5: 3D/2D switchable eye-tracking three-dimensional display

*1: Light source array: A number of light sources arranged at equal intervals for reconstruction of 3D images.
*2: Elemental image array: An image generated to reproduce light rays emitted from an object in various directions
*3: Viewing zone: The range in which 3D images can be viewed.

Audio-Description Production Technology for Live TV Sports Programs

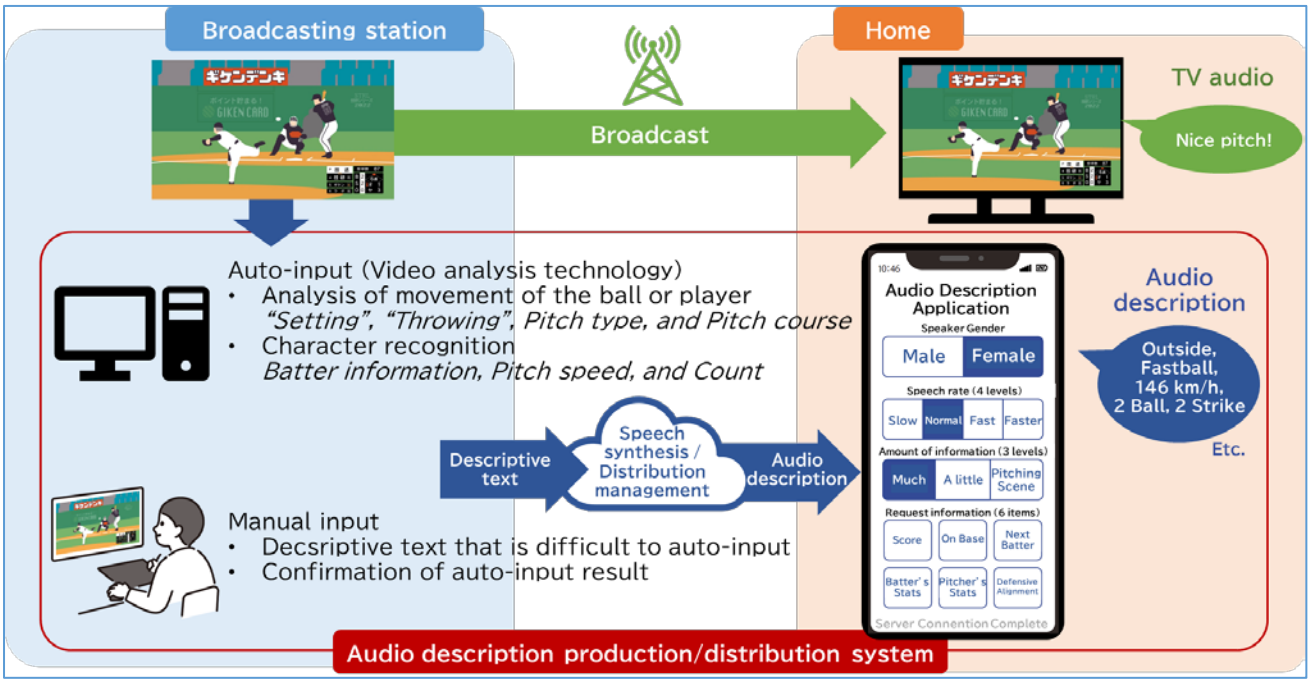
NHK is developing a system to produce and deliver audio descriptions for live sports broadcasting

programs to help more people, including those with visual impairments, fully understand such programs.

Features

- This system generates descriptive texts about plays and game conditions, converts them into audio descriptions, and delivers them to the audio description app before the broadcast video is displayed on the home's television. The audio descriptions are then played in time to match the TV program at home.
- The descriptive texts are either generated by the video/image analysis technology they developed or manually entered by the operator using their input tool.
- Their current focus is live baseball broadcasts. The video analysis technology identifies player's movements ("setting" and "throwing"), pitch types ("breaking ball," "fastball"), and pitch course (e.g., "high inside," "low outside"). The image analysis technology recognizes batter information (such as player name, uniform number, right/left-handed hitter), pitch speed, and count from visual information overlaid on the video.
- The audio description app allows users to adjust the speech rate or amount of information. Users can also listen to information such as score, on-base data, and next batter, which are extracted from external data by the system, at any time they like.

In future work, they will focus on the practical application of an audio description production and distribution system for baseball, while also expanding its scope to other sports and advancing R&D on technologies for efficient audio description production.



Overview of audio description production and distribution system

News Metadata Generation System

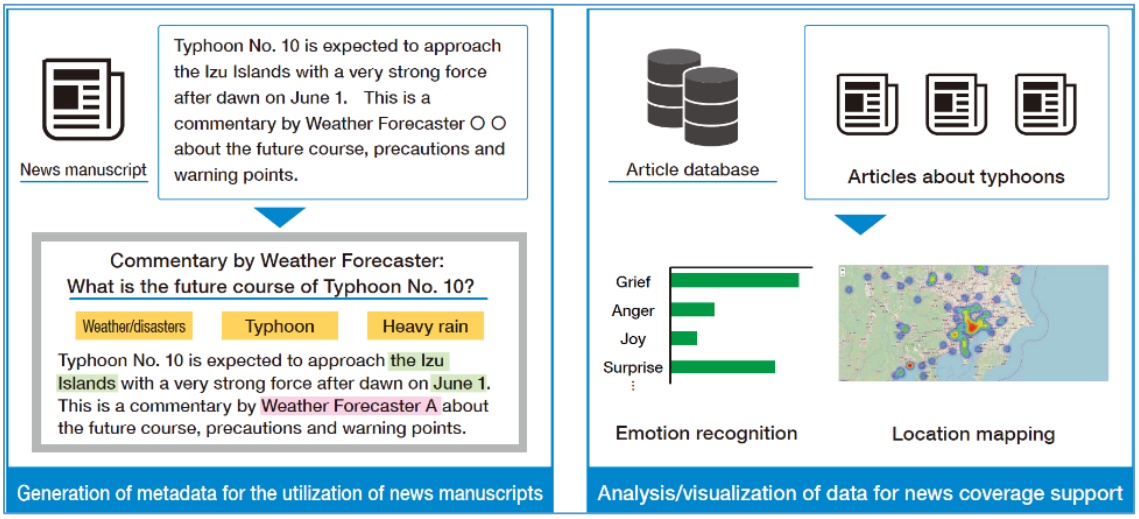
NHK Science and Technology Research Laboratories (NHK-STRL) is conducting research on natural language processing technologies to enhance the efficiency of news content production. This article introduces a system designed to generate expressive content with minimal manual effort by automatically producing metadata for news manuscripts and visualizing the results.

Metadata Generation Using AI for News Manuscript Utilization

When publishing news manuscripts online, NHK assigns multiple labels that succinctly represent the content of each article. Given the existence of thousands of label types, manually selecting the appropriate ones is a

highly time-consuming task. To address this, the system employs AI technology to automatically assign suitable labels to news articles.
NHK-STRL has also developed a system that automates various processes essential to news production, including title generation, keyword extraction, and article anonymization. By combining human oversight with system-generated outputs, the overall efficiency of content production can be significantly improved.

Data Analysis and Visualization to Support News Coverage
In the event of a large-scale disaster or similar situation, the system visualizes the regions begin covered, allowing users to quickly understand the coverage status and plan strategic reporting accordingly. Furthermore, the system visualizes the emotional polarity (positive or negative) of news articles related to each region using emotion recognition technology, thereby contributing to the identification of local issues.



Future Outlook
NHK-STRL aims to deploy these systems in production environments by 2026. By around 2028, the goal is to establish technologies capable of simultaneously processing not only natural language but also other types of information, such as image data.

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Asia-Pacific Broadcasting Union
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Asia-Pacific Broadcasting Union
MNB
MONGOLIAN NATIONAL BROADCASTER

TECHNICAL COMMITTEE MEETING

11-12 September 2025
Tuushin Hotel, Ulaanbaatar, Mongolia

Asia-Pacific Broadcasting Union

Doc T-25/11

ABU Technology

TERMS OF REFERENCE
TOPIC AREAS AND PROJECTS

Revised: July 2025

TOPIC AREA: PRODUCTION

Chairman: Mr Kazim Pektas, TRT, kazim.pektas@trt.net.tr
Secretary: ABU-TD, td@abu.org.my

	PROJECT TOPIC	TASKS	DELIVERABLES	PROJECT MANAGER
1.	**Ultra High Definition TV and Advanced Immersive Sensory Media Systems P/UHDAISM**	1. Monitor developments regarding UHDTV, and study its technical specifications. 2. Monitor developments regarding advanced immersive sensory media and study its technical specifications. 3. Study use cases of advanced immersive sensory media like VR, AR, 360° video, 3D video, audio, and haptic to enhance the audience experience. 4. Study the possibility of a programme exchange technology in ABU region.	1. Report to members on UHDTV developments, including applications and technical aspects. 2. Report to members on the latest technologies on advanced immersive sensory media. 3. Report to members on use cases on advanced immersive sensory media within broadcast and media organization. 4. Contributions to relevant working parties in ITU-R SG6, when necessary. **Time Period: Sept 2025**	**Mr. Kimihiro TOMIYAMA** tomiyama.k-fk@nhk.or.jp **Co-Project Manager:** **Mr Byung Sun KIM, KBS** bskim2000@kbs.co.kr **Mr Halil Us, TRT** halil.us@trt.net.tr **Zhou Yun, ABS/RTPRC** zhouyun@abs.ac.cn **Hu Xiao, ABS/RTPRC** huxiao@abs.ac.cn **Mr. P.S.Srivastava** pss_18@yahoo.com
2.	**Systems for people with special needs P/SN**	1. Study activities related to broadcast service for people with special needs done by other organisations 2. Make possible contributions to international forums or organizations if necessary	1. Report to members outlining broadcast service and systems in place to serve people with special needs 2. Contributions to relevant international forums or organizations **Time Period: Sept 2025**	**Ms. Reiko TAKOU** takou.r-go@nhk.or.jp **Mr D Birlananth, Prasar Bharati** birlananth@prasarbharati.gov.in **Mr. R.P. Joshi** rpjoshi.delhi@gmail.com **KBS, TBS, RTPRC, TRT**
3.	**IT -based Production System and file-based workflows P/ITPS**	1. Study use cases of IT -based programme production systems, which are implemented, or being implemented in broadcasters' facilities. 2. Gather the information about operational know-how in total production chain of the systems above. 3. Collaborate with P/RTA if necessary, especially in metadata or storage issues. 4. Prepare a monograph on IT -based programme production systems if possible.	1. Report to members outlining use cases of IT-based programme production systems and the information about operational know-how in total production chain of the above systems. 2. Monograph on IT -based programme production systems. **Time Period: Sept 2025**	**Mr Okan Salman, TRT** okan.salman@trt.net.tr **Co-Project Manager** **Mr Daeyang Kim, KBS** kimdaeyang@kbs.co.kr **Mr Gökhan Tikit, TRT** gokhan.tikit@trt.net.tr **Mr Nguyen Duc Tue, VTV** tuend72@vtv.gov.vn **Mr P S Srivastava, DDI** pss_18@yahoo.com **Mr. R.P. Joshi** rpjoshi.delhi@gmail.com **Mr Alireza Abedin, IRIB** a_abedini@irib.ir **CCTV/RTPRC;TDM;TVB [Manufacturers]**

	PROJECT TOPIC	TASKS	DELIVERABLES	PROJECT MANAGER
4.	**Big Data, Personalisation and Artificial Intelligence** **P/BDAI**	1. Study use cases of Big Data and technologies like Artificial Intelligence (AI) within broadcasting and media organisations. 2. Gather information about how Data analysis is used for personalisation and how it can be utilised by broadcasters. 3. Study how AI technologies can be deployed and used within production environment and other related applications for broadcasters.	1. Report to members on use cases and applications of Big Data and AI within broadcast and media organisations. 2. Report on the use of Data analytics for personalisation and to understand audience requirements and preferences. **Time Period: Sept 2025**	**Project Manager** **Dr Byunghee Jung, KBS** bhjung@kbs.co.kr **Co-Project Manager** **Mr. Taro MIYAZAKI** miyazaki.t-jw@nhk.or.jp **Dr Sansung KIM, KBS TRI** sansung@kbs.co.kr **Li xiao, ABS/RTPRC** lix@abs.ac.cn **Zhao Ming, ABS/RTPRC** zhaoming@abs.ac.cn **Zheng Ruidi, ABS/RTPRC** zhengruidi@abs.ac.cn **Ms. Wang Yi, ABP/RTPRC** wangyiamy@abp2003.cn

TOPIC AREA: DISTRIBUTION

Chairman: Dr Hirokazu Kamoda, kamoda.h-ci@nhk.or.jp
Secretary: ABU-TD, td@abu.org.my

	PROJECT TOPIC	TASKS	DELIVERABLES	PROJECT MANAGER
1.	**Digital Terrestrial Television Broadcasting** **D/DTTB**	1. Investigate next generation terrestrial television broadcasting technologies and efforts toward their implementation. 2. Investigate mobile reception technologies for terrestrial broadcasting services. 3. Study the development of 5G technology and its applications in broadcasting delivery and related services. 4. Investigate other initiatives and developments related to digital terrestrial television broadcasting (DTTB). 5. Study the use and regulatory aspects of TV White Spaces (TVWS).	1. Report on next generation terrestrial broadcasting technologies and implementation efforts. 2. Report on mobile terrestrial broadcasting, including services for handheld and mobile devices. 3. Report on the development of 5G technologies and their applications in broadcasting. 4. Report on other initiatives and developments related to DTTB. 5. Report on the use and regulatory status of TVWS **Time period: Sept 2025**	**Mr Singo Asakura** asakura.s-ie@nhk.or.jp **Co-Project Manager:** **Dr Jeon Sungho, KBS** jeonsh@kbs.co.kr **Mr Chen Delin, ABS/RTPRC** chendelin@abs.ac.cn **Mr Halil Us, TRT** halil.us@trt.net.tr **Mr D.P. Singh, Prasar Bharati** dpsingh@prasarbharati.gov.in **Mr Rajesh Meena, Prasar Bharati** meena@prasarbharati.gov.in **Mr A K Mangalgi, Doordarshan** amangalgi@yahoo.com **Zhang Yu, ABS/RTPRC** zhangyu@abs.ac.cn **Xiao Jingting, ABS/RTPRC** xiaojingting@abs.ac.cn
2.	**Integrated Broadcast-Broadband and OTT** **D/IBBOTT**	1. Study technologies and specifications related to Integrated Broadcast-Broadband (IBB) platforms. 2. Investigate technologies that enhance broadcasting services in various aspects including integration with OTT platforms. 3. Study information security for broadcasting services delivered via airwaves and/or communication networks (e.g., content protection, conditional access, digital rights management systems). 4. Study cybersecurity measures in broadcasting industry to protect broadcasting infrastructure and services.	1. Report on technologies and specifications of IBB platforms. 2. Report on technologies enhancing broadcasting services, including integration with OTT platforms. 3. Report on information security for broadcasting services over airwaves and communication networks. 4. Report on cybersecurity measures in the broadcasting industry. **Time period: Sept 2025**	**Dr Go Ohtake, NHK** ohtake.g-fw@nhk.or.jp **Co-Project Manager:** **Mr A K Mangalgi, Doordashan** amangalgi@yahoo.com **Mr R.P. Joshi, All India Radio** rpjoshi.delhi@gmail.com **Dr Hirokazu Kamoda, NHK** kamoda.h-ci@nhk.or.jp **Mr Hiroki Endo, NHK** endou.h-hc@nhk.or.jp **Zhang Dingjing, ABS/RTPRC** zhangdingjing@abs.ac.cn **Zhang Yu, ABS/RTPRC** zhangyu@abs.ac.cn **Zhang Wei, ABS/RTPR** zhangwei@abs.ac.cn **He Jing, ABS/RTPRC** hejing@abs.ac.cn **Wang Lei, ABS/RTPRC** wanglei@abs.ac.cn
3.	**Satellite Broadcasting D/SB**	1. Investigate the latest satellite broadcasting technologies and challenges. 2. Study the specifications of latest satellite broadcasting systems.	1. Report on the latest satellite broadcasting technologies. 2. Report on the specifications of latest satellite broadcasting systems. 3. Report on advanced satellite broadcasting	**Mr Masashi Kamei, NHK** kamei.m-kw@nhk.or.jp **Co-Project Managers:**

	PROJECT TOPIC	TASKS	DELIVERABLES	PROJECT MANAGER
		3. Investigate advanced satellite broadcasting technologies using Ka band, etc.	technologies utilizing the Ka band and other high frequency bands. **Time period: Sept 2025**	**Mr K K Rao, Prasar Bharati** kkrao@prasarbharati.gov.in
4.	**Digital Sound Broadcasting Systems** **D/DSBS**	1. Follow developments in digitally modulated radio transmissions in broadcasting, and examine issues related to transition from analogue services to digital services and implementation. 2. Examine issues related to transition from analogue services to digital services in the FM band. 3. Examine the implementation in the medium and shortwave bands.	1. Report on digital radio, including relevant information on ITU-R recommended systems and developments in digital receivers. 2. Report on implementation issues and possibilities. **Time period: Sept 2025**	**Project Manager** **Co-Project Managers:**

TOPIC AREA: **TRAINING AND SERVICES**
Chairman: **Mr P Das, Prasar Bharati, pdasdelhi@gmail.com**
Secretary: ABU-TD, td@abu.org.my

	PROJECT TOPIC	TASKS	DELIVERABLES	PROJECT MANAGER
1.	**Technical Training Priorities and Members Requirements TS/TTPMR**	1. Periodically conduct surveys among members to understand the requirements and priority areas by members and based on these suggest topics for training. 2. Identify requirement of Technical Advisory Services for Member organisations 3. Work with ABU Media Academy to develop: - curriculum-based training programmes - a certification system with different levels - effective monitoring and assessing methods to evaluate how beneficial the training workshops/seminars have been to members. 4. Collaborate with AMA and other established Media Training Academies of members	1. Survey Report on Member requirements 2. List of Priority Areas, Topics and Program Schedule for training 3. Certification and Evaluation Template 4. Database of training academies and training programmes offered by them 5. Databse of Production/ B'cast Technology/ equipment used by Members 6. Database of Resource Persons along with Topics, **Time period: Sept 2025**	**Project Manager:** **Mr. Prakash Veer, Prasar Bharati** p.veer@gov.in **Co-Project Managers:** **Mr. J.B.Roy, Prasar Bharati** jbroy@prasarbharati.gov.in **Mr. Ravinder Kumar, Prasar Bharati** ravinderkumar@prasarbharati.gov.in **Contributors:**
2.	**Skill Development Programme for Managerial, and Occupational Safety TS/ SDPMOS**	1. Identify and develop training programmes for non-technical, managerial, financial and occupational safety and skills enhancement 2. Conduct surveys to study members requirements on these areas such as General management, Health & Safety considerations. 3. Explore the best possible ways of delivery of such training and good practice methods within the industry	1. List of non-technical, managerial, financial Skills courses that can be organised. 2. Identify and suggest at least one such topic to be included in the TD training calendar annually based on member requirements 3. Find out Standard Operating Procedures (SOP) and best practice methods adopted by members on different situations and work environment in general 4. develop standard code of conduct and work ethics information manual 5. Develop a disaster recovery and response manual that can be used in technical areas **Time period: Sept 2025**	**Project Manager**: **Mr. R.K.Joshi, Prasar Bharati** rkjoshi@prasarbharati.gov.in **Co-Project Managers:** **Mr. Ravinder Kumar, Prasar Bharati** ravinderkumar@prasarbharati.gov.in **Dr. D.K. Mazumder, Prasar Bharati** dkmazumder@prasarbharati.gov.in **Mr. Ashok Kr. Panigrahi, Prasar Bharati** akpanigrahi1@prasarbharati.gov.in **Contributors:**
3	**Technical Skill Building and Knowledge Sharing TS/TSBKS** **OR** **High-Tech Exposure & Knowledge Sharing TS/TEKS**	1. Work with industry partners and international events to identify applicable training opportunities available in broadcasting field eg: ITU, IABM, SMPTE etc. 2. Explore and develop a staff exchange or short-term attachment programme among members. 3. Explore easy ways how redundant or in excess equipment from members can be acquired and utilised by other members who can use them.	1. MoU with Industry Partners 2. Guidelines for staff exchange programme 3. Members' Information Exchange platform **Time period: Sept 2025**	**Project Manager:** **Mr. K. Murugan , Prasar Bharati** murugan_k@prasarbharati.gov.in **Co-Project Managers:** **Mr Devesh Kumar, Prasar Bharati** devesh@prasarbharati.gov.in **Mr. J. B. Roy, Prasar Bharati** jbroy@prasarbharati.gov.in **Contributors:**

TOPIC AREA: SPECTRUM

Chairperson: Dr Li Leilei, RTPRC, lileilei@abp2003.cn

Secretary: Veysel Binbay, ABU-TD, veysel@abu.org.my

	WRC-27 ISSUES			
	PROJECT TOPIC	**TASKS**	**DELIVERABLES**	**PROJECT MANAGER**
1.	**to consider a possible new primary allocation to the fixed-satellite service (space-toEarth) in the frequency band 17.3-17.7 GHz and a possible new primary allocation to the broadcasting-satellite service (space-to-Earth) in the frequency band 17.3-17.8 GHz in Region 3, while ensuring the protection of existing primary allocations in the same and adjacent frequency bands, and to consider equivalent power flux-density limits to be applied in Regions 1 and 3 to nongeostationary-satellite systems in the fixed-satellite service (space-to-Earth) in the frequency band 17.3-17.7 GHz, in accordance with Resolution 726 (WRC-23);** **(WRC-27 AI 1.4)**	1. Follow developments of studies in **relevant SGs and WPs of ITU-R** to identify and possible impact on Broadcasting Services. 2. Possible impact on broadcasting service in Asia-Pacific Area.	1. From time to time, circulate among ABU members, relevant information on sharing studies. 2. Preparation of ABU contributions to the relevant SGs and WPs of ITU-R, APT and others. **Reports: As required.** **Time Period: Sept 2025**	**Project Manager** **Co-Project Managers:** **Mr. Rajeev Kumar** rajeev00kumar@yahoo.com **Contributors:**
2.	**to consider technical and regulatory measures for fixed-satellite service satellite networks/systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 42.5-43.5 GHz (Earth-tospace), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) for equitable access to these frequency bands, in accordance with Resolution 131 (WRC-23);** **(WRC-27 AI 1.6)**	1. Follow developments of studies in **relevant SGs and WPs of ITU-R** to identify and possible impact on Broadcasting Services. 2. Possible impact on broadcasting service in Asia-Pacific Area.	1. From time to time, circulate among ABU members, relevant information on sharing studies. 2. Preparation of ABU contributions to the relevant SGs and WPs of ITU-R, APT and others. **Reports: As required.** **Time Period: Sept 2025**	**Project Manager** **Co-Project Managers:** **Mr. Rajendra Kumar** rkumar@prasarbharati.gov.in **Contributors:**

	WRC-27 ISSUES			
	PROJECT TOPIC	**TASKS**	**DELIVERABLES**	**PROJECT MANAGER**
3.	**to consider appropriate regulatory actions to update Appendix 26 to the Radio Regulations in support of aeronautical mobile (OR) high frequency modernization, in accordance with Resolution 411 (WRC-23); (WRC-27 AI 1.9)**	1. Follow developments of study results in **relevant SGs and WPs of ITU-R** 2. Possible impact on broadcasting service in Asia-Pacific Area.	1. From time to time, circulate among ABU members, relevant information on sharing studies. 2. Preparation of ABU contributions to the relevant SGs and WPs of ITU-R, APT and others. **Reports: As required.** **Time Period: Sept 2025**	**Project Manager** **Co-Project Managers:** **Mr. Rajeev Kumar** rajeev00kumar@yahoo.com **Contributors:**
4	**to consider developing power flux-density and equivalent isotropically radiated power limits for inclusion in Article 21 of the Radio Regulations for the fixed-satellite, mobile-satellite and broadcasting-satellite services to protect the fixed and mobile services in the frequency bands 71-76 GHz and 81-86 GHz, in accordance with Resolution 775 (Rev.WRC-23); (WRC-27 AI 1.10)**	1. Follow developments of study results on **relevant SGs and WPs of ITU-R** 2. Possible impact on broadcasting services.	1. From time to time, circulate among ABU members, relevant information on sharing studies. 2. Preparation of ABU contributions to the relevant SGs and WPs of ITU-R, APT and others. **Reports: As required.** **Time Period: Sept 2025**	**Project Manager:** **Dr. Li Leilei** **lileilei@abp2003.cn** **Co-Project Managers:**
5	**to consider studies on possible new allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage, in accordance with Resolution 253 (WRC-23);** **(WRC-27 AI 1.13)**	1. Follow developments of study results on **relevant SGs and WPs of ITU-R** 2. Possible impact on broadcasting services.	1. From time to time, circulate among ABU members, relevant information on sharing studies. 2. Preparation of ABU contributions to the relevant SGs and WPs of ITU-R, APT and others. **Reports: As required.** **Time Period: Sept 2025**	**Project Manager:** **Dr. Li Leilei** **lileilei@abp2003.cn** **Co-Project Managers:**

	WRC-27 ISSUES			
	PROJECT TOPIC	**TASKS**	**DELIVERABLES**	**PROJECT MANAGER**
6	**to consider regulatory provisions for receive-only space weather sensors and their protection in the Radio Regulations, taking into account the results of ITU Radiocommunication Sector studies, in accordance with Resolution 682 (WRC-23);** **(WRC-27 AI 1.17)**	1. Follow developments of study results on **relevant SGs and WPs of ITU-R** 2. Possible impact on broadcasting services.	1. From time to time, circulate among ABU members, relevant information on sharing studies. 2. Preparation of ABU contributions to the relevant SGs and WPs of ITU-R, APT and others. **Reports: As required.** **Time Period: Sept 2025**	**Project Manager:** **Dr. Li Leilei** **lileilei@abp2003.cn** **Co-Project Managers:**

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Asia-Pacific Broadcasting Union
MNB
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Tuushin Hotel, Ulaanbaatar, Mongolia

Asia-Pacific Broadcasting Union

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Status Reports

Doc T-25/20-1

STATUS REPORT

Organisation:	Voice of Vietnam (VOV)		
Period:	2025	Date of Report:	2025.19.08

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

- Drafted and piloted an electronic document management & filing process within the Office.

- New Services/new projects initiated

- Commission the Coastal Radio Channel, dedicated to coastal residents and motorists traveling routes along Vietnam's 3,260-km coastline.

- Research projects

- Research solutions to transform the production and distribution model for multimedia programs.
- Research, compile, and develop a digital dictionary system for ethnic minority languages to support ethnic-language radio broadcasting.
- Research energy-saving solutions for FM broadcasting systems.

- Internet and Mobile Broadcasting Services

- Develop the VOV News mobile application that aggregates all VOV websites into a single app.

			Radio	Television
Coverage %			91,6%	0%
Programme Channels			8	0
Studios (Production)	File-based Set-up	R/N/D	R	
	SDTV	R/N/D		
	HDTV	R/N/D		
	UHDTV			
	IP Based Set-up	R/N/D		
Transmission & Delivery	HF	R/N/D	D	
	MF	R/N/D	R	
	FM	R/N/D	R	
	TV	R/N/D	D	

	OTT/IBB/Internet Services	R/N/D	R	
	Mobile Services	R/N/D	R	

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	**Area**	**Brief Details:** **1. Objectives** **2. Progress to date**	**Challenges/Problems Faced:** **1. Lack of resources** **2. Lack of know-how** **3. Others (e.g. up-skilling)**	**Solutions Implemented/Type of assistance requirement from ABU**
1.	**Development projects/Upgrading facilities/Training**	Training courses	Enhancing reporting and technical skills for VOV's reporters and technicians	Financial shortage Lack of speaker	ABU supports haft of related costs ABU seeks qualified speakers for the training course (this is the most important requirement)
		Facilities to distribute Podcast	Developing a system/ effective distribution channel for podcast	Lack of international consultation	ABU seeks successful model to share its experience to VOV
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		Technical meetings	VOV didn't join	Lackage of budget	
		Webinars	Reporters registered to join actively		
		Abu Confest	4 VOV's reporters joining in Malaysia		
		ABU GA	6 VOV's cadres joining in Mongolia		
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1** **Organizing a Podcast training course in November**			ABU supports Flight ticket for speaker VOV will cover all the others related cost
		Activity 2 **Organizing a tachnical workshop in October**			ABU supports Flight ticket for speaker VOV will cover all the others related cost
		Activity 3			

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU

Doc T-25/20-2

STATUS REPORT

Organisation:	Radio Television Hong Kong (RTHK)		
Period:	Oct 2024 to Aug 2025	Date of Report:	25 Aug 2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

- Adoption of AI Technology

1. Launch of live video transcript generator and on-demand audio transcript generators using Automatic Speech Recognition (ASR) AI modes and cloud technology to allow newsroom staff to read the transcripts in nearly real time while viewing the videos
2. Deployment of a pilot platform for automated media asset tagging, featuring capabilities such as transcription, summarization, translation, face recognition, scene detection, object detection, as well as including advanced AI search with contextual understanding and prompt generation capabilities
3. Launch of AI technology for subtitle production and automatic summarization during the production of TV programmes
4. Expansion of AI Laboratory for the development of AI tools for video and audio production, including live voice to transcript, summary and generative animated videos; photo to videos, enhanced video restoration and voice cloning
5. Deployment of an AI-powered Chatbot for the RTHK website

- Studio Upgrade

6. Upgrade of the studio facilities and broadcast network for 4K filming, live production and web streaming
7. Deployment of a large scale curved LED wall and cinematic cameras with Extended Reality TV production

- Developments in TV/ Radio production

8. Deployment of 4K microwave links for Outside Broadcast
9. Deployment of 4K Outside Broadcast Truck with full IP based broadcast systems and 5G mobile transmission for TV production
10. Deployment of super slow motion cameras and recording system for TV sports production
11. Deployment of automatic workflow for 4K and closed subtitling on RTHK website and mobile applications
12. Deployment of Cloud Editing with camera to the Cloud for field production
13. Deployment of Disaster Recovery service for TV broadcasting using cloud technology
14. Deployment of Demodulators, IRD pools and Monitoring system for 2025 China National Games

15. Launch of new DTT presentation systems for pop-up channel for China National Games
16. Launch of a new ingestion centre for TV production
17. Launch of a remote TV production systems for live TV event via dark fibre solution
18. Adoption of two-tier firewall systems for media production network
19. Adoption of Identity Access Management System to enhance the security measures and remote support services on TV production network

- **Enhancements in Transmission**

20. Improvement of the Remote Monitoring System and Studio-to-Link (STL) System of DTT broadcast networks
21. Expansion of the population coverage of the new FM channel (CNR "The Greater Bay") to 99%
22. Replacement of aged FM broadcast antennas at one FM transmitting station
23. Relocation of FM broadcast frequencies at three FM transposer stations for overall frequency planning optimization
24. Replacement of the aged AM guyed antenna mast and combining system at an AM transmitting station

- New Services/new projects initiated

- Adoption of AI Technology

1. Development of electronic scheduling system for radio production workflow
2. Enablement of AI tools in video and audio post-production

- Development of Cloud Technology

3. Adoption of cloud technology for Disaster Recovery service for radio broadcast
4. Enablement of cloud technology for studio production

- **Enhancements in Transmission**

5. Replacement of legacy E1 links by IP links for Studio-to-Link (STL) system of radio broadcast networks
6. Improvement works for DTT Single Frequency Network (SFN) monitoring system

- Research projects

1. Research on integration of the automatically generated media asset tagging into the existing archive systems
2. Research on 4K playout and 4K transmission on DTT platform
3. Adoption of CWDM/DWDM video transmission via dark fibres between campuses
4. Research on new single headend system to support subtitling services for both DTT and OTT platforms
5. Research on Live speech/ texts to sign languages and vice-versa

- Internet and Mobile Broadcasting Services

1. Migration of the RTHK main web services from on-premises infrastructure to cloud platform
2. Deployment of DRM for TV archive playback on RTHK online platform

3. Enhancement of the RTHK TV application to incorporate playback for 4K archive programmes and caption selection
4. Consolidation of mobile apps into single mobile apps

			Radio	Television
Coverage %			99% (AM/FM)	99% (DTT)
Programme Channels			4 (FM) 4 (AM)	6 (DTT, High Definition)
Studios (Production)	File-based Set-up	R/N/D	R	
	SDTV	R/N/D		N/A
	HDTV	R/N/D		R
	UHDTV			N
	IP Based Set-up	R/N/D		N
Transmission & Delivery	HF	R/N/D	N/A	
	MF	R/N/D	R	
	FM	R/N/D	R and N	
	TV	R/N/D	N/A	R and N
	OTT/IBB/Internet Services	R/N/D	R	R and N
	Mobile Services	R/N/D	R	R and N

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges / Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented / Type of assistance requirement from ABU
1.	Development projects / Upgrading facilities / Training	Evaluating 4K transmission on DTT platform	Improve audience experience	• Insufficient resources to enable 4K playout, headend system and archiving system • Insufficient technical manpower resources for long-term support	• Closely cooperated with suppliers and contractors in knowledge sharing • Intensive training and skill transfer for internal staff Closely cooperated with programme sections to produce more 4K contents
		Developing AI auto tagging	• Assist in analysis of video / audio / photo • Develop a smart search engine using natural language on top of traditional keywords search Integration with existing archive systems	• Insufficient expertise in providing regional specific tagging features • Insufficient experience in managing the security among multiple applications and processes • Require more knowledge and experience in building up retrieval augmented generation insufficient knowhow on effective management of the integration involving multiple vendors	• Arrange data scientists for knowledge sharing • Arrange successful case sharing • Intensive training and skill transfer for internal staff

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges / Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented / Type of assistance requirement from ABU
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		ABU Digital Broadcasting Symposium 2025	Attendance. giving presentations and sharing		
		ABU Technical Committee Meetings 2025	Nomination of Engineering Awards, attendance, giving presentations and sharing		
		CCBN-ABU NEXUS Event, 2025	Attendance, giving presentation and sharing		
		ABU webinar series on different technology topics	Audience		
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1**	Provide case study / sharing on utilizing computer vision processing and complex speech decomposition using AI & Cloud technologies		
		Activity 2	Provide sharing sessions for live speech/texts to sign languages and vice-versa using AI & Cloud technologies		
		Activity 3			

Doc T-25/20-3

STATUS REPORT

Organisation:	Mediacorp Pte Lte		
Period:	2025	Date of Report:	6 August 2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency
  - Completed the implementation of cloud archival.
  - Completed the delivery of 4K OB van.
- New Services/new projects initiated
  - Nil
- Research projects
  - Nil
- Internet and Mobile Broadcasting Services
  - Launched FAST channel in North America.

			Radio	Television
Coverage %			100%	100%
Programme Channels			11	6
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		
	HDTV	R/N/D		
	UHDTV			
	IP Based Set-up	R/N/D		
Transmission & Delivery	HF	R/N/D		
	MF	R/N/D		
	FM	R/N/D		
	TV	R/N/D		
	OTT/IBB/Internet Services	R/N/D		
	Mobile Services	R/N/D		

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	Development projects/Upgrading facilities/Training	Cloud TV Playout	• To trial cloud TV playout. • Tender process.	• High operating cost. • Unsure of the performance. • Unsure of technical support etc	The technical/operation issues shall surface when it is implemented.
		Media IP infrastructure project	• To upgrade existing baseband central infrastructure. • Tender process.	• Technology refresh • Lack of baseband router choices	The technical/operation issues shall surface when it is implemented.
2.	Participation in ABU Activities	Area	Level of Participation	Reasons for not participating (though interested)	
		Training	Attended DBS	NA	
		ABU Session at Broadcast Asia 2025	Peh Beng Yeow participated as the moderator.	NA	
		ABU Engineering Award 2025	Participated in the judging process.	NA	
3.	Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform	Activity 1			
		Activity 2			
		Activity 3			

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU

Doc T-25/20-4

STATUS REPORT

Organisation:	MNB Mongolian National Broadcaster		
Period:	2024-2025	Date of Report:	2025.08.14

PART A

Technical Developments during the past year:
• System upgrades/changes to practices for improved quality/efficiency We are trying to 4K and buyed 4K camera
• New Services/new projects initiated Digital archive solution. Project is ongoing
• Research projects Ai live translation we are working live subtitle and live translation with ai voice
• Internet and Mobile Broadcasting Services 4G/5G news gathering system 4G/5G live transmition, Mnb App OTT service 5 video channel 2 radio channel

			Radio	Television
Coverage %				
Programme Channels			2	5
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		
	HDTV	R/N/D	9	5
	UHDTV			
	IP Based Set-up	R/N/D		
Transmission & Delivery	HF	R/N/D		
	MF	R/N/D		
	FM	R/N/D	2	
	TV	R/N/D		
	OTT/IBB/Internet Services	R/N/D	2	5
	Mobile Services	R/N/D		

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	**Development projects/Upgrading facilities/Training**	TV and Radio Digital archive project	1. Tv archive digitalazation and radio archive digitalation 2. 2025 q4	1. Old ingest equipments not manufacturing can't find market	Wanna find from ABU members some old equipment 1. U-Matic Type Video Cassette Tape Recorder Editor Player 2. Betacam video player 3. DVCAM video player 4. HI 8 video player 5. XDCAM video player that type of old player can't find in market
		MNB APP OTT platform	1. 5 MNB video channel 2 radio channel 2. 2024 q3		Wanna to watch similar OTT solutions from ABU members and wanna visit and wanna to know-how
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		2025 april Beijing CCBN Nexus event	Joined CTO MNB		
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1**			
		Activity 2			

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
		Activity 3			

Doc T-25/20-5

STATUS REPORT

Organisation:	Vanuatu Broadcasting & Television Corporation (VBTC)		
Period:	2025	Date of Report:	11/08/2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

We have installed the following;

- WinMedia automation software on our TV services
- We have intergrade communication system between RTS, Hollyland and Unity Intercom to improve efficiency between our field team and the team in Studio.

- New Services/new projects initiated
  - We have initiated the Digitisation of our old footage on Beta SP tape.
  - Working on the roadmap and costing for a DTV site.
  - We are working to create App for Music, News and Content.

- Research projects

We are doing some research projects on the deployment and cost for the Digital TV

- Internet and Mobile Broadcasting Services

			Radio	Television
Coverage %			100%	100%
Programme Channels			3 Radio channels	1 TV channel
Studios (Production)	File-based Set-up	**R**/N/D	Upgrade	
	SDTV	**R**/N/D		Upgrade in our TV Studio and Broadcast
	HDTV	R/**N**/D		New still having feasibility studies
	UHDTV			Not yet
	IP Based Set-up	R/**N**/D		Upgrade to SRT
Transmission & Delivery	HF	**R**/N/D	Operational	
	MF	**R**/N/D	Operational	

	FM	**R**/N/D	Operational	
	TV	**R**/N/D	Operational	
	OTT/IBB/Internet Services	R/**N**/D	Feasibility studies	
	Mobile Services	R/**N**/D	Feasibility studies	

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	**Development projects/Upgrading facilities/Training**	Streaming	1. Musical App, News App and Content App 2. Launch on 1st September 2025	1. We have the resources 2. Lack of know-how 3. Need upskilling.	Get training on how to create an App that can be used in monetizing revenue for VBTC.
		TV ON Air Broadcast	1. Create a seamless workflow for the On Air techs in TV 2. Complete	1. We have to purchase the equipment offshore 2. Lack of know-how 3. Need continuous training.	Provide ongoing training.
		TV Recording Studio	1. Enable the director to talk with the presenters and for the reporters to talk with field team. 2. Complete	1. We have to purchase the equipment offshore 2. Lack of know-how 3. Need continuous training.	Provide ongoing training.
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		CONfest Malaysia	Head of Content and two producers.		
		ABU GA 2025	Not able	Lack of funds	
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1**	1. Technical Training level 2. To advance knowledge of the Technician	1. Lack of resources 2. Lack of know how 3. upskilling	Provide webinar or in country
		Activity 2	1. Audio Training 2. To enable content makers to edit audio files in a proper format	1. Lack of resources 2. Lack of know-how 3. upskilling	Provide webinar or in country training
		Activity 3	1. Video Editing Training. 2. To enable content makers to proper edit	1. Lack of resources 2. Lack of know-how 3. upsakilling	Provide webinar or in country training.

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
			video footage using proper format.		

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Asia-Pacific Broadcasting Union
MNB
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TECHNICAL COMMITTEE MEETING

11-12 September 2025
Tuushin Hotel, Ulaanbaatar, Mongolia

Doc T-25/20-6

STATUS REPORT

Organisation:	National Broadcasting Services of Thailand (NBT-Thailand)		
Period:	2024-2025	Date of Report:	August 28th 2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

  - In 2024, all radio equipment for the five radio frequencies was replaced and upgraded.

  - The equipment in the television broadcasting rooms, 1 room of 1000 square meters, 2 rooms of 400 square meters, and 1 room of 150 square meters, has been completely renovated. They can produce high-definition 4K programs and have a virtual studio system at the PRD Media Operation Centre.

  - Equipment was allocated to support live streaming across 69 stations, including provincial public relations departments and the central media department, utilizing 4G/5G network technology.

  - Provide a multimedia management system (Media Asset Management – MAM) to facilitate the exchange of public relations media, enabling the search and efficient management of digital media.

- New Services/new projects initiated

  - In 2025, plan to replace and upgrade radio equipment for six radio frequencies.

  - Produced public relations media signs (Video Wall Outdoor Media) at 8 stations nationwide, with central management in Bangkok.

  - Provides FM and AM radio frequency spurious emission detection equipment with accessories.

  - Equipment will be allocated to support live streaming across 30 stations, leveraging 4G/5G network technology.

- Research projects

  - NBT-Thailand has successfully completed the implementation of text transmission using the Radio Data System (RDS), as specified by the National Broadcasting and Telecommunications Commission Office.

  - NBT-Thailand is conducting research on Digital Audio Broadcasting (DAB+) technology.

- Internet and Mobile Broadcasting Services

  - NBT-Thailand provides over-the-top (OTT) services under the name “PRDEE” at https://prdee.prd.go.th/.

			Radio	Television
Coverage %			97% of household	95.1% of household
Programme Channels			79 FM / 25 AM	1 Nationwide. (NBT2 HD) 4 Regional Programs (NBT 11)
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		
	HDTV	R/N/D		
	UHDTV			
	IP Based Set-up	R/N/D		
Transmission & Delivery	HF	R/N/D		
	MF	R/N/D		
	FM	R/N/D	R	
	TV	R/N/D	N	Ensure backup coverage for the main station in Bangkok and its surrounding areas.
	OTT/IBB/Internet Services	R/N/D	N	
	Mobile Services	R/N/D	N	

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	Development projects/Upgrading facilities/Training	Provincial radio station	1. replace and upgrade radio equipment for six radio frequencies. 2. Finished in 2026	Procurement process	
		Bangkok	All of studio will finish in 2026 (5 studios)	Lack of Procurement process	
2.	Participation in ABU Activities	Area	Level of Participation	Reasons for not participating (though interested)	
3.	Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform	Activity 1			
		Activity 2			
		Activity 3			

Doc T-25/20-7

STATUS REPORT

Organization:	Public Service Broadcasting Nepal, Radio Nepal		
Period:	Till date	Date of Report:	2.09.2025

PART A

Technical Developments during the past year:
• System upgrades/changes to practices for improved quality/efficiency • Study and Plan for digital platform in operation • Upgrade FM relay stations • Digital audio archiving • Installations of FM relay stations • Start Study on Digital switchover AM/FM and OTT • Digital networking and New Services/new projects • Connectivity on audio link via OFL,DTH, Satellite • New studio upgrade and new installation • Digital Platforms • Internet and Radio Nepal Mobile App (Android and IOS) • Podcasting
• Research projects on broadcasting sectors • Project on emergency warning broadcast system via radio • Study on Second audio channel

			Radio	Television
Coverage %			Most of the urban areas and some remote places	
Programme Channels			Central one channel and other province channels	
Studios (Production)	File-based Set-up	**R**/N/D	Content Sharing Service	
	SDTV	R/N/D		
	HDTV / UHDTV	R/N/D		
	IP Based Set-up	R/N/D		
Transmission & Delivery	HF	**R**/N/D	STL link	
	MF	**R**/N/D	AM (3 Stations)	
	FM	R/**N**/D	FM (36 Stations)	
	TV	R/N/D		
	OTT/IBB/Internet Services	R/**N**/D	You tube, Tune core, social media	

	Mobile Services	R/**N**/D	Mobile App	

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	**Area**	**Brief Details:** **1. Objectives** **2. Progress to date**	**Challenges/Problems Faced:** **1. Lack of resources** **2. Lack of know-how** **3. Others (e.g. up-skilling)**	**Solutions Implemented/Type of assistance requirement from ABU**
1.	**Development projects/Upgrading facilities/Training**	Upgrading FM Broadcasting	1. Increase coverage	1. Lack of resources 2. Lack of budget 3. Lack of international networking	Radio Nepal is still in an analogue broadcasting the country has plan to switchover in digital broadcasting. Radio Nepal needs support from ABU and other counties technical support for digital broadcasting in Nepal.
		Online Vacancy Management System	1. Implement an online system to recruit new staff		
		Multi Media Content Creation	1. To post in YouTube 2. Up skilling		
		Digital Platforms	1. Upgrading analogue system		
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		…	…	Most of the time we are not able to participating the event because of the budget.	
		Online Activities	Different level Staffers		
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1**	Digital Networking, OTT		
		Activity 2	Digital switchover		
		Activity 3	AI and ICT		

Submitted by: ***Er. Udaya Krishna shrestha***
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Doc T-25/20-8

STATUS REPORT

Organisation:	Sri Lanka Rupavahini (TV) Corporation		
Period:	01/01/2023 - 15/09/2024	Date of Report:	27/09/2024

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency
  a) Launched of Rupavahini HD transmission on IPTV Platform
  b) Launched of VHF 06 transmission from main Tx station while operating **adjacent-channels** from same TV location.
  c) Social Media platforms were integrated with Television Programmes to cater new audience and also gather instant feedback from viewers.
  d) Launched new web sites for all three television channels using content promotion-based templates.
- New Services/new projects initiated
  a) Internet Radio
- Research projects
- Internet and Mobile Broadcasting Services
  a) OTT and IPTV based HD broadcasting services project started.

			Radio	Television
Coverage %				80
Programme Channels				3
Studios (Production)	File-based Set-up	R/N/D		R
	SDTV	R/N/D		R
	HDTV	R/N/D		
	UHDTV			
	IP Based Set-up	R/N/D		N
Transmission & Delivery	HF	R/N/D		
	MF	R/N/D		
	FM	R/N/D		
	TV	R/N/D		N
	OTT/IBB/Internet Services	R/N/D		R
	Mobile Services	R/N/D		N

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	**Development projects/Upgrading facilities/Training**	Studio Technical infrastructure	To Upgrade the Studio production quality to HD (in progress)	Lack of resources/ funds	Knowledge Experiences and Financial Assistanc
		OB Trucks	To facilitate HD production in Outside locations (in progress)	Lack of resources/ funds	Knowledge Experiences and Financial Assistanc
		HD Linking and Decoding units	to be linked HD feeds to and from SLRC and to be decode foreign HD and UHD/ 4K / 8K feeds (yet to start)	Lack of resources/ funds	Knowledge Experiences and Financial Assistanc
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		Webinar Series on unlocking-the-future-of-video	Online participation with the relevant staff	Participated	
		Webinar Series on satellite-transmission	Online participation with the relevant staff	Participated	
		Webinar Series on disaster-management	Online participation with the relevant staff	Participated	
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1**	Webinar / Workshop	Workflow design from studio recordings, ingest, editing, archiving to transmission playout for file-based workflow. Introduction for Open-Source software for post production, playouts	
		Activity 2	Webinar	Case studies on SD to HD transformation, how to handle mix format transmission with existing materials	
		Activity 3	Webinar / Workshop	Virtual Studio Technology With AR, VR and relevant Open-Source software for multi camera Virtual Studio Productions	

Doc T-25/20-9

STATUS REPORT

Organisation:	TRT		
Period:	30.09.2024 – 25.08.2025	Date of Report:	29.08.2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency
  - The Digital Archive System Project - Present 4PB media archive and related database is migrated to and reachable by the new system. The data transfer to LTO-9 tape cartridges has been completed. System compatibility and user settings have been finalized. User trainings have been provided, and the Digital Archive System has been made available to the user.
  - Archive System (Diva-Oracle) Renewal and Expansion Project for TRT-World / TRT-Arabi channels – physical installation has been completed and renewed to LTO-9 and Tape Library capacity increased to 7,5PB. Media transfer to LTO-9 tape has been finalized.

- New Services/new projects initiated
  - Bilgin (Enterprise AI Assistant) – Ongoing project enabling TRT personnel to access organizational information seamlessly.
  - Virtual Speaker for TRT Radio – Ongoing project cloning broadcaster voices to automatically reproduce news content.
  - AI Event – Real-time transcription and translation into 52 languages for TRT's international events.
  - AI Live (Proof-of-Concept) – Prototype system delivering live transcripts for real-time broadcasts.
  - Katip for TRT News – Automated transcription and translation service for uploaded video and audio content.

- Research projects
  - AI-Powered Archive System: Intelligent archiving, indexing, and retrieval of media assets.
  - AI-Assisted Sign Language Solutions: Automatic sign language transcription, sign-to-text, and text-to-sign conversion.
  - AI-Driven Radio Theatre for TRT Radio: Synthetic voice generation and creative production support.
  - AI Content Authenticity Detection: System to distinguish AI-generated content from human-created content.
  - With artificial intelligence technologies, it is aimed to utilize advanced functions such as speech-to-text conversion, face recognition, classification of videos based on their content, detection of scenes based on keywords or individuals, and automatic clip generation.

- Internet and Mobile Broadcasting Services
  - AI Live (Proof-of-Concept) – Developed a prototype system that delivers real-time transcription for live streams.

			Radio	Television
Coverage %			TRT FM: %99.7 TRT Radio1: %93.6 TRT Nagme: %90.8 TRT Turku: %92.3 TRT Radio News: %88.9 TRT Radio 3: %82.3 TRT Radio Kurdi: %21.7 TRT Radio World: %30.59 TRT Radio Arabia: %21.4	TRT 1 : %98.4 TRT News: %98.1 TRT Sport : %96.8 TRT Kids : %92 TRT Kurdi : %16
Programme Channels			TRT FM TRT Radio 1 TRT Nagme TRT Turku TRT Radio News TRT Radio 3 TRT Radio Kurdi TRT Radio World TRT Arabia	TRT 1 TRT News TRT Sport TRT Kids TRT Kurdi
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		
	HDTV	R/N/D		
	UHDTV			
	IP Based Set-up	R/N/D		
Transmission & Delivery	HF	R/N/D		
	MF	R/N/D		
	FM	R/N/D		
	TV	R/N/D		
	OTT/IBB/Internet Services	R/N/D		
	Mobile Services	R/N/D		

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	**Development projects/Upgrading facilities/Training**	Bilgin (Enterprise AI Assistant)	1. Accessing organizational information easily. 2. Planned for release by the end of the year		Having enough knowledge and experience. No technical assistance is needed at this time.
		Digital Radio (DAB+)	In trial	Waiting the final frequency planning form RTUK. 8 radio programmes in Ankara, Istanbul, Izmit and Bursa broadcasting via DAB+.	Having enough knowledge and experience. No technical assistance is needed at this time.
		Digital TV (DVB-T2)	In trial	Waiting the final frequency planning form RTUK. 6 SD/3 HD TV programmes and 14 Radio prorammes in Ankara, Istanbul, Izmir, Adana and Bursa broadcasting via DVB-T2.	Having enough knowledge and experience. No technical assistance is needed at this time.
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		DBS2025 Malaysia (AI in Broadcasting)	Booth and speak for Showcase TRT's AI applications		
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1**			
		Activity 2			

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges / Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented / Type of assistance requirement from ABU
		Activity 3			

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Asia-Pacific Broadcasting Union
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MONGOLIAN NATIONAL BROADCASTER

TECHNICAL COMMITTEE MEETING

11-12 September 2025
Tuushin Hotel, Ulaanbaatar, Mongolia

Doc T-25/20-10

STATUS REPORT

Organisation:	RTPRC		
Period:	2024.9-2025.8	Date of Report:	2025.08.29

PART A

Technical Developments during the past year:

System upgrades/changes to practices for improved quality/efficiency

Accelerated Expansion of UHD Live Broadcasting

Nine provincial television broadcasters in China are currently establishing dedicated 4K UHD satellite channels. Among these, three channels have already successfully launched. The remaining six are scheduled to commence operations by September 2025. These 4K channels are being distributed across multiple platforms, including cable television, IPTV, and over-the-top (OTT) new media services, significantly enriching the overall viewing experience for audiences.

Technical Research and Validation Testing of Plug-in Set-Top Box

This initiative aims to develop a new generation of user-friendly set-top boxes with a compact form factor, reduced connection complexity, and lower costs. Key technical advancements include optimized electromagnetic compatibility (EMC) design, improved thermal dissipation performance, and comprehensive upgrades to both hardware and software architectures. These innovations collectively simplify installation and daily operation, ultimately leading to a more streamlined and superior viewing experience for the end-user. In addition, RTPRC has developed a tri-mode(infrared, Bluetooth, NearLink) universal remote control , with which users can operate both of the TV and the set-top box.

CBN National Internet Backbone Network (CBNET)

China Broadcast Network (CBN) has successfully implemented a critical national infrastructure project: the CBN National Internet Backbone Network (CBNET). This project was honored with the ABU Engineering Award on SDGs Implementation 2024. CBNET establishes an all-optical, intelligent network foundation, achieving comprehensive optical coverage across 31 provinces, 52 data centers, and over 400 network sites. Its fully intelligent capacity management enables efficient resource sharing among eight super cores, 31 provincial cores, and three National Access Points (NAPs)/direct interconnection points, with backbone traffic capacity reaching 7.2T. During its deployment, CBN pioneered a 400G network upgrade within the Yangtze River Delta Economic Zone. Furthermore, it marks the first large-scale deployment of IPv6+ innovative technologies on a national backbone network. A landmark achievement is the first-ever interconnection of provincial networks within China's broadcasting industry. This backbone is pivotal for integrating cable television and broadcast 5G into a unified, end-to-end national network, signaling its readiness to serve as the foundational National Cultural Network. Consequently, CBNET is capable of providing secure, high-capacity digital connectivity for cultural institutions and consumers at all levels across the nation, facilitating the digital production and online dissemination of spiritual and cultural products.

- New Services/new projects initiated

On-Site Production of 4K/8K UHD Video Using a 5G-A Millimeter Wave Light Compression Solution

CBN proposes leveraging the ultra-large bandwidth and low-latency characteristics of 5G-Advanced (5G-A) millimeter-wave technology to implement ultra-high-definition (UHD) light-compression real-time production and broadcasting. This initiative aims to achieve lightweight and wireless high-quality UHD real-time production from the content source. It will enable more flexible and efficient production of high-quality audiovisual services, such as 4K/8K UHD live broadcasts and multi-angle sports viewing, broadening innovation in production methods and enhancing content novelty. In September 2024 and April 2025, an end-to-end private network test system for 4K and 8K UHD light-compression real-time production was successfully established and tested. Field tests confirmed that the network performance—specifically bandwidth and latency—of this 5G-A millimeter-wave technology meets the requirements for 4K/8K light-compression uplink transmission, achieving stable transmission at ultra-high bitrates. Furthermore, professional evaluations conducted by the Super High-Definition Laboratory of the Academy of Broadcasting Science, NRTA, confirmed that the subjective and objective quality of the 4K/8K UHD videos produced using this 5G-A millimeter-wave light-compression solution is consistent with videos produced using traditional fiber-optic SDI transmission.

A Technical Solution Integrating Emergency Broadcasting with 5G RedCap

CBN has innovatively proposed a technical solution combining emergency broadcasting with 5G RedCap. The solution involves upgrading the modules of existing emergency broadcasting terminals in the broadcasting and television network to domestically produced IoT modules that support 5G RedCap. A testing plan and test cases have been developed, and technical pilot verifications have been completed in multiple provinces and cities across the country. In the pilot deployments across various regions, the new 5G RedCap emergency broadcasting terminals are connected to the emergency broadcasting platform through the broadcasting and television 5G private network, enabling functions such as the broadcast, management, and feedback of emergency information. Furthermore, the network transmission has been further improved in terms of low latency, stability, network security, and low power consumption. Through lightweight technology upgrades, network collaborative optimization, and enhanced security protection, the new 5G RedCap emergency broadcasting terminals address the pain points of traditional emergency broadcasting terminals, such as one-way communication, high costs, and narrow coverage, comprehensively reconstructing the basic capability architecture of emergency broadcasting. Currently, provincial network companies in multiple regions have entered the large-scale implementation and deployment phase.

- Research projects

Research and Development of Key Technologies for Intelligent Generation of 3D Studio Scenes

This research investigated intelligent methods for generating three-dimensional studio scenes and developed a system capable of producing both 2D studio backgrounds and 3D models. The system has been deployed to support applications for eight audiovisual organizations, including Huya Live and Southern New Media.

Evolution of the National Emergency Broadcasting System

This work involves ongoing support for the development of the National Emergency Broadcasting System. It focuses on developing capabilities for project planning and solution formulation at the NRTA and provincial radio/television administration levels. Additionally, research on municipal-level emergency broadcasting systems is being conducted, building upon the experience gained from pilot projects in cities like Beijing and Shanghai.

Research on Technical Solutions for Converged Cloud-Network Infrastructure in Radio and Television

This project explores the current development status, technical architecture, key technologies, and industrial practices of the computing power network. It clarifies the key role of the computing power network in promoting digital transformation. By combining the resource advantages of the broadcasting and television network with the technical advantages of the computing power network, it proposes development suggestions for the cloud-network fusion infrastructure to promote the digital upgrade of the broadcasting and television industry.

Vehicle-mounted Audio Service and Public Display System

The project includes advancing the development of an information management system for vehicle-mounted audio services. Concurrently, it involves developing National Standards specifying security requirements for backend management systems that govern public display systems broadcasting audiovisual programs.

Research on Technologies for Sharing and Protecting Training Corpora for Multimodal Large Models in Radio and Television

This project addresses the current industry challenge where audiovisual data and computing resources are managed by separate institutional platforms. It investigates mechanisms for sharing and applying audiovisual data, as well as technologies for data security protection. The project aims to establish comprehensive data sharing and management strategies covering pre-event, in-process, and post-event phases. This ensures that external computing centers can utilize industry data resources effectively while rigorously safeguarding data security and protecting the rights and interests of data owners. The ultimate goal is to formulate practical implementation guidelines for data sharing and protection in training large-scale models for the broadcasting industry.

Research on the Development and Countermeasures for Multimodal Generative AI in the Radio and Television Industry

This project analyzes application scenarios and deployment methods within the radio and television industry to propose suggestions for developing industry-specific applications. It further focuses on analyzing potential risks introduced by generative artificial intelligence, such as deepfake, data leakage, content homogenization, and information cocoons, particularly in the three critical links of content creation, recommendation, and presentation. Based on this analysis, the research proposes multi-dimensional risk mitigation strategies.

Research on Digital Watermarking Technology for Short Video Copyright Protection

Addressing the copyright protection and provenance tracking needs of short-form videos, this project tackles the vulnerability of watermark-based identification to tampering and various distortions. It delves into digital-watermarking techniques tailored for short-form video, proposing an edge-aware dual-task approach coupled with video-frame denoising for watermark embedding and extraction. The method delivers accurate ownership verification and provenance tracking when infringement occurs, thereby providing robust technical support for safeguarding short-form video copyrights.

- Internet and Mobile Broadcasting Services

UHD Quality Monitoring for Internet Audiovisual Programs

In accordance with regulatory requirements, internet audiovisual platforms are mandated to raise the percentage of ultra-high-definition (UHD) programs among their newly added content. Furthermore, in compliance with the industry standard GY/T 405-2024 "Video Quality Requirements and Subjective Assessment Methods for Network Audiovisual Programme", testing institutions are tasked with conducting ongoing supervision and evaluation of program quality. The findings from these evaluations are summarized on a quarterly basis. This initiative is designed to drive continuous improvement in the technical quality of online audiovisual content, ensuring a superior viewing experience.

			Radio	Television
Coverage %			99.74%	99.82%
Programme Channels			2967	3152
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		
	HDTV	R/N/D		
	UHDTV			China has added three provincial-level UHDTV channels in 2025, bringing the current

				national total of UHDTV channels to twelve.
	IP Based Set-up	R/N/D		
Transmission & Delivery	HF	R/N/D		
	MF	R/N/D		
	FM	R/N/D		
	TV	R/N/D		
	OTT/IBB/Internet Services	R/N/D		
	Mobile Services	R/N/D		

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	**Development projects/Upgrading facilities/Training**				
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		ABU Technical Bureau Mid-Year Meeting	The expert from Academy of Broadcasting Planning (NRTA) submitted the Chairman's Report in his capacity as Chairman of the Spectrum Topic Area.		
		ABU AI Forum （Beijing, China）	The ABU AI Forum is organized by ABU and the National Radio and Television Administration, and undertaken by China Radio and Television International Economic & Technical Co., Ltd.		
		CCBN-ABU NEXUS Event-AI Workshop（Beijing, China）	The AI Workshop is jointly organized by the Academy of Broadcasting Science (NRTA) and the Technical Bureau of ABU, under the guidance of the International Cooperation Department of the National Radio and Television Administration.		
3.		**Activity 1**			

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
	Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform				
		Activity 2			
		Activity 3			

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62nd General Assembly and Associated Meetings

Asia-Pacific Broadcasting Union
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TECHNICAL COMMITTEE MEETING

11-12 September 2025
Tuushin Hotel, Ulaanbaatar, Mongolia

Doc T-25/20-11

STATUS REPORT

Organisation:	China Media Group		
Period:	2024	Date of Report:	2025-8-28

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

· Completed an end-to-end IP-based production chain, enabling uncompressed 4K/8K over IP with 30 % lower latency.

· Deployed AI-driven content QC and automatic technical review, cutting review time by 50 % and reducing errors by 70 %.

· Rolled out a cloud-native collaborative production platform that shortens average turnaround time by 25 %.

- New Services/new projects initiated

· "5G+8K Ultra-HD Mobile Live" service: in partnership with the three major carriers, delivered 120 major-event 8K mobile live streams.

· Multi-angle interactive sports OTT channel: offers eight free-viewpoint streams with real-time data overlays, exceeding 5 million monthly active users.

· AI-anchor initiative: bilingual (Chinese-English) digital humans now used for bulletins and data-driven segments.

- Research projects

· "Real-time 3D Audio Coding for 8K VR" – National Key R&D project; algorithm validated and prototype ready.

·Conducted research on 8K ultra-high-definition imaging and skin-tone optimization; developed the Implementation Guide for Simultaneous 4K UHD and HD Compatible Production and Channel Broadcasting.

·The CMG Algorithm replaces manual scheduling by combining user profiles and business contexts to deliver precise content recommendations, empowering program departments with data-driven layout operations.

- Internet and Mobile Broadcasting Services

· Upgraded OTT apps with HDR Vivid & Audio Vivid support; peak daily concurrent users tripled.

· Launched mobile "short-form clip" tool allowing one-tap 15–60 s vertical videos; >800 k user uploads per month.

· Released "Emergency Broadcasting Mini-Program" linked to the National Emergency Management Ministry, reaching 120 million users with ≤5 s response time.

			Radio	Television
Coverage %			98%	97%
Programme Channels				3 new 4K channels
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		D → phase-out in progress
	HDTV	R/N/D		R → full HDR upgrade completed
	UHDTV			N → 3 new 8K studios commissioned
	IP Based Set-up	R/N/D		R → full replacement of SDI base-band
Transmission & Delivery	HF	R/N/D		
	MF	R/N/D		
	FM	R/N/D		
	TV	R/N/D		R → digital terrestrial expansion
	OTT/IBB/Internet Services	R/N/D		N → HarmonyOS client launched
	Mobile Services	R/N/D		N → added 5G live streaming

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	**Development projects/Upgrading facilities/Training**	4K/8K OB-van upgrade Outside Broadcast	1. Replace HD truck with IP-based 8K unit 2. Chassis ordered, cameras delivered, testing 20 % complete	Lack of 8K lenses & test-signal sources	-
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		TC Meeting 2024	Attended (1 delegate)	-	
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	**Activity 1**			
		Activity 2			
		Activity 3			

Doc T-25/20-12

STATUS REPORT

Organisation:	Television Broadcasts Limited		
Period:	October 2024 to August 2025	Date of Report:	August 29, 2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

1. Adoption of Spine and leaf network technology for media network infrastructure
2. Micro-segmentation of network system to enhance security for production systems.
3. Continue Central Transcoding Farm facilities enhancement to support and 4K/UHD files conversion with HDR support.
4. LTO will be replaced by in-house developed Digital Asset Management Solution.
5. Adoption of Mini Workgroup editing environment for different editing needs.
6. Enhancement of Sobey HDNLE Media Asset Management to a DOCKER platform.
7. Adoption of A.I. Technology to streamline Production / Post Production workflow for subtitle enhancement and workflow automation.
8. Continue SCTE customization for 3rd parties' advertisement systems to insert advertisement for OTT platform.
9. Continue the research of low latency solution for OTT platform.
10. Continue to use A.I. technology to do video de-noising during up-version of SD files to HD.

- New Services/new projects initiated

1. Use Scale-Out NAS and JBOD solution for long-term deep archive solution.

- Research projects

1. Continue the study of transcoding and cross conversion between SDR and HDR materials.
2. Continue SD HDR and 4K/UHD HDR study.

- Internet and Mobile Broadcasting Services

1. New DTTB technology study
2. 5G HPHT TV study

			Radio	Television
Coverage %			NA	99%

Programme Channels			NA	5 HD
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		
	HDTV	R/N/D		
	UHDTV			
	IP Based Set-up	R/N/D	NA	
Transmission & Delivery	HF	R/N/D	NA	
	MF	R/N/D	NA	
	FM	R/N/D	NA	
	TV	R/N/D	NA	29 sites
	OTT/IBB/Internet Services	R/N/D	NA	
	Mobile Services	R/N/D	NA	

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	Development projects/Upgrading facilities/Training				
2.	Participation in ABU Activities	Area	Level of Participation	Reasons for not participating (though interested)	
		Introduction to TV Production Styles (Session 1)	Engineer, update and acquire knowledge (On-line)		
		Latest Techniques in TV Production (Session 2)	Executive & Engineer, update and acquire knowledge (On-line)		
3.	Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform	Activity 1			
		Activity 2			

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
		Activity 3			

Doc T-25/20-13

STATUS REPORT

Organisation:	Myanma Radio and Television		
Period:	2013-2025	Date of Report:	27th August,2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

Myanmar Radio and Television (MRTV) has been undergoing significant technical upgrades to its TV transmission capabilities, largely driven by the global shift from analog to digital broadcasting. So the following projects have been carried out ; Shifting from Analog to Digital, High-Definition (HD) Broadcasting, Direct-to-Home (DTH) System implementation, Upgrading of Infrastructure and Studios, Digitalization of Content, New room system upgrading, channel rebranding, expansion of FM radio coverage, Establishing of DAB radio transmission and internet on line broadcasting (MRTV Apk & Radio Apk, Web Portal and Social Media)

- New Services/new projects initiated

MRTV mobile application for iOS and android to improve live streaming quality and user experience.

- Research projects

TV whitespace, To broadcast MRTV In-house channels on OTT platform. Research on AI based automatic captioning and speech to texts for news programs. Implementing of AI in broadcasting industry, OTT implementation and digital radio broadcasting.

- Internet and Mobile Broadcasting Services

MRTV has established a web portal (since 2013) where audiences can tune into both radio and TV news and programs. MRTV has launched MRTV TV Application (MRTV Apk) and MRTV Radio Application (MRTV Apk). We used LiveU and Haivision to broadcast for some important live events.

			Radio	Television
Coverage %			78.84	92.7
Programme Channels			6	18
Studios (Production)	File-based Set-up	R/N/D	R(Ongoing, Upgrade)	R(Ongoing, Upgrade)
	SDTV	R/N/D	-	D
	HDTV	R/N/D		(R/N)
	UHDTV			
	IP Based Set-up	R/N/D	R(Visual Radio)	R(LiveU, Aviwest)
Transmission & Delivery	HF	R/N/D	R	
	MF	R/N/D	R	

	FM	R/N/D	R	
	TV	R/N/D		R(DVB-T2)
	OTT/IBB/Internet Services	R/N/D	N	N
	Mobile Services	R/N/D	N	N

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	**Area**	**Brief Details:** **1. Objectives** **2. Progress to date**	**Challenges/Problems Faced:** **1. Lack of resources** **2. Lack of know-how** **3. Others (e.g. up-skilling)**	**Solutions Implemented/ Type of assistance require - ment from ABU**
1.	**Development projects/Upgrading facilities/Training**	Digital Transmission	Started in 2013, total of 155 station have been completed in DVB-T2 transmission.	Budget constraint. Among of 258 stations, 103 stations need to migrate to digital.	Supported of other outsources as in funded by or Official Development Assistance from other developed countries with the help of ABU.
		HD transmission	In February 2020, MRTV Channel began regular broadcasting in HD. In 2025, all channels owned by MRTV has been to upgraded to HD format.	Requires infrastructure and technology for broadcasters to capture and produce content in 4K resolution.	Training hosted by ABU
		OTT	MRTV web portal was launched in 1st April 2013. On 2nd September 2023 , as a Mobile Application, laun ched of MRTV App and on 24th May of 2024 ,MRTV Radio App was also launched.		Training hosted by ABU
		Analogue Switch Off (ASO)			
		Training			

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/ Type of assistance require - ment from ABU
2.	**Participation in ABU Activities**	**Area**	**Level of Participation**	**Reasons for not participating (though interested)**	
		ABU TV Song Festival and webinars hosted by ABU as in IP Infrastructure & Applications (March 2021), Dolby-ABU Webinar Series on Audio-Visual Technologies (May–June 2020), WorldDAB-ABU DAB+ Technical Webinar Series (October 2020), Video Compre ssion Technologies and Applications (26 March 2021)	MRTV (Myanmar Radio and Television) actively particip ates in the Asia-Pacific Broadcasting Union (ABU) activities, including broad casting events like the ABU TV Song Festival and attending various meetings and training programs . MRTV became a full member of the ABU in 1997 and has been involved in initiatives related to media development and training within the Asia-Pacific region. MRTV also participates in other ABU activities, such as the annual competition for radio and television programs (ABU Prizes), and events like the B25 Global Coordination Conference, 62nd ABU General Assembly, and ABU Media and Culture Days.		

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/ Type of assistance require - ment from ABU
3.	**Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform**	Activity 1; 5 G broadcasting technological training	To deliver streaming services to mobile devices over broadcast networks. To deploy all mobile device viewers receive the live event through the 5G network.	Infrastructure requirements, limited availability of high-frequency spectrum, lack of technical resources and human skill to deploy the technology.	Proper training supported by ABU with skill full expertise.
		Activity 2 Emerging technologies for cloud based broadcasting training		Receiver penetration ,Funding and Investment: Continued investment in infrastructure and technology. Regulatory Framework: Establishing a clear and supportive regulatory framework for on line broadcasting and Competition: Adapting to an increasingly competetive media landscape with the rise of online streaming services and private broadcasters.	
		Activity 3 Broadcasting over IP and cybersecurity training	Utilize to use Internet Protocol (IP) networks to transmit audio, video, and data, replacing traditional dedicated infrastructure like satellite and terrestrial networks with a more	Revolving around network infrastructure, security, and interoperability. Key issues include ensuring reliable, high-quality signal delivery, managing bandwidth effectively, and	Needed to provide the training organized by ABU.

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/ Type of assistance require - ment from ABU
			flexible, scalable, and cost-effective solution.	securing content from piracy and unauthorized access.	

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TECHNICAL COMMITTEE MEETING

11-12 September 2025
Tuushin Hotel, Ulaanbaatar, Mongolia

Doc T-25/20-14

STATUS REPORT

Organisation:	NHK (Japan Broadcasting Corporation)		
Period:	Sep.2024 - Aug.2025	Date of Report:	August 29, 2025

PART A

Technical Developments during the past year:

- System upgrades/changes to practices for improved quality/efficiency

Initiative to Promote IP Remote Production

Products compliant with the SMPTE ST 2110 standard are increasing as the shift toward IP-based production is accelerating. While AMWA NMOS has been standardized as a control protocol, it primarily supports device discovery and connection management, and does not cover detailed operations such as audio fader control. As a result, many vendors use proprietary protocols, making interconnection and interoperability between different vendors challenging.

To address this issue, NHK has been working on enabling remote production while maintaining compatibility across different vendors. Specifically, NHK developed a tool that allows control of audio faders using an open standard "Ember+" while conforming to international audio standards. This tool was successfully tested in remote environments with favorable results.

Additionally, Dante holds a significant share in the audio-over-IP market, and many broadcasters already own Dante-compatible equipment. To make effective use of these assets, the tool incorporates a conversion function between ST 2110 and Dante. Since Dante and ST 2110 use different synchronization methods, aligning synchronization was a challenge. However, by handling synchronization internally within the converter, this issue was resolved, simplifying system integration.

Furthermore, the tool enables bidirectional conversion of control signals between Dante and Ember+, allowing for matrix control and audio level adjustments.

NHK plans to continue leveraging these insights to further promote remote production, including the development of remote-controllable Fader Units and other related initiatives.

- New Services/new projects initiated

Completion of the Information Building

The construction of the Information Building at the NHK Broadcasting Center in Shibuya, Tokyo, was completed at the end of October in 2024. This marks the first phase of the Broadcasting Center redevelopment project, which began in May 2021.

The Information Building will serve as a new hub for NHK's news and information dissemination, both domestically and internationally. It will house facilities such as the News Center and play a vital role in delivering reliable information during major disasters, including a potential earthquake directly beneath the Tokyo metropolitan area, helping to protect the lives and livelihoods of viewers and citizens.

Currently, broadcasting equipment is being installed, and full-scale operations of television/radio broadcasting and internet delivery are scheduled to begin in 2026.

- Research projects

Development of Large Language Models with Data Held by Broadcasting Stations

NHK Science & Technology Research Laboratories (STRL) is developing large language models (LLMs) to improve the efficiency of various tasks in the program production process. STRL has experimentally built an LLM that has been trained on news articles and other data (i.e., broadcasting station data) broadcast by NHK, and verified the effectiveness of using this data in improving the accuracy of answers to questions about news coverage. As a result, we confirmed that the rate of incorrect answers regarding broadcast facts was reduced by around 10%. Going forward, STRL will proceed with further verification and R&D with a view to supporting information gathering by summarizing large volumes of documents, as well as supporting tasks such as translation and proofreading.

https://www.nhk.or.jp/strl/english/news/2025/3.html

A VVC Multi-layer Encoding System That Enables Video Content Layering

NHK STRL has succeeded in developing the world's first real-time multi-layer video encoder which is compatible to the international video coding standard VVC (Versatile Video Coding). This will enable people to watch two (or more) different types of content through one broadcasting channel. This is the first time a real-time VVC encoder will make possible the multi-layering of video content without sacrificing video quality.

https://www.nhk.or.jp/strl/english/news/2024/6.html

- Internet and Mobile Broadcasting Services

New Internet Service "NHK ONE" (Starting October 2025)

In response to the revision of the Broadcasting Act, NHK will begin offering internet-based program distribution as a mandatory service starting October 1, 2025. Alongside traditional TV and radio broadcasting, NHK will enhance its delivery of reliable information and rich content via the internet.

Key Features of "NHK ONE"

- A new NHK ONE website: Offers live streaming, catch-up (on-demand) services, news articles/videos, and other content in a more user-friendly format.
- TV app: Provides live streaming of NHK General TV and Educational TV along with news articles. Catch-up content, which is already available, will continue to be offered.
- Smartphone/Tablet apps; "NHK Plus", "News & Disaster Prevention", and "for School" apps will be updated. Radio-focused app "Radiru Radiru" and language learning app "Gogaku" remain unchanged. Note that the international service app "NHK WORLD-JAPAN" can be used as it is now.

			Radio	Television
Coverage %			MF Radio1: 99.9% Radio2: 99.9% FM: 98.0%	Digital Terrestrial: 98.2%
Programme Channels			AM Radio:2 FM Radio:1	Digital terrestrial:2 Digital Satellite (HD):1 Digital Satellite (UHD):2
Studios (Production)	File-based Set-up	R/N/D		
	SDTV	R/N/D		
	HDTV	R/N/D		
	UHDTV			
	IP Based Set-up	R/N/D		

Transmission & Delivery	HF	~~R/N/D~~	3	
	MF	~~R/N/D~~	Radio1: 280 Radio2: 146	
	FM	~~R/N/D~~	532	
	TV	~~R/N/D~~		Digital: 2,212
	OTT/IBB/Internet Services	~~R/N/D~~		
	Mobile Services	~~R/N/D~~		

R = Replacement/upgrade
N = New
D = Discontinued

PART B
CURRENT ACTIVITIES

	Activities	Area	Brief Details: 1. Objectives 2. Progress to date	Challenges/Problems Faced: 1. Lack of resources 2. Lack of know-how 3. Others (e.g. up-skilling)	Solutions Implemented/Type of assistance requirement from ABU
1.	Development projects/Upgrading facilities/Training				
2.	Participation in ABU Activities	Area	Level of Participation	Reasons for not participating (though interested)	
3.	Suggestions for New ABU Activities e.g. study topic projects, webinars, workshops, symposiums etc, spectrum activities, information exchange platform	Activity 1			
		Activity 2			
		Activity 3			

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Asia-Pacific Broadcasting Union

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Information Documents

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11-12 September 2025
Tuushin Hotel, Ulaanbaatar, Mongolia

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5G-A 8K Ultra-HD Video Shallow Compression Wireless Live Streaming System

China Broadcasting Network Group Corporation Ltd.
Shuang Li

Abstract: *China Broadnet has built a globally leading 8K ultra-high-definition low-compression wireless live streaming system based on 5G-A technology in Beijing. Through an end-to-end full-link solution (including 8K cameras, low-compression encoders, millimeter-wave base stations and other equipment), it utilizes the ultra-high uplink rate (stable at 1.1 Gbps) of the 5G-A millimeter-wave network to transmit JPEG-XS low-compression lossless 8K videos, achieving extremely simple ultra-high-definition live streaming in a wireless environment. This system breaks through the limitations of traditional cables and supports photographers to move freely for shooting.*

Based on 5G-A (5G-Advanced) technology, China Broadcasting Network Group Corporation Ltd. (China Broadnet) has built a world-leading 8K ultra-high-definition video shallow compression wireless live streaming system in Beijing, aiming to verify the feasibility of real-time production and transmission of ultra-high-definition videos in wireless environments. The system comprises 8K ultra-high-definition cameras, 8K shallow compression encoders, CPEs, 5G-A millimeter-wave base stations and BBUs, switches, 8K shallow compression decoders, and 8K display terminals, forming an end-to-end full-link solution.

Leveraging the ultra-high uplink rate capability of the 5G-A network, China Broadnet transmits high-quality visually lossless 8K video data that has undergone JPEG-XS low-latency shallow compression, enabling minimalist ultra-high-definition live streaming over a wireless private network. Photographers are free from restrictions on cable deployment and length, allowing them to flexibly choose optimal shooting spots. They can also achieve real-time synchronization and same-quality live streaming with wired camera positions, bringing audiences more scene perspectives and a more immersive ultra-high-definition viewing experience.

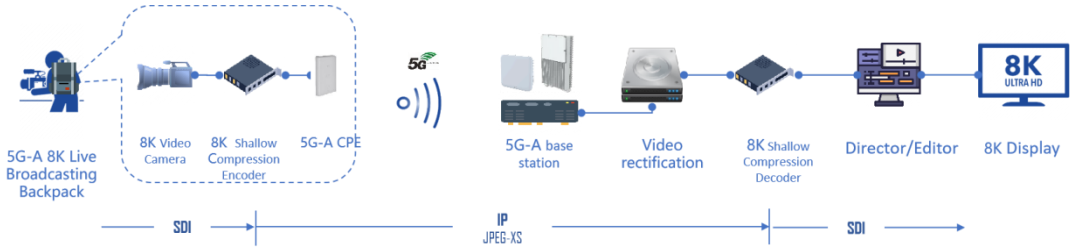

Fig1:System diagram

This system has, for the first time, realized 8K shallow compression video wireless live streaming based on 5G-A millimeter waves, verified the feasibility of millimeter-wave communication in ultra-high-definition video transmission, and filled the domestic technical gap in this field. Test results show that the 5G-A millimeter-wave network performs excellently in 8K video transmission, with the uplink rate remaining stable at 1.1Gbps, and all indicators meeting the technical requirements for ultra-high-definition live streaming. It has successfully adopted a

distributed micro-station architecture to address the challenges of millimeter-wave signal coverage and penetration, providing an innovative solution for high-density wireless transmission scenarios. In addition, it has achieved in-depth integration between shallow compression encoding technology and the 5G-A network, reducing the bit rate to 1/30 of that of traditional 8K transmission while ensuring image quality, thus lowering dependence on network bandwidth.

Fig2: Millimeter-wave Panel Station (pRRU)

Fig3：Live broadcast demonstration of the China Broadnet booth at the CChina Broadnet exhibition

Practice of Building an All-Media Media Asset Management System Driven by Large Multimodal Models

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Abstract

This paper takes Shanghai Media Group (SMG) as a case study to explore the transition of media asset management (MAM) systems from traditional storage to intelligent cataloging and large multimodal model-driven deep understanding. It presents the architecture, fusion algorithms, and core technologies of an all-media MAM system powered by large multimodal models. Practical applications demonstrate significant improvements in cross-modal retrieval accuracy and user interaction efficiency. The study also envisions future development trends such as industry-specific fine-tuning, AI-generated content, and cross-platform integration.

Keywords

Large multimodal model; Media asset management; Cross-modal retrieval; Intelligent content processing

0 Introduction

In the era of artificial intelligence, broadcasting and television face rapid transformation. As a core infrastructure, MAM systems are critical for efficient media management. The emergence of large models provides opportunities for upgrading from manual cataloging to intelligent, multimodal-driven systems. SMG has explored this direction by building an all-media MAM system integrating discriminative AI and large multimodal models, aiming to enhance retrieval, interaction, and content utilization under the initiative of “SMG in AI.”

1 Evolution of Media Asset Systems

1.1 From Discriminative AI to Intelligent Cataloging

MAM systems evolved from simple storage to intelligent services. Between 2015–2022, discriminative AI such as OCR, speech, and facial recognition enabled automated cataloging, knowledge graphs, and topic recommendations[1][2]. SMG’s intelligent cataloging system now processes over 30,000 hours annually, reducing manual costs while improving retrieval accuracy.

However, tag-based methods remained insufficient for semantic-rich or

image-based retrieval, highlighting the need for large multimodal models.

However, tag-based cataloging still could not fully satisfy user retrieval needs. For example, when users described content using sentences or paragraphs, matching became difficult. Additionally, both traditional MAMS and discriminative AI-based MAMS relied on text search and could not handle image-based retrieval. The emergence of large language models (LLMs), and especially large multimodal models (LMMs), brought AI's ability to understand and process audio-visual content into a new era, enabling deeper semantic comprehension and richer retrieval applications.

1.2 Large Multimodal Models

A large multimodal model (LMM) is an artificial intelligence model capable of simultaneously understanding and processing multiple modalities, such as text, images, audio, and video. LMM architectures typically adopt either a **dual-tower structure** (e.g., CLIP[3]) or a **fusion structure** (e.g., Flamingo[4]). SMG deployed the M^2-Encoder[5], trained on billions of text-image pairs, to map modalities into a unified semantic space.

To address limited adaptability to emerging entities, SMG combined discriminative AI cataloging with LMM cross-modal mapping, forming a hybrid **multimodal-driven MAM system**.

2 System Architecture

The system follows a pipeline of **data preprocessing** – **cross-modal retrieval** – **fusion optimization,** supported by vector databases and caching for efficiency.

- **Data preprocessing:** Keyframe extraction and discriminative AI cataloging enrich video semantics before model processing. Keyframes are transformed by M^2-Encoder into unified high-dimensional semantic vectors, enabling alignment across text, image, and video modalities(Figure 1).
- **Cross-modal retrieval:** When users input text queries into the MAM system, preprocessing (including word segmentation and normalization) is first performed. LLMs assist in parsing queries to extract and categorize entities (e.g., people, objects, scenes) into model-compatible formats; M^2-Encoder then converts the query into a semantic vector. This vector is compared with semantic features of

stored video keyframes, and vector-based retrieval results are merged with traditional metadata and AI-generated catalog tags via a **fusion algorithm**. Final results are ranked and presented (Figure 2). The ranked results include confidence score-sorted videos, preview keyframes, and direct video links, allowing users to quickly find desired content.

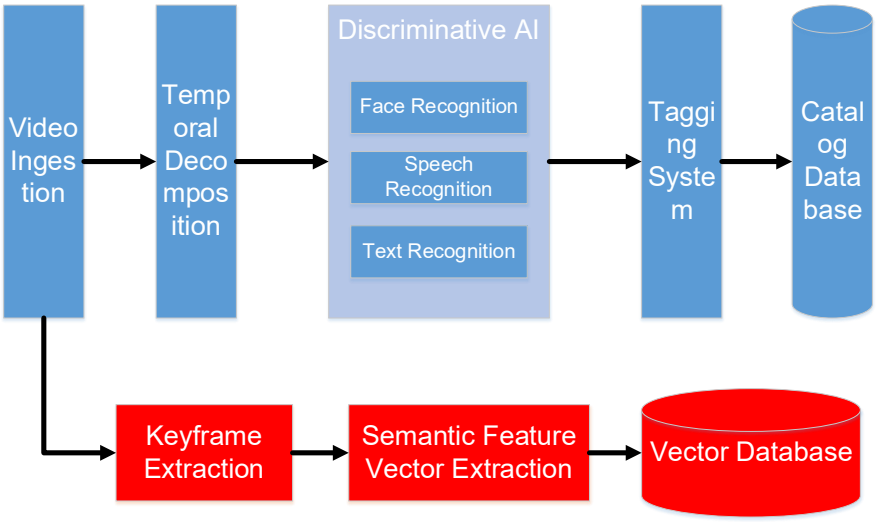

Figure 1. Workflow of the multimodal large model-driven MAM system

- **Fusion algorithm:** We combined the latest cross-modal large model capabilities with ElasticSearch (ES)-based text retrieval (traditional metadata and AI labels). The fusion algorithm integrates results from multiple retrieval methods, assigning weights to different modalities to compute composite scores. Specifically, the system evaluates the matching degree of text tags, AI recognition tags, face recognition, and cross-modal results. By weighted averaging, a final score is produced, ranking videos from high to low. Each modality generates retrieval confidence scores, and top candidates are selected for fusion. Weighted confidence values (with weights summing to 1) yield the final **fused_score**, ensuring accurate results.
- **Infrastructure:** Milvus stores feature vectors, Redis accelerates responses.

This architecture effectively enhances retrieval performance and scalability.

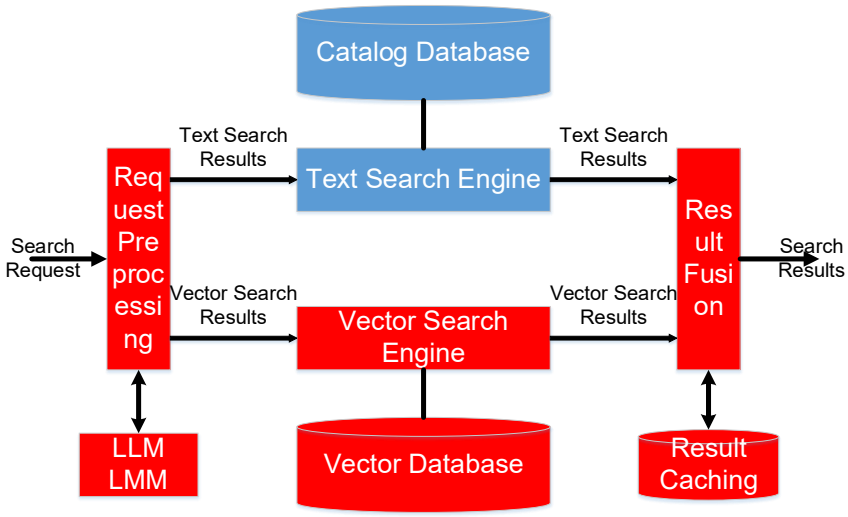

Figure 2. Retrieval architecture of the multimodal large model-driven MAM system

3 Applications and Optimization

3.1 Real-World Applications

In SMG's **Xnews platform**, multimodal retrieval expanded from tag-based search to multi-dimensional retrieval across text, speech, faces, and visual features. Search diversity improved fourfold, enabling accurate location of clips (e.g., "Oriental Pearl Tower night view").

Interactive retrieval with LLMs refined vague queries via dialogue and recommendation, reducing mismatches. Response times reached the **second level**, supporting real-time content creation.

3.2 System Optimization in Practice

Weights of different modalities were dynamically adjusted to stabilize online operations (e.g., merging face retrieval into tag retrieval). Final weights balanced accuracy and efficiency, ensuring sustainable deployment.

4 Future Prospects

Looking ahead, media asset management systems will continue to evolve through fine-tuning of industry-specific large models and integration of domain knowledge graphs, thereby enhancing semantic precision and timeliness. At the same time, the adoption of AIGC technologies will enable automated video summarization,

script generation, and personalized editing, offering more natural retrieval interactions through voice or video queries. Furthermore, cross-platform integration supported by cloud-edge computing and open APIs will expand system interoperability, transforming MAM from a storage and management tool into an intelligent engine for content creation and distribution, and accelerating the broadcasting industry's digital transformation.

5 Conclusion

This paper summarized SMG's practice in building an all-media MAM system driven by large multimodal models. The system's hybrid design significantly improved retrieval accuracy and interaction efficiency. Future developments will integrate advanced models, AIGC, and cross-platform ecosystems, accelerating the broadcasting industry's digital transformation.

First Author Profile

Qu Lu (1988–), female, Senior Engineer, General Manager of the Cloud Computing Center (Research Institute) at Oriental Pearl New Media Co., Ltd. She holds a Master's degree and mainly focuses on technological management, empowerment, and innovation in media digital transformation. She leads her team in developing SMG's digital media infrastructure and advancing the application of new technologies such as AI. Over the past five years, she has led her team to obtain **20+ patents, 60+ software copyrights, and 40+ science and technology awards**.

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Key Technologies and System Implementation of Intelligent Video Scene Synthesis

Xue Ziyu

Abstract: We present an end-to-end framework for intelligent content production in the broadcasting and audiovisual sector, spanning the full pipeline from text input to multimodal output. The framework integrates four core modules: text-guided multimodal generation; 3D digital modeling and virtual-real fusion; model compression and acceleration; and industry-specific dataset construction. Building upon this architecture, we implemented an intelligent, natural-language-driven media generation system and validated it in representative scenarios, including television studios, live variety shows, micro-dramas, and cultural-tourism promotion. Across these settings, the system preserved semantic consistency and physical realism while increasing production efficiency by up to 30%, reducing costs by about 20%, and achieving generation throughput of ≥1 minute of video per TFLOPS. In micro-drama and documentary production, direct per-session cost savings of 78%-85% were realized. These results provide a replicable technical pathway and system-level solution for deploying generative models in broadcasting and audiovisual applications.

Keywords: Generative Artificial Intelligence, Intelligent Video Scene Synthesis, NeRF, 3D Gaussian Splatting, Virtual-Real Fusion, Industry Dataset

1 Introduction

Since 2018, artificial intelligence has been elevated to a national strategic priority. In 2024, the State Council's Government Work Report launched the "AI+" initiative, and the National Radio and Television Administration called for accelerating AI integration into broadcasting and audiovisual sectors, establishing standards for generative AI, developing industry-specific large models and application platforms, and strengthening risk governance. Within this policy and industrial context, generative AI (AIGC) has advanced rapidly, with the global market expanding at an average annual rate of 35% and applications in China extending to film and television production, virtual live streaming, and educational content generation.

The audiovisual content industry exhibits a dual techno-economic dynamic. On one side, film and television production requires substantial investment in high-precision post-production (e.g., digital matte painting); on the other, cultural programming relies heavily on professional teams for real-time adaptation and scene synthesis, yet is constrained by limited budgets and tight production cycles. Despite recent progress, generative AI still faces challenges in semantic understanding, dynamic 3D representation, and controllability. These limitations often appear as modeling distortions, chroma-key artifacts, and repetitive background generation, degrading audience experience and production efficiency.

To close these gaps, we focus on three core tasks: developing lightweight generative models with multi-view consistency, constructing customized datasets for

broadcasting and audiovisual applications, and building an end-to-end intelligent media production system.

2 Research Objectives and Innovations

2.1 Objectives

This research targets intelligent video scene synthesis in broadcasting and audiovisual production, with the goal of developing an efficient and controllable end-to-end media generation system. The system is designed to support generation and editing from text descriptions to images, videos, and 3D scenes, while ensuring semantic consistency, maintaining physical realism in 3D modeling and virtual-real fusion, enabling adaptive adjustment of dynamic parameters with real-time feedback, and lowering both production thresholds and computational costs (generation efficiency ≥ 1 minute of video per TFLOPS).

2.2 Innovations

(1) Proposes an intelligent video scene synthesis architecture tailored to broadcasting and audiovisual applications, establishing an industry-oriented framework with practical scalability;

(2) Develops lightweight generative models with multi-view consistency to enable high-quality and coherent text-to-image/video synthesis;

(3) Builds domain-specific datasets (≥50,000 frames) with multi-dimensional metadata annotations for studio and outdoor scenes to support efficient model training;

(4) Implements an integrated media content generation system that combines lightweight large-model generation, human segmentation, and dynamic background synthesis, validated through scenario-based pilots.

3 Technical Roadmap and Methodology

3.1 Overall Technical Roadmap

We advance core technologies for intelligent video scene synthesis and build an end-to-end media generation system for broadcasting and online audiovisual applications. Our framework encompasses text-guided multimodal generation, 3D digital modeling, model compression, and industry-specific dataset construction (Fig. 1).

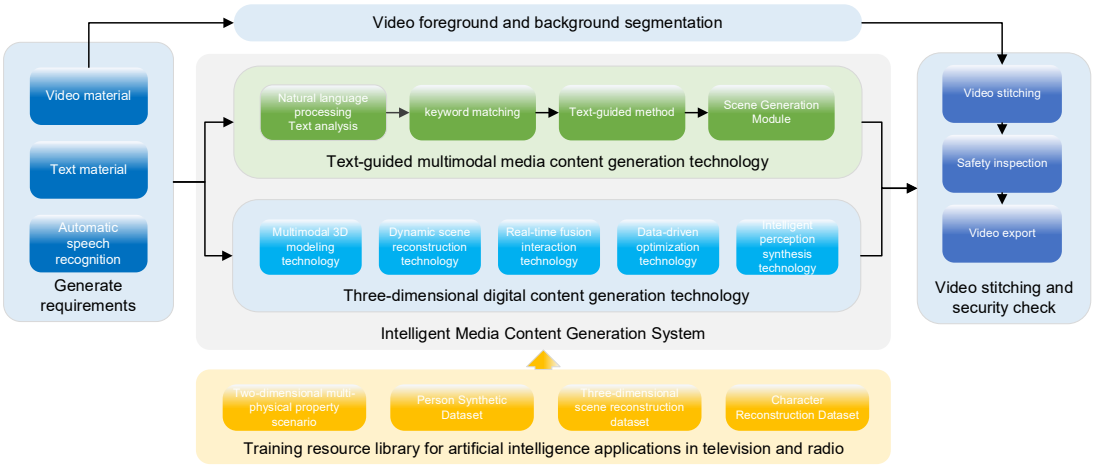

Figure 1. Architecture of the Broadcasting and Audiovisual Intelligent Media Content Generation System

3.2 Text-Guided Multimodal Media Content Generation

We couple GLM/DeepSeek with Stable Diffusion in a collaborative pipeline that operationalizes a “semantic understanding, prompt generation, visual creation” workflow. Cross-modal alignment is optimized by minimizing spherical distance between text and image embeddings. The system integrates speech recognition, segmentation, and background replacement, and includes a dynamic prompt engine that adapts to user feedback, ensuring strong semantic coherence while preserving creative expressiveness.

3.3 3D Digital Content Generation and Virtual-Real Fusion

For multimodal 3D modeling, we use CLIP to align text-visual features and NeRF for 3D reconstruction. We introduce a sparse-voxel latent representation with a Transformer-based VAE and multi-task decoders that unifies meshes, radiance fields, and 3D Gaussian volumes (Fig. 2). Multi-camera reconstruction via 3D Gaussian Splatting attains $<$0.5-pixel reprojection error and 45 fps at 4K. Global illumination and ray tracing enforce lighting consistency ($\leq$5% for static scenes; $\leq$8% for dynamic scenes). For virtual-real fusion, alpha compositing and Z-buffer mapping yield sub-millimeter alignment (RMSE $\leq$0.8 mm).

3.4 Model Compression and Acceleration

At the module level, we apply TinyGLM distillation, structured pruning, low-rank decomposition, and diffusion-step parameter sharing. These measures shrink parameters from 2.1B to 903M (-57%), accelerate inference by 3.4×, cut latency from 320 ms to 95 ms, and reduce memory from 24 GB to 7 GB. The accuracy drop is minimal (-1.2%), with FID=18.9 and cross-modal alignment $\sim$92%.

3.5 Industry Training Resource Construction

We curate a composite dataset that integrates a 2D Scene-and-Person Synthesis Dataset (SIPD; 22,203 images with dense annotations) and a 3D reconstruction corpus comprising 60+ 4K videos, 100+ high-resolution images, and motion sequences at ≥1080p@60 fps. Semi-automatic labeling with SAM and active learning reduces manual correction effort by 90%. On studio tasks, transfer learning lifts mAP from 0.60 to 0.95 (Fig. 2).

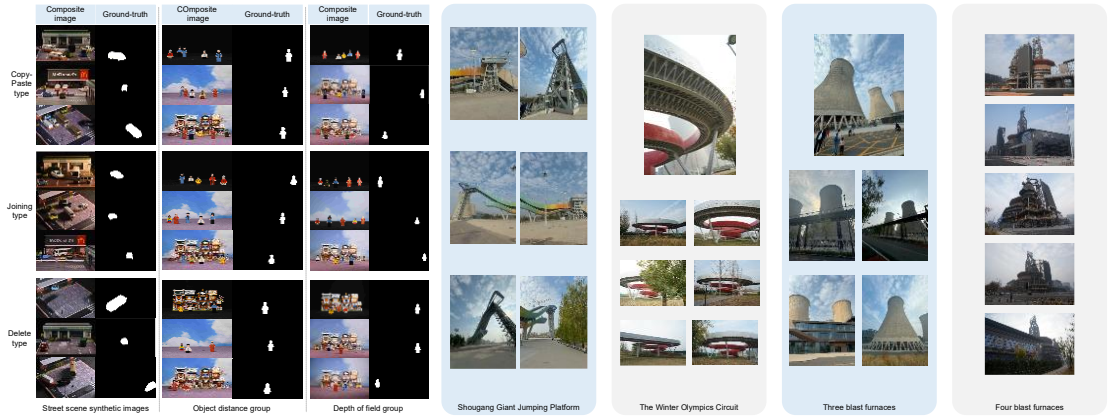

Figure 2. Broadcasting and Audiovisual 2D/3D Training Datasets

4 System Design and Implementation

4.1 Functional and Performance Indicators

Functions: Intelligent scene generation (text/voice-driven, dynamic backgrounds, green screen replacement), 3D object modeling and scene reconstruction, virtual-real fusion with real-time rendering (RTMP/WebRTC, latency ≤200 ms), and automatic editing with adaptive adjustment (ITU-R BT.2100 compliant).

Performance: Text-to-scene ≤5 s/frame (≤10 s for complex dynamics); 3D models ≥50k polygons (≥100k for complex objects); lighting error ≤5% (≤8% dynamic); efficiency ≥1 min video/TFLOPS; preview/download ≤2 s.

4.2 Architecture and Core Modules

Logical architecture: User interaction → Prompt engineering → Content generation → Rendering output → Resource management.

Technical architecture: NLP parsing and prompt generation (GPT-2/DeepSeek), cross-modal alignment (CLIP), diffusion generation (SD), 3D reconstruction (NeRF/3DGS), physical rendering (ray tracing + IES), low-latency streaming (RTMP/WebRTC), GPU cluster scheduling (A100).

Core modules:

Natural language to scene: Semantic parsing → Prompt templating → Iterative optimization.

Background replacement: Segmentation + Alpha channel + motion blur (edge precision ±1 px).

3D object generation: Semantic-driven modeling and mesh refinement, single-image/multi-view reconstruction.

Virtual-real fusion: Lighting consistency across intensity, direction, and color temperature; adaptive occlusion.

Automatic editing: Temporal action detection + audio spectrum analysis, with adaptive exposure (EV ±3) and contrast (0-100).

5 Experiments and Application Validation

5.1 Algorithm and System Validation

On MS-COCO and proprietary video datasets, compressed models significantly improved inference efficiency while preserving semantic alignment and generation quality. Compared with NeRF, Gaussian Splatting reduced GPU memory to 14.3 GB (↓42%) and shortened generation time to ~45 s. Part-level editing achieved ≤0.5 mm error, with compatibility across OBJ/FBX, NeRF, and 3DGS formats. System-level tests showed baseline generation ≤5 s/frame (≤10 s for dynamics), text-image alignment ≥80%, dynamic rendering ≥45 fps, and green screen edge error ≤1 pixel.

5.2 Dataset and Annotation Pipeline Evaluation

The SIPD dataset spans street view and human scenes under diverse physical conditions. Synthetic augmentation included splicing and copy-paste. A semi-automatic annotation pipeline (SAM + active learning) processed 2,000 images/day at 2K resolution, cutting manual correction by 90% and enhancing data consistency.

5.3 Industrial Applications and Outcomes

The system was piloted in studios, micro-dramas, variety shows, cultural tourism, and educational content with partners including Wasu Media, Southern New Media, Jishi

Media, and Huya Live. Over 20 studio templates were standardized, while cultural tourism pilots generated high-precision outdoor models.

Economic impact: Virtual scene production costs fell by 78-85%, production cycles shortened from 5 to 1 day, yielding ~¥1.94M in additional revenue and ~¥490K in tax contributions (2023-2024).

Social impact: Integration with traditional workflows enabled customization for SMEs, reduced energy use by ~10%, and supported workforce transformation toward “creativity + technology” hybrid roles.

5.4 System Deployment

The system supports independent or integrated deployment with converged media workflows. Hardware configuration includes dual A100 GPUs (≥40 GB VRAM), ≥256 GB RAM, and ≥10 TB NVMe SSD. Software stack comprises Ubuntu/Windows, PyTorch/TensorFlow, CUDA/cuDNN, OpenCV/FFmpeg, and RTMP/WebRTC. Deployment on private or hybrid clouds is secured via VPC and API gateways. Latency ≤200 ms is prioritized for live production, while throughput is optimized for post-production rendering.

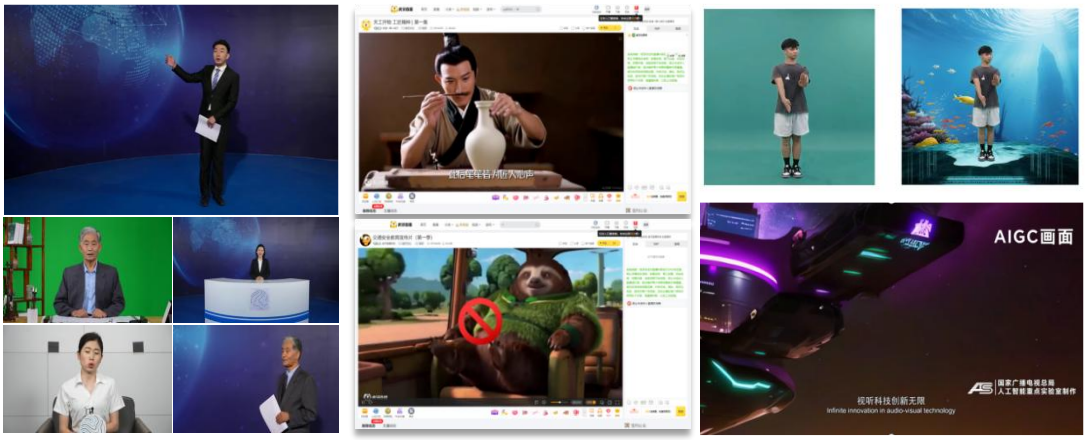

Figure 3. Applications in Studios, Live Streaming, Short Videos, and Film Production

6 Conclusions and Outlook

We propose and implement a systematic solution for intelligent video scene synthesis in broadcasting and online audiovisual domains. The work establishes replicable technical and engineering pathways across text-guided multimodal generation, 3D reconstruction and virtual-real fusion, model compression and acceleration, and industry-specific dataset development, and validates these approaches across diverse scenarios, demonstrating measurable efficiency gains and cost reductions.

Future work will focus on three directions:

(1) Spatio-temporal consistency modeling and generation control for complex cinematic language and dynamic camera movements;

(2) Development of quantitative evaluation systems for semantic consistency, lighting consistency, and compliance, aligned with industry standards;

(3) Continuous optimization of computational efficiency and end-to-end latency in private/edge deployments, with improved data closed-loop and online adaptive mechanisms.

ChinaDRMLab, Academy of Broadcasting Science, National Radio and Television Administration

Progress of ChinaDRM Technical Standards and Industrialization

Shen Yang, Chen Weiwei

Abstract: This paper introduced the standardization progress of ChinaDRM technologies in China and the international standardization, and the industrialization promotion mechanisms of ChinaDRM. Facing the copyright protection challenges under the new situation, this paper puts forward suggestions about building an open, trustworthy, cooperative, and mutually beneficial international digital copyright protection ecosystem.

1.Standardization Status of ChinaDRM Technology

To promote high-security-level copyright protection for audiovisual content, the National Radio and Television Administration of China has issued a digital rights management standard system for audiovisual content distribution, releasing six industry standards. These standards cover multiple aspects including technical requirements, system integration, testing methods, and compliance testing, providing comprehensive technical support for digital rights management in audiovisual content distribution. The published standards are as follows.

GY/T 277-2019 Technical specification of digital rights management for video audio content distribution

GY/T 333-2020 Digital rights management for video audio content distribution—Digital rights management system integration for digital cable television

GY/T 334-2020 Digital rights management of video audio content distribution—Digital rights management system integration for OTT TV

GY/T 246-2020 Digital rights management for video audio content distribution—Digital rights management system integration for IPTV

GY/T 335-2020 Digital rights management for video audio content distribution —Standard compliance test

GY/T 336-2020 Digital rights management of video audio content distribution—System compliant requirements

On the basis of the aforementioned standards, to guide industry entities such as audiovisual content providers, service providers, smart terminal equipment and chip manufacturers, and DRM technology providers in accelerating the application and implementation of DRM technical standards, as well as strengthening copyright protection for audiovisual content, the National Radio and Television Administration

issued the "Implementation Guidelines for Digital Rights Management (DRM) Technology in Audiovisual Content Distribution (2023 Edition)" on December 4, 2023. These guidelines provide direction for audiovisual content providers and service providers to achieve encrypted distribution and secure authorization of audiovisual content, as well as for smart terminal equipment and chip manufacturers to integrate and develop DRM client functionalities that comply with industry standards.

As of 2025, the ChinaDRM-related technical standards have been approved and published by ITU-T, specifically:

ITU-T J.1040 Digital rights management for video and audio content distribution - Requirements (https://handle.itu.int/11.1002/1000/16192).

ITU-T J.1041 Digital rights management for video and audio content distribution - System Architecture (https://handle.itu.int/11.1002/1000/16262).

ITU-T J.1042 Digital rights management for video and audio content distribution - Client (https://handle.itu.int/11.1002/1000/16263).

2.Industrial Application Status of ChinaDRM

In the industrialization and application of ChinaDRM technical standards, China has established a comprehensive industrial support system encompassing four key aspects: research and development production, security evaluation, service certification, and key management.

In terms of research and development production, the ChinaDRM Laboratory of the Academy of Broadcasting Science has developed a unified DRM client SDK to facilitate the rapid deployment of DRM across various smart terminals. Regarding security evaluation, the ChinaDRM Laboratory conducts assessments of DRM technologies and products to ensure their compliance with standards and interoperability. For key management, ChinaDRM has established a DRM Trust Management Center, which ensures mutual trust between DRM servers and clients through legal agreements and a unified digital certificate technical framework. In the area of service certification, the Service Certification Center of the Academy of Broadcasting Science carries out Digital Rights Management (DRM) service certification to guarantee the secure and effective deployment of DRM technical standards across the industry.

Currently, the Chinese market has 29 DRM server products, 28 DRM client chips, and 22 DRM client devices that comply with the standards. Over 260 million terminal devices, including smart TVs, smart set-top boxes, mobile terminals, and in-vehicle entertainment systems, have integrated DRM functionality. Seven audiovisual equipment manufacturers have built DRM systems that meet industry standards and have passed the Digital Rights Management (DRM) service

certification.

3.Next Steps and Recommendations

In the context of the global audio-visual industry's digitalization and ultra-high-definition development, while new technologies and business models are driving the prosperous development of the global audio-visual industry, audio-visual piracy is also showing new and diversified trends. The digitalized, networked, and globalized black-industry piracy is the biggest challenge to global copyright protection. New types of audio-visual consumption models such as short video editing, re-creation, and the application of generative artificial intelligence, have sparked new copyright disputes, which are accelerating the erosion of the copyright interests of the professional, high-quality audio-visual content creation and distribution industry chain. The end-to-end DRM ecosystem for global audio-visual content still exhibits shortcomings and weaknesses. The deployment of DRM technology at low security levels is a particularly vulnerable spot for piracy attacks. Driven by the profits of piracy, DRM cracking techniques continue to be explored and become more and more sophisticated.

Faced with the development of new technologies and business models, all parties in the global media industry chain should jointly explore solutions. We should adhere to the principles of openness, cooperation, and mutual benefit, take copyright protection as the core goal, and prioritize the healthy development of the global audio-visual industry chain. Together, we should safeguard the international audio-visual copyright protection ecosystem.

In the future, all parties in China's audio-visual copyright protection industry chain will continue to deepen exchanges and cooperation with their international counterparts. China will discuss the evolution of DRM technology, strengthen its implementation, and explore the path of international audio-visual copyright protection ecosystem evolution, which features continuous technological innovation, improving security levels, and expanding protection scopes. China will contribute to building an open, trustworthy, cooperative, and mutually beneficial international digital copyright protection ecosystem.