

EBU

OPERATING EUROVISION AND EURORADIO

TECHNOLOGY
& INNOVATION
WORKPLAN 2017-2019

JUNE / 2017

EUROPEAN BROADCASTING UNION

The European Broadcasting Union (EBU) is the world's foremost alliance of public service media (PSM). Our mission is to make PSM indispensable.

We have 73 Members in 56 countries in Europe, and an additional 33 Associates in Asia, Africa and the Americas.

Our Members operate nearly 2,000 television and radio channels, together with numerous online platforms, broadcasting in more than 120 different languages. They reach audiences of more than one billion people around the world.

We have offices in Brussels, Rome, Dubai, Moscow, New York, Washington DC, Singapore, and Beijing. Our headquarters are in Geneva, Switzerland.

Discover more about the EBU on www.ebu.ch

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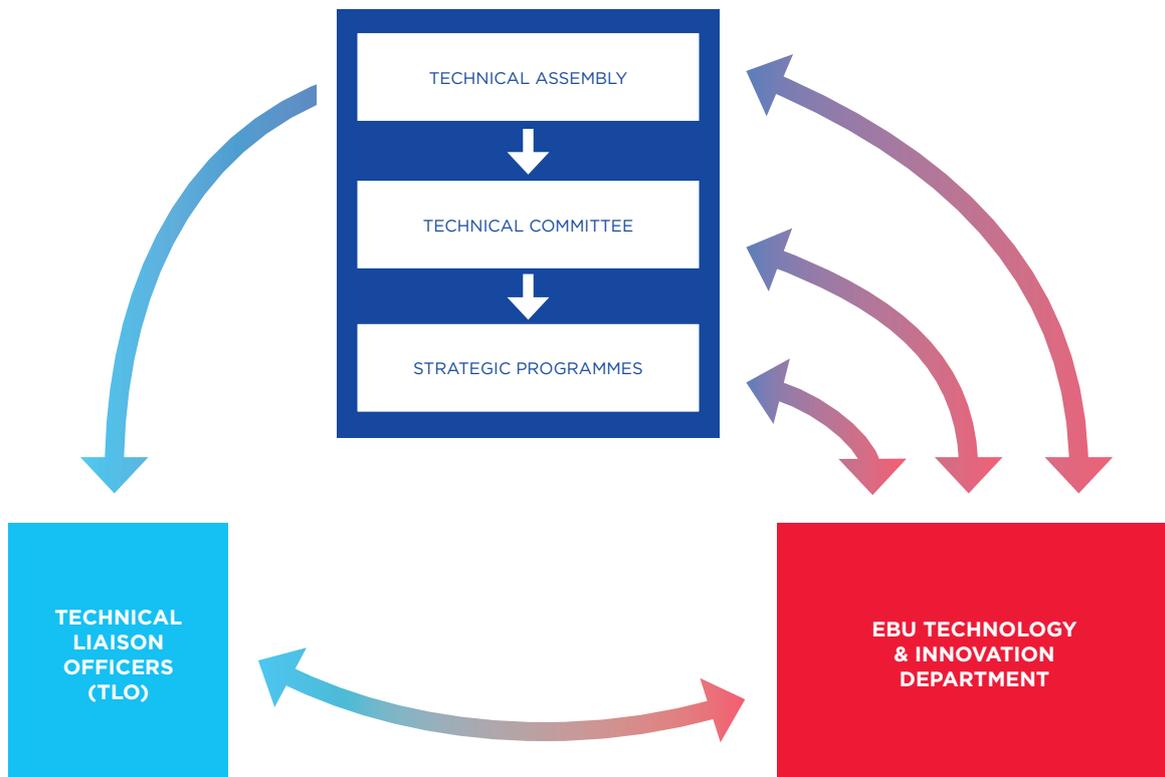
1. OUR WORK

This workplan describes the activities of the European Broadcasting Union's Technical Committee for the period of June 2017 to June 2019. Endorsed by the EBU Technical Assembly, it is enacted by the elected Technical Committee, the Technical Liaison Officers and the Strategic Programmes in coordination with the EBU Technology & Innovation department.

The work is carried out largely through groups termed Strategic Programmes (SPs), made up of employees of EBU Members. An SP's purpose is to consider technological and economic aspects

in addressing the mid- and long-term strategic challenges of EBU Members. SPs can also set up Project Groups, gathering Members and industry experts to undertake activities in specific areas, but the parent SP retains overall responsibility for those activities. The activities of the EBU Technology & Innovation department, such as software development, inter-departmental work, conferences and a wide range of publications, are also integral to this workplan.

Our website tech.ebu.ch contains the most up-to-date information about ongoing work.



2. THEMES, STRATEGIC GOALS AND STRATEGIC PROGRAMMES

A comprehensive set of Strategic Goals, grouped under six overarching Themes, were identified by Members in the development of this workplan.

Through its SPs, the Technical Committee works to meet the Strategic Goals under each Theme, while the EBU Technology & Innovation department provides EBU Members with regular briefings.

The six Themes are interdisciplinary, gathering work done in several SPs under a single banner. They provide context and aid in the coordination and alignment of the work carried out by the SPs.

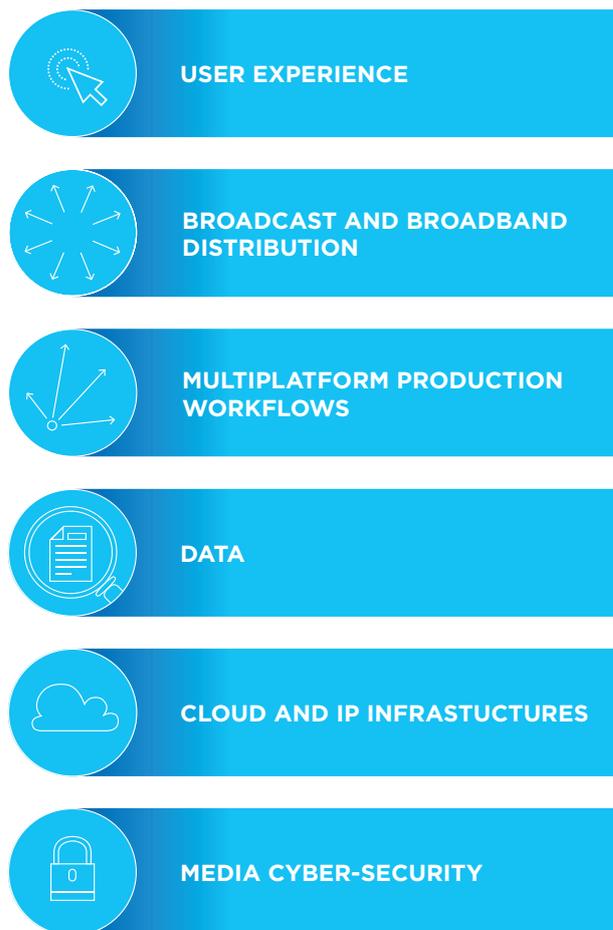
The Strategic Goals for each Theme were identified by a survey in the first half of 2017 of the EBU Technical Committee, the Technical Liaison Officers and the existing SPs. Care was taken to consider the full diversity of needs among EBU Members.

To meet the Strategic Goals (see Section 3), the Technical Committee and its SPs specify deliverables. All current deliverables, milestones, and due dates are listed in the online appendix to this workplan at tech.ebu.ch/workplan2017-19.

This appendix is a living document and regularly updated by the Technical Committee, often based on newly identified needs of Members.

The ability to meet all goals depends on the availability of corresponding resources. In some cases, where sufficient resources are not available, meeting the goals fully may not be possible.

THE SIX THEMES



HOW SPS RELATE TO INDIVIDUAL THEMES

		THEMES					
		USER EXPERIENCE	BROADCAST AND BROADBAND DISTRIBUTION	MULTIPLATFORM PRODUCTION WORKFLOWS	DATA	CLOUD AND IP INFRA-STRUCTURES	MEDIA CYBER-SECURITY
STRATEGIC PROGRAMMES	FUTURE DISTRIBUTION		○				
	VIDEO SYSTEMS	○		○			
	SPECTRUM		○				
	PRODUCTION INFRASTRUCTURES			○	○	○	○
	ONLINE SERVICES	○	○		○	○	
	MEDIA INFORMATION MANAGEMENT			○	○	○	
	RADIO	○	○				
	AUDIO SYSTEMS	○		○			
	MEDIA SECURITY	○	○	○	○	○	○
	IMPLEMENTING OPEN INNOVATION	○		○	○	○	

3. STRATEGIC GOALS FOR EACH THEME

The following tables list the Strategic Goals identified by the Technical Committee and Technical Liaison Officers for the period of 2017-2019.

The corresponding deliverables defined by the Technical Committee and its SPs are regularly updated and listed in the online appendix A at tech.ebu.ch/workplan2017-19.



THEME 1: USER EXPERIENCE

This Theme covers technologies that aim to provide a new or improved user experience for public service media (PSM) services delivered over-the-air or on broadband. Examples of this

are personalization services for content offerings, big screen experience with immersive sound and video, mobile television and radio, and new experiences such as 360° video, VR, AR, and MR.

CURRENT STRATEGIC GOALS		CONTRIBUTING SPs
1.1	Co-develop a recommendation and personalization system.	Online Services
1.2	Provide best practices for improving QoS (Quality of Service) of OTT-delivered media services.	Online Services
1.3	Provide best practices and guidelines for Members' technology roadmaps to enhanced HD services or implementation of UHD TV, including HDR, HFR and colour, in an end-to-end context.	Video Systems
1.4	Study and analyse emerging immersive video and audio systems, such as VR, AR, MR, 360° and object-based audio applications. Consider editorial issues and the implications for broadcasters' workflows and technology roadmaps.	Video Systems Audio Systems
1.5	Maintain the content provider's intended QoE (Quality of Experience) to the end user - irrespective of location, access service, or quality thresholds required or regulated.	Online Services Video Systems
1.6	Develop and investigate advanced access services, provide open standards and open implementations.	Online Services Video Systems
1.7	Define new user experiences in digital radio and provide guidance in the rollout of hybrid radio applications.	Radio

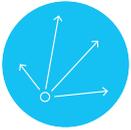


THEME 2: BROADCAST AND BROADBAND DISTRIBUTION

Media delivery systems, including their spectrum use and their availability, are key to how Members reach their audiences. Future broadcast systems, mobile services (like LTE, 5G) and the

organization of streaming delivery (OTT and CDNs) are central to linear and non-linear content distribution to all platforms, by all delivery methods, at any time.

CURRENT STRATEGIC GOALS	CONTRIBUTING SPs
2.1 Investigate future mobile networks such as LTE and 5G with regard to their applicability to PSM. Take an active part in the standardization of B2C and B2B applications for broadcasters.	Future Distribution Online Services Spectrum
2.2 Secure spectrum for DTT (digital terrestrial television) for the foreseeable future. In parallel, investigate opportunities for other innovative distribution mechanisms and the associated spectrum requirements and implications.	Spectrum
2.3 With regard to HTTP streaming including protected content streaming, understand and investigate the move from linear to on-demand and provide guidelines for streaming and standards for web IP distribution.	Online Services
2.4 Provide guidelines for digital switchover in radio and television.	Radio Spectrum



THEME 3: MULTIPLATFORM PRODUCTION WORKFLOWS

This Theme includes topics such as IT systems in production, agile development methods and cost-effective multiplatform and multi-format workflows for a variety of content genres (e.g. VR, UHD TV, HD and new audio formats). Work that takes place under this Theme should assist Members in their transition, help them to

make optimal technology investment decisions, and highlight open and standardized system alternatives where appropriate. The Theme also addresses editorial, organizational and change management issues, which requires cross-disciplinary efforts between technology and editorial teams.

CURRENT STRATEGIC GOALS		CONTRIBUTING SPs
3.1	Investigate how technology drives open innovation in Member organizations and commercial players; how innovation is nurtured and managed; and how broadcasters are impacted by and are managing the digital transformation.	Implementing Open Innovation Audio Systems
3.2	Accompany and assist Members' new building initiatives and identify flexible multiplatform workflows (bricks, bytes, behaviour).	Implementing Open Innovation Production Infrastructures
3.3	Provide guidelines on the use of IP technologies in live television and remote production as well as future applications.	Production Infrastructures
3.4	Represent Members' interests in standards organizations and industry bodies such as JT-NM, and ensure that best practice operational guidelines are developed, including supporting software.	Production Infrastructures
3.5	Investigate specific UHD TV production systems and strive for open standards. Disseminate information and educate Members in technical and operational issues (e.g. HDR).	Video Systems
3.6	Provide best practices on file-based media exchange formats, including metadata, to maximize efficiency.	Media Information Management Video Systems
3.7	Evaluate new and existing video codecs for practicality in content production (from camera to distribution) in order to maintain content providers' intended QoE.	Video Systems
3.8	Investigate IMF (Interoperable Media Format) for use as a multiplatform version toolset that supports flexible workflows and can generate content for any platform or distribution network.	Video Systems
3.9	Provide guidelines for radio and television archives.	Audio Systems Video Systems
3.10	Investigate and fill relevant standards gaps for multiplatform provisioning of access services.	Audio Systems Video Systems
3.11	Analyse object-based video and sound production.	Audio Systems Video Systems



THEME 4: DATA

The Data Theme relates to the management and analysis of data and metadata across the production and delivery chain. Special focus will be given to data analytics and related

technologies such as machine learning and other artificial intelligence techniques. Note that AI/ML may also heavily influence content production in the coming years.

CURRENT STRATEGIC GOALS	CONTRIBUTING SPs
4.1 Investigate Big Data analytics and cognitive services with regard to their application in the media production process and for personalization.	Media Information Management Online Services
4.2 Analysis of privacy issues.	Media Security Online Services Media Information Management
4.3 Provide an update to the TV-Anytime specifications on behalf of the Members.	Media Information Management
4.4 Action plan for FIMS (Framework for Interoperable Media Services) utilization in the cloud and associated update(s) of the FIMS specification.	Media Information Management Production Infrastructures
4.5 Further develop, disseminate and promote the use of EBUCore, the Class Conceptual Data Model and a new process model for production workflows. This should include the consideration of advertisements - in conjunction with EGTA.	Media Information Management
4.6 Develop a common description pattern and tools for automatic metadata extraction and their application in production and archives (radio and television).	Media Information Management
4.7 Evaluate and test emerging machine learning and artificial intelligence tools to make recommendations to Members on utilization and adoption.	Media Information Management Online Services



THEME 5: CLOUD AND IP INFRASTRUCTURES

All applications of cloud-based services across the content production and delivery chain are part of the Cloud and IP Infrastructures Theme. Work in this area includes the analysis of interoperability issues, the monitoring of relevant specifications and the investigation of future business models enabled by shared facilities. It also examines

models for dynamic/hybrid cloud usage (the connection of on-premises/private cloud infrastructures with the public cloud). This topic is closely linked with the move to IP infrastructures in live studio, remote production and virtualization. The overall objective in this area is to assist Members in making the right investment decisions.

CURRENT STRATEGIC GOALS	CONTRIBUTING SPs
5.1 Study the practicality of cloud technologies for production over the next few years (e.g. uncompressed video production in the cloud).	Production Infrastructures
5.2 Understand future models and workflows enabled by end-to-end cloud systems (contribute, shape and deliver) and how these are affected by the choice of cloud technologies.	Implementing Open Innovation Production Infrastructures
5.3 Use of cloud services as part of CDNs (content delivery networks).	Online Services
5.4 Assist Members in the transition to IP and provide guidelines on the emerging SMPTE ST 2110 standard (drive for a single standard). Perform interoperability tests for live IP production applications.	Production Infrastructures
5.5 Investigate and develop a test and measurement regime for new standards for IP in live production.	Production Infrastructures
5.6 Investigate and analyse the economic model of using cloud-based services as an alternative to on-premises equipment.	Production Infrastructures



THEME 6: MEDIA CYBER-SECURITY

The scope of the Media Cyber-Security Theme comprises all matters pertaining to the protection

of, and security threats to, Members' IT systems, and where appropriate, to users' receiving systems.

CURRENT STRATEGIC GOALS	CONTRIBUTING SPs
6.1 Identify specific requirements for networked media across all cyber-security domains (i.e. with regard to architecture, risk assessment, threat intelligence, operations, governance, user education) for different deployment environments.	Media Security
6.2 Establish a trusted platform for discussion between EBU CISOs (Chief Information Security Officers) and identify confidentiality issues related to products.	Media Security
6.3 Develop recommendations on cloud service security.	Media Security Production Infrastructures
6.4 Provide, on request, a confidential security audit of individual EBU Members in partnership with the EBU Internal Audit Committee.	Media Security
6.5 Encourage the adoption of security recommendations by Members and industry.	Media Security
6.6 Establish an online monitor of security threats and vulnerabilities.	Media Security
6.7 Increase communications to raise awareness of cyber-security.	Media Security
6.8 Harmonize guidelines with international groups in association with WBU-TC.	Media Security

4. SUPPORTING DEPARTMENTAL ACTIVITIES

This section, together with appendices B and C (tech.ebu.ch/workplan2017-19), gives an overview of other activities, groups, resources and relations managed by the EBU Technology & Innovation department.

SOFTWARE ENGINEERING

In-house software engineering teams are essential to many of our Members in their digital transformation. In order to assist and to minimize duplication of work already being performed elsewhere, EBU Technology & Innovation has created a unit to educate, advise and empower Members to run software-driven collaborative projects. Each SP can ask for assistance and leverage existing tools and best practices when code needs to be developed as part of an identified deliverable.

FLAGSHIP CONFERENCES AT THE EBU

Together with the SPs and Members, the EBU Technology & Innovation department organizes various events such as workshops and conferences. Workshops and webinars are organized as needed throughout the year to investigate emerging issues, while the standing flagship conferences take place at defined times.

These are as follows:

- Production Technology Seminar (January/February)
- Digital Radio Summit (February)
- Broadthinking (March)
- Technical Assembly (June)
- Network Technology Seminar (June)
- Forecast (November)
- Cyber Security (Autumn)

INTERNATIONAL BROADCAST CONVENTION (IBC)

Each year, the Technology & Innovation department organizes a showcase of EBU technical activities at IBC. The department, the Technical Committee and the SPs are involved in the preparation of a stand at the exhibition, in addition to papers and a session at the conference.

TECH-I MAGAZINE AND EBU TECH REVIEW

The EBU Technology & Innovation department publishes the quarterly magazine tech-i, designed for technical staff and managers of EBU Members and other broadcast-related companies. The EBU also publishes the online journal EBU Technical Review, which includes more in-depth technical papers and articles.

THE MEDIA TECHNOLOGY PULSE PUBLICATION

The EBU Technology & Innovation department also creates the Media Technology Pulse publication, intended to signal important issues in broadcast and broadband technology to non-technical as well as technical management.

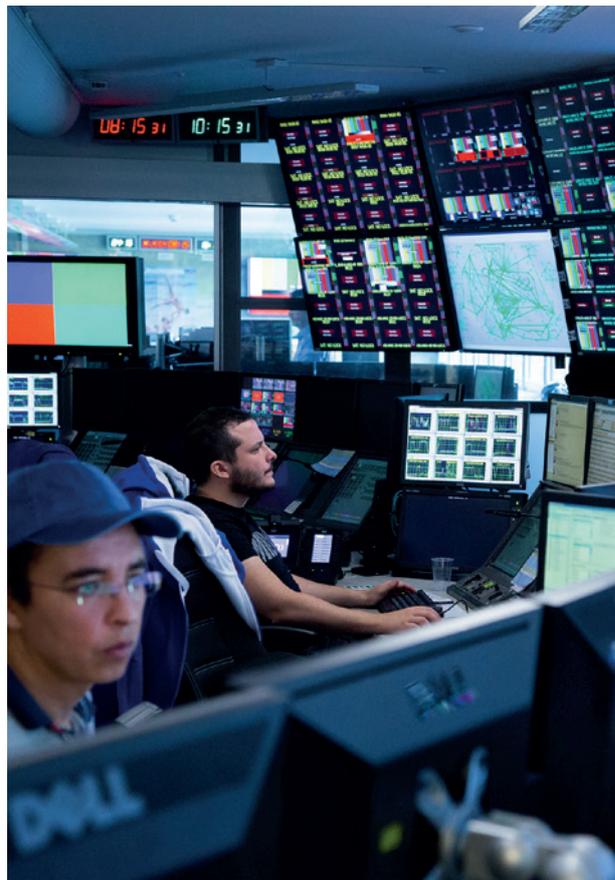
TECHNICAL COMMITTEE ANNUAL STUDY MISSION

Each year, members of the Technical Committee and Technical Liaison Officers undertake a study visit to a country or region where there are major technical developments under way that may have an impact on the EBU and its Members. Their findings are reported to EBU Members.

5. INTER-DEPARTMENTAL COLLABORATIONS

The EBU Technology & Innovation department cooperates with other departments of the EBU in areas that include the following:

- Implementing Open Innovation (SP) with the Eurovision Academy
- Training programmes with the Eurovision Academy (IP Studio curriculum, ASBU training and other initiatives)
- Digital Transformation Initiative with the Media department
- Digital radio initiatives with the Media department
- Content collaboration with the Media department
- VR collaboration with the Media department
- Regulatory EU consultations with the Brussels office
- EU MediaRoad project with the Brussels office
- News Technology Seminar with the News Committee
- Liaising with the Online and TV committees
- New Member Buildings project with the Eurovision Academy
- BISS (Basic Interoperable Scrambling System) with Eurovision for a new improved Scrambling Algorithm for Contribution
- Contributions to the EBU Big Data Initiative



6. SCOPE OF THE STRATEGIC PROGRAMMES

FUTURE DISTRIBUTION (FORMERLY FDS)

Chair: Roland Beutler (SWR)
Coordinator: Darko Ratkaj (EBU)

The group studies the relevance of different broadcasting, fixed and mobile television distribution options for PSM, in particular in terms of reach, quality, free-to-air, and market position. It also models the viewing profile of users from a technical point of view (e.g. linear/non-linear, in-house produced/user-generated content, television set/other devices, in the home/on the move, and individualized/personalized services). This needs to link to the future technical and regulatory requirements for connectivity and quality for relevant use cases. The group also studies the impact of new delivery models and hybrid approaches, and it acts as a focal point for EBU activities related to 5G.

VIDEO SYSTEMS (FORMERLY BHD AND QC)

Chairs: Andy Quested (BBC), Dagmar Driesnack (IRT)
Advisors: Giorgio Dimino (RAI) and Friedrich Gierlinger (IRT)
Coordinator: Frans de Jong (EBU)

Video Systems deals with all aspects of video images, image quality and quality assessment, specifically concerning HDTV, UHD TV, High Dynamic Range and High Frame Rates as well as emerging immersive image systems such as Augmented, Mixed and Virtual Reality. Taking an end-to-end approach from production to distribution and the consumer, the work will encompass all aspects of video processing, investigate production codecs, related file formats and wrappers (e.g. MXF, IMF), workflows and access services and also evaluate practicality and cost aspects.

Video Systems will provide strategic and technical advice and, through active collaboration with industry and standards bodies such as the SMPTE, DVB, W3C and ITU-R, will help to ensure broadcaster requirements are reflected in future media applications and services.

SPECTRUM (FORMERLY SMR)

Chair: David Hemingway (BBC)
Coordinator: Elena Puigrefagut (EBU)

Spectrum sets out to identify, formulate and represent EBU Members' interests in relevant regulatory bodies and at influential events related to spectrum issues. It builds alliances and brings together the wider broadcasting community to draw in expertise and shared resources from across the broadest selection of Members to do technical work and to lobby national and international bodies.

PRODUCTION INFRASTRUCTURES (FORMERLY FNS)

Chair: Phil Tudor (BBC) and Markus Berg (IRT)
Coordinators: Hans Hoffmann (EBU, acting), Willem Vermost (EBU)

Production Infrastructures helps Members transition to infrastructures based on IT networks in studio and remote production. This is done by studying the requirements of broadcasters, by sharing knowledge, experience and test results, and by providing updates on new technologies. Production Infrastructures also examines the impact of new IP technologies on operational and production practices and workflows. It offers guidance on the path to dematerialized production facilities using cloud technologies.

ONLINE SERVICES (FORMERLY BIS)

Chair: Ignacio Gomez (RTVE)
Coordinator: Bram Tullemans

Online Services is the home for internet-based front-end (user interface) and back-end distribution technologies including HbbTV. It investigates their short-, mid- and long-term impacts on PSM (e.g. universal reach, prominence or service provisioning). Online Services also identifies which types of (technical) services EBU Members may develop in the OTT (over-the-top) domain, delivers useful software personalization tools for Members, and offers guidance on the use of cloud solutions and CDNs.

MEDIA INFORMATION MANAGEMENT

Chair: Alberto Messina (RAI)
Coordinator: Jean Pierre Evain (EBU)

Media Information Management investigates the use of machine learning and artificial intelligence in broadcast applications. The group will make use of semantic modelling and Service Oriented Architectures (FIMS), which offer greater interoperability than current, often proprietary, system design practices.

The SP also identifies and evaluates tools for the generation of multimedia and subtitle information, for content analysis and for efficient automatic metadata extraction. The group shares expertise and best practices with a community of specialists from industry, academia and Members. The FIMS taskforce, which is managed jointly by the EBU and AMWA, contributes to the definition of standards that ensure interoperability and robustness.

RADIO

**Chairs: Javier Sanchez (RTVE),
Paolo Casagrande (RAI)**
Coordinator: Ben Poor (EBU)

Radio provides the platform for EBU Members to help each other in the move from analogue to digital and hybrid radio platforms, through prototyping, testing and demonstrating new services based on digital and hybrid radio. These new services and platforms are supported by open standards and a focus on the democratization of digital radio, benefiting members and their audiences. The group seeks to improve the radio user experience wherever the audience is, including mobile and automotive listening, through collaborations with the wider industry and device manufacturers.

AUDIO SYSTEMS (FORMERLY FAR)

Chair: Mathieu Parmentier (FTV)
Coordinator: Roger Miles

Audio Systems provides guidance to help broadcasters make the move to new (IP-based) audio systems, provides input to ITU and ETSI standardization, and organizes seminars and workshops to enable sharing of best practices in new audio production technology. Audio Systems targets the development of the missing ecosystem that links content creators with the sound rendering functions in end-user devices. These objectives are driven by the object-based audio (OBA) approach developed in the Audio Definition Model (ADM) of EBUCore. The PLOUD group falls within Audio Systems' remit and it will continue with work on audio loudness.

MEDIA SECURITY (FORMERLY MEDIA CYBER SECURITY)

Chair: Andreas Schneider (SRG)
Coordinator: Adi Kouadio (EBU)

Media Security provides media-specific security guidance covering threat mitigation best practices (DDoS, ransomware), information security (data protection and privacy), media services and infrastructures security (cloud, IP networks, web services), and security governance (organizational principles). The SP collaborates with media systems vendors to raise the overall level of security for broadcast systems through the adoption of minimum security standards and agreed benchmarking procedures.

In addition, the SP also serves as a trusted forum for its community of media security experts. Media Security also takes a leading role in raising awareness about security as a critical business risk for media companies.

IMPLEMENTING OPEN INNOVATION (FORMERLY IMPS/FCP)

Chair: Robert Amlung (ZDF)
Coordinator: Hans Hoffmann (EBU T&I), Helene Rauby-Matta (EBU Media Department)

Implementing Open Innovation (IOI) is jointly coordinated by the EBU Technology & Innovation department and the Eurovision Academy. IOI examines structures and processes within an organization that encourage ideas, develop and test innovative approaches, and that eventually ensure their successful application in mainstream production. The programme also brings to the forefront products and services that allow PSM organizations to better serve digital audiences.

IOI organizes themed visits several times per year to explore how EBU Members and other organizations successfully manage digital transformation. As the gradual shift to IP, IT, data- and cloud-driven technologies in PSM is producing major changes in corporate culture, IOI investigates the impact and opportunities associated with this transition.

While highlighting existing strategic partnerships, IOI visits also explore other parts of the digital innovation landscape in which Members operate, such as start-ups, commercial media actors or universities.

7. SUMMARY

By working together, and with the support of the Strategic Programme and Project Group participants, EBU Members are able to achieve much more than by working in isolation. The above is a summary of ongoing and planned activities for the Technical Committee's SPs over the next two years.

By nature this workplan is a living document that keeps track of developments in the broadcast and broadband environment. A continuous review process is in place as the work of the Technical Committee and the SPs will evolve over time.

The online version of this workplan, which can be found on the EBU technology website (tech.ebu.ch/workplan2017-19), provides up-to-date information on the activities and deliverables of the Strategic Programmes, a list of our liaisons with external groups and a section on frequently asked questions.

APPENDIX A: DELIVERABLES OF THE STRATEGIC PROGRAMMES

tech.ebu.ch/workplan2017-19

Following the consultations with the Technical Liaison Officers and Technical Committee to define the Strategic Goals for the period 2017-2019, the chairs of the SPs were asked to propose deliverables to work towards these goals. This section of the workplan lists the SP deliverables and due dates. Changes will be made by the Technical Committee and the SPs during the course of 2017-19. As it will be updated frequently, the appendix is an online document only.

APPENDIX B: LIAISON BODIES AND EXTERNAL GROUPS

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On behalf of the Technical Committee, the EBU Technology & Innovation department takes leadership of, maintains a presence in or liaises with a variety of external organisations.

APPENDIX C: FAQ - HOW TO GET INVOLVED

tech.ebu.ch/workplan2017-19

Refer to this document for information about how to get involved in our work and for more detailed descriptions of the roles of the Technical Committee, Technical Liaison Officers and Strategic Programmes.

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