

tech-i

On track for more immersive audio and video?

Plus

- Connected cars: where did the radio button go?
- Defining spectrum positions ahead of WRC-23
- VRT's Stijn Lehaen on disruption and the importance of play and more...



Cover story: The EBU's Audio Systems and Video Systems groups used this summer's European Championships 2022 at Munich's Olympiastadion to capture valuable test content. On pages 10-11, Werner Bleisteiner (BR) and Simon Thompson (BBC) describe the aims of the project and the challenges they faced.

Photo: Werner Bleisteiner

Editor-in-Chief: Antonio Arcidiacono
Managing Editor: Patrick Wauthier
Editor: Eoghan O'Sullivan
tech@ebu.ch

Design: Louise Tait

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Thinking differently about the metaverse and shared experiences

Antonio Arcidiacono, Director of Technology & Innovation, EBU

It's all too easy to dismiss the metaverse as a greed-driven attempt by tech giants to pull us ever deeper into their web; or perhaps as a techno-utopian vision of a life lived in 3D headsets. And for many people, the reaction is to simply ignore it. However, there is another way to look at this. I firmly believe public service media (PSM) should offer our own vision of a metaverse that is oriented towards collective social value.

Let's first look back in time. Historically, PSM have delivered content with shared experiences in mind. These experiences could be shared in the first degree, sitting together in the living room; or at a secondary level, providing common subjects to discuss at work or social gatherings with friends and family. It is in our DNA.

This is the direct opposite of what the online tech giants are doing today. Their aim is to isolate each user, making it easier to extract valuable data and to target advertising. Essentially, they work to control the 'loyalty' of each individual citizen to their own personal content or information offer. "It's mine. It's not yours."

SOCIAL ADVANTAGE

While personalization does have a role to play for PSM, the fundamental goal must be to develop and distribute content so that people can benefit from it collectively, whether at home or wherever people may gather. This is an area where PSM have a structural social advantage that must be defended and renewed.

A natural extension of this is that PSM should partner with entities that produce live events, integrating such events into the PSM content offer and jointly promoting them. Furthermore, involving citizens directly in



“The online tech giants’ aim is to isolate each user, making it easier to extract valuable data and to target advertising.”

content creation, again with a focus on the collective, will empower them as shareholders in PSM.

Some industry voices predict or even call for the death of broadcasting. This is about more than a shift to 'better' technologies. Dismantling broadcast infrastructure in fact represents an attempt to attack the foundations of collective media content in favour of individual media content. The result is a de facto segmentation of society that distorts the social bases that have underpinned the accelerated evolution of our societies.

A world where broadcasting is entirely replaced by individual unicast pipes to each user is a

world where individualism has conquered the collective.

DIFFERENT VISION

We must think about the future media landscape in a more holistic manner. The digital education of large swathes of the population is allowing the development of new content and experiences that *combine individual interactions with collective experiences*.

It is not the Oculus-based individual isolation of the Facebook metaverse that PSM should pursue. Rather, it is the augmented reality of an outdoor experience where I combine my physical experience – from a simple stroll to attending a live concert or sporting event – with a common, location-dependent experience that I can share with other people enjoying the same emotions.

UN Secretary-General António Guterres recently sounded the alarm on the direction being taken by the social media giants:*

“Social media platforms based on a business model that monetizes anger & negativity are causing untold damage to societies. Hate speech & misinformation are proliferating. Our data is being bought & sold to influence behaviour.”

While Guterres pointed to the need for stronger regulation, I believe PSM can play a role as a powerful counterweight to trends he highlighted. *Our* metaverse should be one that brings people together, outside of their bubble. The role of PSM, in the metaverse or any other universe, is that of *increasing* social interaction and creating an environment in which informed citizens can share their experiences and find better ways of living together.

* <https://tinyurl.com/guterres-tweet>

Dominique Hoffmann (ARD/SWR) chairs the new EBU Technology Think Tank



A new pipeline for young tech talent

The EBU's new Technology Think Tank focus group was created in September 2022. Endorsed and supported by the EBU Technical Committee (TC), the group was born from the business requirement to address the challenges of PSM in a media world that is evolving at a fast pace and where understanding and reaching younger audiences is a priority.

This group of young women and men have been identified by

the TC as the next generation of media-technology experts and leaders among EBU Members. Feeding into the TC, the group will explore trends, opportunities and challenges in media creation, distribution and consumption, also identifying potential areas for collaborative work among EBU Members.

An additional task for this group is to identify and propose changes that will more effectively bring the new

generation of experts and leaders into the EBU's technical activities.

Chaired by Dominique Hoffmann, Head of Technology and Production at ARD/SWR, (Germany), the group includes:

- Stefan Kollinger, Innovation Officer, ORF (Austria)
- Ruth Degraeve, Manager of VRT MAX platform, VRT (Belgium)
- Rahel Luder, Junior Project Coordinator for International Projects, Research & Business Development, Swisstext (a subsidiary of SRG SSR), (Switzerland)
- Hilary O'Callaghan, Online Content and Channel Manager, RTÉ (Ireland)
- Yannick Olivier, Broadcast Engineer, France TV (France)
- Sandeep Thandi, Lead Architect (Model & Process), BBC (UK)

This new pillar should enrich and support the ongoing and future activities of the T&I Department, the TC, and EBU Members, including in the area of Diversity, Equality and Inclusion (see page 13).

EBU pushes for European media data space

Since joining the Gaia-X project last year, the EBU has been promoting the creation of trusted media data spaces to enable sovereign exchange of content and data. The EBU and Gaia-X recently published a position paper, authored by the EBU and the vertical ecosystem group for media within Gaia-X, calling for the creation of a data space for the European media and creative industry sector.

Relying on core building blocks under development by various organizations in Europe, such as Gaia-X, such a data space would allow the media industry to improve data flows and digital rights management in the production chain, get better insights on user needs and preferences, increase findability of media content, innovate around new data-driven technologies, and create new business opportunities while guaranteeing data sovereignty. Using standard core elements for the media data space would also foster collaboration with other industries such as automotive, mobility and tourism.

The position paper sets out use cases that could be implemented within a trusted media data space and defines key building blocks required to support them. It also lists a number of existing

data-sharing initiatives in Europe that could be made interoperable to achieve a 'federation' of data-sharing solutions as a kick start for the creation of a media data space.

The position paper was based on feedback gathered during 2022 from EBU Members and relevant actors across the industry.

The EBU is now driving the creation of a consortium to answer the call for the deployment of a media data space under the EU's Digital Europe programme.

Interested parties should contact Lucille Verbaere (verbaere@ebu.ch). The position paper is available via: tech.ebu.ch/publications



Enabling new narrative visions through immersive media

TRANSMIXR, a €9 million project funded by the EU's Horizon Europe programme and led by the Technological University of the Shannon in Ireland, had its kick-off meeting on 25-26 October.

The EBU's Brussels office is one of the partners of the consortium, which counts 19 organizations from 12 European countries. Together, the TRANSMIXR team contains advanced and complementary expertise and skillsets in European research, media and innovation programmes, as well as in-depth knowledge of AI and XR and their application to the media sector.

The project will produce a suite of user-centric technologies to support the creation, consumption and understanding of new media experiences in distributed, collaborative and immersive ways through the convergence of AI and XR.

Application of the living lab methodology, focused on innovation in real-life environments, will allow TRANSMIXR to develop and evaluate four pilots that bring

the vision of future media experiences to life in four important culture and creative industry domains: news media, broadcasting, performing arts, and cultural heritage.

The Brussels office of the EBU will manage communication and dissemination activities and will facilitate exchange of expertise and cross-collaboration with the EBU AI & Data group. For the EBU and its Members, following the work of TRANSMIXR and its pilot projects will provide an opportunity to keep in touch with cutting-edge media developments, including broadcast/multicast and unicast delivery of immersive experiences. Sustainability aspects will also be in focus.

EBU Member RTV Slovenija is another TRANSMIXR partner and will work, together with partner media organizations, on ensuring that the implemented framework is grounded in real industry needs. Another EBU Member, Ireland's TG4, is currently in the process of joining the consortium.

For more information visit: www.transmixr.eu

The TRANSMIXR kick-off meeting was held in Athlone, Ireland



Thomas Hinrichs, Director of News and Current Affairs for BR, will be a keynote speaker for TS 2023

BR/Markus Konvalin

PTS2023: producing unforgettable media experiences

The EBU Production Technology Seminar returns on 24-26 January in Geneva, with a programme that will take in everything from the evolution of the newsroom to AI-based workflows, volumetric video, virtual production, Web3, NFTs for media, and a whole lot more.

The theme that ties everything together at PTS2023 is optimizing the media experience for the audience across all types of content.

Keynotes from industry leaders will anchor each day of the conference, setting the scene for a compelling mix of presentations, panels and hands-on demonstrations. The fresh experience of producing the FIFA World Cup in HDR (high dynamic range) is sure to generate plenty of interest, as will the latest reports from EBU Members who are building facilities that leverage the latest IP and cloud-based workflows.

Change, transformation and innovation are always essential themes for PTS. The programme will make space for a broad discussion on what is needed to transform from a traditional broadcaster to a tech-driven media company, and also why R&D&I – research and development and innovation – is so critical in this.

In two dedicated technology-oriented streams, the programme will dive deep into synthetic humans, advances in AI and metadata in media, and into emerging production technologies for new efficient workflows.

Where did the radio button go?

The evolution of car entertainment systems means that radio must fight to retain its pre-eminence for media audiences. **Gwen Niehues**, who manages automotive projects for Germany's ARD, explains why a pan-European approach is key.

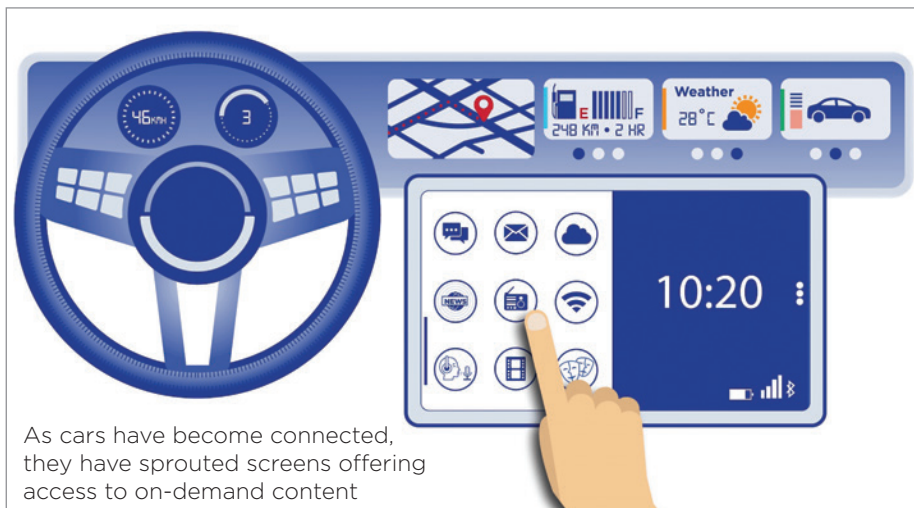
For decades, the radio has been a trusted companion in the car: one push of a button, and drivers can enjoy music, news, talk, traffic information and more. Radio is intuitive, reliable, free and entertaining. However, in recent years, the entertainment choices of drivers and passengers have grown exponentially. As cars have become 'connected', they have sprouted screens, through which users can access virtually any on-demand content they desire. In this new environment, radio might become one of many applications, and that intuitive, first-level physical radio button might disappear altogether.

Sounds worrying? Maybe. But that's not the full story: our audiences keep telling us they love radio, and especially in the car. And nowadays PSM organizations have even more (audio) content to offer on demand. That is why now is exactly the right time to act. Within ARD, we are putting increased focus on the automotive space to make sure we can continue to provide audiences on the road with high-quality linear and on-demand content.

FOUR PRINCIPLES

Even as we consolidate ARD's automotive efforts on a national level, we are very aware that car manufacturers operate on an international, or even global level. We are happy, therefore, to contribute to the EBU's Connected Cars and Devices group, where we not only exchange ideas with our colleagues from across Europe, but also come together to execute concrete projects to bring PSM content into car entertainment systems.

So, what do we want to achieve through our work? What should



As cars have become connected, they have sprouted screens offering access to on-demand content

a future radio experience look like? To answer these questions, we developed a set of four principles that we, as the EBU Connected Cars group, use to guide our work.

First, radio must remain easy to use. It should start with the push (or touch) of a button. Audiences love radio precisely because it is so easy and because they don't need to choose. Even if we might add features, we should not forget that radio needs to remain intuitive and, especially in the car, safe to use without distraction.

Secondly, radio should not just be easy to find, it should be impossible to miss. Just like the physical radio button used to be, it should exist on that first level and not disappear in the jungle of apps.

Thirdly, radio in the car should be focused and personalized. We should make smart suggestions based on prior listening but be transparent with the data we collect.

And lastly, radio comes as a package. It includes public and private stations, as well as local,

national and international broadcasters. All radio stations should be found in the same place.

AUTOMOTIVE INDUSTRY

Within the Connected Cars group we are not just using these principles to guide our work internally, we are also actively approaching the automotive industry. In meetings and workshops we are sharing our ideas for the future of radio and PSM content. And so far, car manufacturers have shown great interest and are open to our suggestions. By collaborating on a European level, we can offer automotive companies the scope and scalability they are looking for.

We should not forget that as PSM organizations we are the ultimate experts when it comes to radio. That means that we also have the expertise to directly collaborate with the automotive industry, who are open to input from us. Now is the time to make sure that our content stays front and centre in connected cars.

EBU Members can join the Connected Cars and Devices group via the website: tech.ebu.ch/connected-cars

A video explaining the principles for radio in connected cars is available here: tinyurl.com/connected-car-principles

An expanded scope for EuroVOX

The EBU's **Ben Poor**, Product Owner for EuroVOX, says the tool is going from strength to strength, being used for a growing array of applications and with enhanced capabilities in the pipeline, thus helping EBU Members meet their accessibility obligations.

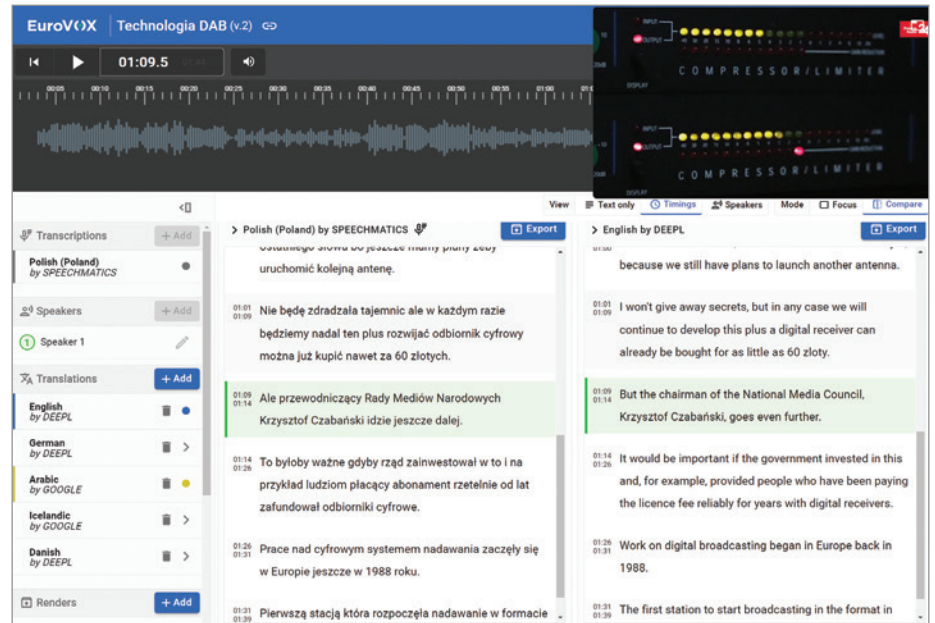
For EuroVOX, 2022 has seen big leaps forward both in terms of what it can do and in how it is being used. It had already established itself as one of the key components of the EBU's *European Perspective* initiative, where EuroVOX is used to transcribe, translate and revoice thousands of articles and videos each day. We see now, however, that there are other domains where it can be applied and may prove to be even more useful.

Activities across the EBU are beginning to take advantage of the straightforward transcription and translation of audio and video content that EuroVOX offers. Beyond the applications in news tools, it is also being used elsewhere in the EBU's content exchange networks, to provide captions for social media content using the Euroradio Storyboard tool (available to EBU Members via storyboard.ebu.ch), and as part of ongoing work to make the huge library of recordings from EBU events more accessible to a wider audience. There are also promising trials on how EuroVOX could be deployed for on-demand audio content, particularly with longer-form podcasts.

FILE-BASED TO LIVE

The focus so far has been on working primarily with file-based content, transcribing pre-recorded audio and video content. However, there is an increasing need to deal with live content. This is not just within the EBU itself, where our own events and webinars could be offered in multiple languages, but also for our Members, to help them meet their widened accessibility obligations for both online and broadcast services.

While real-time transcription has long been a part of



EuroVOX, this has now been developed into a dedicated application that works end-to-end as a system for automatic captions, alongside the possibility of simultaneous subtitles in a huge range of languages. By using EuroVOX as a single integration point, it is possible for EBU Members to mix and match different providers of transcription and translation technology.

Further developments are anticipated during 2023, with the goal to add functions for treating live content in the existing EuroVOX tool. This would give a user the ability to see transcriptions and translations in real time, with the ability to apply corrections and adjustments before being output as captions and/or subtitles to a live broadcast signal or online

stream.

Of course, one of the characteristics of machine-based transcription and translation is that the technology surges forward in terms of its capabilities. The advantage of a project like EuroVOX is that tools and workflows can be built around the premise of providing open and equal access to a wide range of technology vendors. This makes it quicker and easier to use the best capabilities of each, switching between them, and taking advantage of new advances. This also means that we can work with EBU Members to help them with their obligations to make their content more accessible.

To learn more about EuroVOX, visit: tech.ebu.ch/eurovox

BUILDING TOGETHER

EuroVOX is a great example of collaboration between the EBU Technology & Innovation department and EBU Members. The co-development approach ensures that the tool evolves to meet the day-to-day needs of public service media, adding real value for the Members.

Defining the options for the future of the UHF band

With the World Radiocommunication Conference 2023 (WRC-23) just one year away, the group tasked with preparatory studies on the topic of future use of UHF spectrum in ITU Region 1 has delivered its report. **Walid Sami** explains the outcomes.

In September 2022, ITU Task Group 6/1 (TG6/1) completed two years of work, the outcome of which will be reflected in the overall report of the Conference Preparatory Meeting (CPM) for WRC-23. The group was asked to define possible regulatory solutions for the future use of the UHF band in Europe, Africa and parts of the Middle East, ITU Region 1.

USAGE & NEEDS

The first outcome of TG6/1 is a summary of current spectrum use and future needs for the radiocommunication services currently operating in the UHF band, including broadcasting and mobile telecoms. It shows that an overwhelming majority of countries require the current amount of UHF spectrum allocated to broadcasting to be retained, while a few administrations express a need for some of this spectrum to be made available to mobile services, either for mobile broadband, for police and emergency services, or for military ad-hoc mobile usage.

SHARING STUDIES

Secondly, TG6/1 provides the results of technical studies on sharing and compatibility between mobile and broadcasting as well as between mobile and other incumbent services, in particular radio astronomy and PMSE (programme making and special events) applications.

Several studies confirmed results from similar studies for previous WRCs, which showed that coexistence between mobile and broadcasting across borders is very difficult as it would require very large geographical separation, e.g. several hundreds of kilometres. This has been confirmed by real cases of



The Popov meeting room at the ITU

interference reported in the 700 MHz and the 800 MHz bands, where mobile services were, for a period, used alongside continuing broadcast services in neighbouring countries. Other studies showed that PMSE applications cannot operate in the same bands as mobile broadband.

However, further studies were submitted suggesting the opposite conclusions, i.e. that coexistence with the mobile services is quite feasible. This led to controversial discussions and diverging views in the group which could not be reconciled.

POSSIBLE OPTIONS

Thirdly, TG6/1 has identified possible regulatory options to solve the question of WRC-23 Agenda Item 1.5, regarding the future use of the UHF band. These options include the following, with further alternatives under each:

- No change to the current allocation in the 470–694 MHz band at WRC-23, with or without postponement of the discussion to WRC-27 or WRC-31.
- Additional primary allocation to the mobile service in the 470–694 MHz band or parts thereof, with or without conditions that may include:

- Identification for mobile services or no such identification
- Allocation in the whole Region 1 or only in some countries
- Mobile operations limited to downlink
- Entry into force later (e.g. 2031)

• Secondary allocation to the mobile service in the 470–694 MHz band
There were opposing views in TG6/1 on all three parts of the final text, and these had to be reflected in many places in the document as no consensus could be reached.

It is now up to the second CPM, in March 2023, to incorporate the TG6/1 report alongside reports on other WRC-23 agenda items into a final report that will be submitted to WRC-23. As further inputs from ITU members on open issues are expected, the text proposed by TG6/1 is likely to be further modified. Nevertheless, the outcome of TG6/1 will enable national administrations and regional groups to formulate their respective positions on the WRC-23 Agenda Item 1.5.

WRC-23 will take place from 20 November to 15 December 2023 in the United Arab Emirates.

Find more information at: tech.ebu.ch/spectrum

Testing IP production equipment for spec compliance and security

The fourth edition of the JT-NM Tested programme brought over 100 experts to the Riedel Group facility in Wuppertal, Germany last August. The EBU's **Ievgen Kostiukevych** reports on the changes introduced for the latest round of testing.

The JT-NM Tested programme is recognized, both among vendors and in user communities, as a major driving force for the adoption of open media-over-IP standards and specifications. The August 2022 edition introduced major infrastructure, test and measurement, control, and automation additions and changes.

ROBUST NETWORK

The on-site network was completely rethought and redesigned, putting scalability and real-world operations first. For the first time, the network was fully routed, with every device residing in its own subnet. That required robust DHCP and DNS services, which itself enabled the use of NMOS broadcast controllers for the essence testing. This greatly reduced the amount of manual configuration needed.

Pedro Ferreira, the core developer for EBU LIST, said the importance of a robust control plane can't be underrated. "While it took us an average of 30 to 40 minutes to validate a device with manual configuration, this was reduced to 5 to 10 minutes when using NMOS."

The ST 2110 testing team, led by Willem Vermost (VRT), added support for newly released standards and recommendations as well as addressing earlier limitations in the test scenarios. Support for ST 2110-22 with JPEG XS testing was added, and support for ST 2110-31 testing was finalized. Some additional real-world PTP test scenarios were also added.

While the RP 2110-25 recommendation on test and measurement equipment alignment wasn't officially published at the time of testing, the opportunity was taken to run

JT-NM Tested is sponsored by the Joint Task Force on Networked Media and administered by the EBU in partnership with experts from VRT, CBC/Radio-Canada, BBC R&D, ARGE RBT, and several industry vendors.

an exercise on vendor alignment and interoperability, confirming its relevance. Additionally, the use of RP 2059-15, addressing PTP monitoring, was strongly recommended at the event.

The ST 2110 testing team executed a total of 11,000 individual tests against 84 products.

NMOS TESTING

While early JT-NM Tested editions were targeted exclusively towards testing of the endpoints, to broaden the programme's scope and encourage unified, open control-plane adoption, the March 2020 event introduced testing of the NMOS IS-04 registry and broadcast controllers. Though challenging, these additional tests had become a valuable part of the NMOS testing by the August gathering.

Led by Félix Poulin (CBC/Radio-Canada), the NMOS team put great effort into automation, collaborating with the NMOS Steering Group in AMWA to introduce additional functionality. Experts from CBC/Radio-Canada, BBC, and ARGE RBT joined the team, which performed and



The August 2022 edition of JT-NM Tested was hosted by Riedel Group in Germany

validated 17,000 individual tests against 74 media nodes and nine registries and controllers, with 92% of those tests being automated.

"Testing consistency is very important," said Félix. "We must ensure that every test is evaluated equally between the teams. This way, we remain fair and transparent to the manufacturers and provide the best value to the end users, including EBU Members. And this can only be achieved through automation."

CYBERSECURITY

Cybersecurity remains an essential and integral part of JT-NM Tested. Led by Gerben Dierick (VRT), the cybersecurity testing team, in partnership with the EBU Media Cybersecurity community, once again conducted a large-scale vulnerability assessment.

Responses to a pre-test questionnaire gave the team information on how a device was expected to behave in the network, what ports were kept open and for what reasons, etc. This eliminated any false positive results and informed more educated conclusions on a given product. While the individual results are not published, for obvious reasons, the team thoroughly investigates every threat discovered and follows up with vendors to clarify and suggest potential mitigation plans.

The team analysed a total of 7,841 warnings, boiling them down to 601 potential vulnerabilities of varying severity. Each vendor has received an individual report, and anonymized overall results are published in a general report.

Getting closer to action with high frame rate

This summer's European Championships 2022 provided an opportunity for production technology experts from EBU Members to capture valuable new test material. Below, **Simon Thompson** (BBC) describes the video-related goals while, opposite, **Werner Bleisteiner** (BR) tells the audio story.

Four years ago, the EBU Video Systems and Audio Systems groups came together on the western edge of Berlin to undertake a test shoot of epic proportions at the multisport European Championships 2018. (See *tech-i*, issue 38.) In the last four years, much has happened – the small issue of a global pandemic, the closure of Germany's IRT, the event's host broadcaster changing – but still some of the outstanding questions from 2018 remained. For example, how can 'object-based' or 'metadata-guided' audio soundscapes be switched in time with camera shot changes in a live production? And what can high frame rate (HFR) video contribute to the overall viewing experience?

So, when the European Championships 2022 were announced, we approached the new broadcast partners to ask for access. Duly granted, a much smaller group than 2018's converged on Munich on a swelteringly hot day in August (reminiscent of the Berlin event) and headed to the #BackToTheRoofs* event site in



Frans de Jong and Simon Thompson checking the HFR camera.

the Olympiapark to find our equipment, get access passes and plan day one.

The Video Systems group had a number of goals:

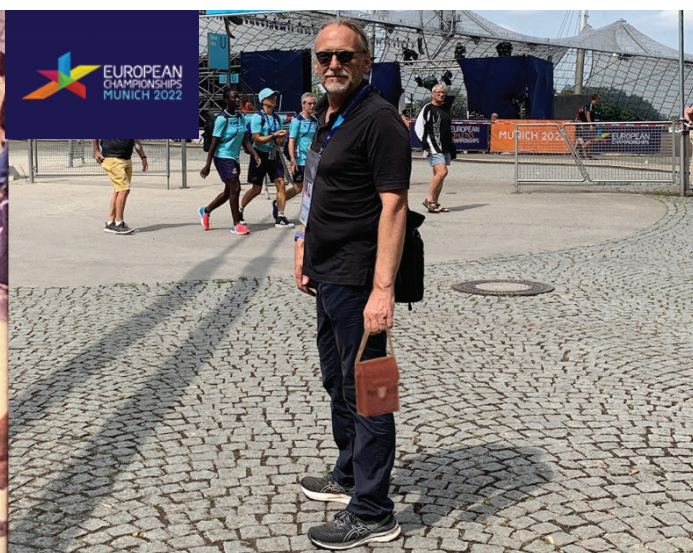
- Record a multicamera feed of the high jump event to enable us to create a pseudo-live video file. This will be combined with work by Bayerischer Rundfunk (BR) to create a metadata-guided audio track with multiple languages, accessibility and three-dimensional sound that switches in time with the cameras.
- Record some super high frame rate video for use in testing. Can we use HFR (high frame rate) to create better ordinary frame

rate video?

- Record images using a plenoptic camera, which captures information about the light field emanating from a scene. Could it be good enough for broadcast use? What are the benefits?
- Record some ultra-wide-angle video for testing. AR and VR (augmented and virtual reality) are becoming increasingly common; how can we maximize encoding efficiency? Can we combine it with 16:9 broadcast footage?

Over the three days that followed, we successfully completed the first three assignments. Unfortunately, the torrential rain that followed the sweltering heat (also reminiscent of the Berlin event) defeated us, preventing completion of the fourth task. We are now working on the output test files and will present results as soon as they are available.

** The "Roofs" in question being the 70,000 seat Olympiastadion and surrounding venues, which are early examples of computer-designed suspended geometric panels. The brave can don a climbing harness and walk along them.*



A young Werner Bleisteiner at the 1972 Munich Olympics; right: fifty years later, at the same venue and carrying the same (still functional!) Bell & Howell 252 movie camera.

Werner Bleisteiner

Reaching new heights for audio capture

Werner Bleisteiner (BR) explains how the sound scene was captured at the event.

Holding the European Championships 2022 (EC2022) in Munich's iconic Olympiapark this summer was a perfect decision. After two years of lockdowns and restrictions, everybody longed for an outstanding sporting event in the city – and the tourism industry hoped to get back to business with people flying in and generating good turnover (before Oktoberfest).

And perhaps this perspective of a 'home match' triggered me, too, when during a joint EBU Audio Systems and Video Systems meeting early May, I noted that we hadn't yet had the chance to create some proper test files according to the UHD/NGA parameters we proposed in the EBU recommendations on contribution (R 153) and file exchange (R 154) in 2021. The reason for that was, of course, clear: highlight activities like the Eurovision Song Contest had not taken place and even small-scale collaborative operations had not been allowed.

Throwing in EC2022 as the next-best option seemed futile: many important deadlines had passed or were about to; the organizational and technical planning of the event had been completed; camera and microphone positions had been determined; requirements for the delivery format had long been fixed. To our surprise, Norbert Garske, the head of production for EC2022, had wide open ears (and eyes) for our request. Looking at the positioning plans for cameras and microphones, we had only to decide which of the many, many competitions making up EC2022 would best suit our objectives for vision and sound. The men's high jump final seemed to fit the bill.

3D AUDIO AMBIENCE

Even though virtually hundreds of microphones were spread throughout the Olympiastadion (with nine for the high jump



Robert Schwering (BR) with the portable 3D audio rig.

alone), with the requested broadcast production format being only 2.0 (stereo) we missed a substantial feature we needed: 3D audio. For this we sought a minimum format of 4+5-0 (or 5.1.4) for the overall ambience, in the IT/ME (International Sound/Music & Effects) set-up as recommended in EBU R 123.

There are many techniques and devices to capture such a sound scene. However, without having particular experience for such a large-scale venue as Olympiastadion, applying an ORTF-3D microphone array (eight capsules) from Schoeps seemed to be the most universal choice. Even an obvious one, as BR had one in stock that had longed for action!

Provided with a weather shield from BBC R&D, my BR colleague Robert Schwering was the one and only of us to actually climb up stadium's iconic roofs late in July, as rigging had to be completed well before competitions started. (And of course he had to go there a second time four weeks later, to get it down again.)

CLOSE TO THE ACTION

With this array now in place, we sought possibilities to fulfil another option: how could we deal with the ambience when switching from wide-angle 3D audio (ORTF-3D) stadium views, to athletes on the field? Down

there, the auditory impression is very different from that at 'the best seat on the grandstand'. In addition, to be flexible, could we get something portable (if we needed to move around)?

Robert developed such a rig: a Sennheiser Ambeo Microphone, capturing first-order ambisonics (FOA, with four channels) plus an additional M/S (mid/side) hooked up to a Zoom H6 recorder, all weather-proof on a stand. Unfortunately, we could not get this onto the field, owing to some regulations we hadn't known about.

Having everything prepared and ready to run for the evening show, at 19:00 thunder struck and rain poured, muddling the whole schedule for about an hour. While Frans, Simon and Robert stayed back in the BBC compound, having eyes and ears on the four video and 64 audio feeds we had ordered and were now running onto the Aja and Joeco recorders, I thought I'd take another chance to capture some 3D audio ambience. So, I was strolling around the places I was allowed to go, keeping my ears open, trying to figure out where it sounded different from what would be the primary ambience audio.

After almost an hour, I'd found it: in the Westkurve stand of Olympiastadion, down close to the racetrack, right behind the photographers' booth. A massive crowd behind and above, some close around, heavy PA sound with music and announcers, yet some distinctive direct sounds from the field in the front, and with reflections all around. Possibly almost like being on the field? I set my 'third unit' Zoom H2 in FOA mode and let it run...

The EBU Video and Audio Systems groups would like to thank Norbert Garske and Benedikt Happe from the EC2022 organizers and Richard Morgan, Mark Graves, Jessica Trafford and Melissa Sharman from BBC Sport.

From data to knowledge with EBUCorePlus

Jürgen Grupp (SWR), chair of the EBU working group on metadata modelling, introduces the new fully semantic standard ontology for media, which comes with its own demonstrator kit.

“Moving from data to knowledge is the way forward in a digitized organization.” So says my colleague Alexandre Rouxel, senior project manager for Data and AI at the EBU. “Data are not the oil of the future; they do not disappear. They can be linked to generate knowledge in a cumulative way that can be further exploited by people and machines.”

Knowledge can be defined as the meaningful connections between dots of information. People collect knowledge to gain insights to help better solve problems. This is how our brains work.

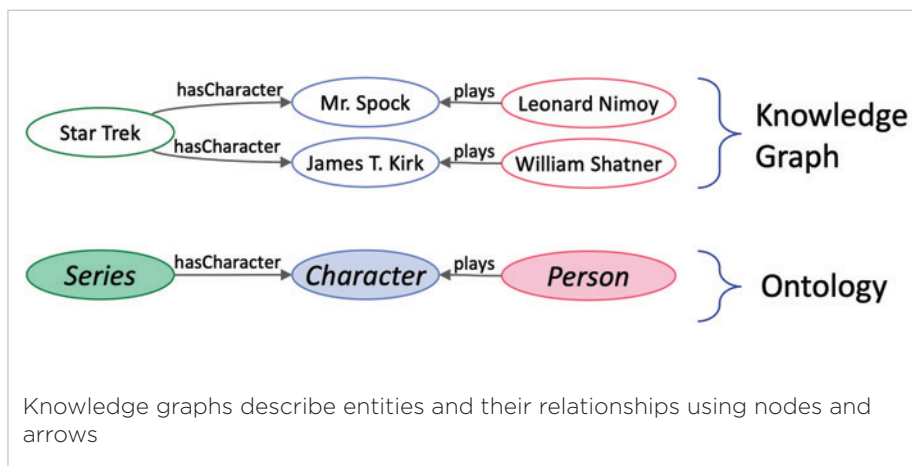
Similarly, machines represent information as data, and machine learning (ML) can link that data to generate knowledge.

UNDERSTANDING ONTOLOGIES

In the world of semantics, machines can represent knowledge in a graph. The knowledge graph is a data structure describing entities and their relationships by means of nodes and arrows (see graphic). Every arrow, its source node and its target node form a ‘triple’. A triple represents a simple statement like: ‘Mr. Spock is a character in Star Trek’ or ‘William Shatner plays James T. Kirk’.

The meaning of the nodes and arrows as well as the rules for building the graph are often defined in an ontology. So, we can understand ontologies as a specific type of data model.

While ontology design is a field of AI, it is executed by experts from the business domain. Good ontologies are business-oriented and technology-independent, making them interoperable by nature.



NEW METADATA STANDARD

EBUCorePlus is an ontology for media enterprises. It is defined by EBU Members for the media community. It follows up on two long-standing EBU ontologies: EBUCore and CCDM (Class Conceptual Data Model). The two were merged and thoroughly revised. The result is EBUCorePlus, the new standard that can fully replace its predecessors. It inherits both the long-lasting reliability of EBUCore and the end-to-end coverage of the media value chain* of CCDM. EBUCorePlus is specified using the ontology web language and therefore strictly semantic.

Moreover, EBUCorePlus serves as a plug and play framework. It can be used out of the box, either in its entirety or just a subset of its elements. But it may also be adapted and extended to enterprise-specific needs. Especially for system integration tasks and defining requirements, projects benefit from EBUCorePlus as a business – not technology – oriented language.

For example, vendors that deliver data to media enterprises approached us at the EBU booth during IBC2022. They are interested in using EBUCorePlus as the standard delivery format for their services. This format will

come at no extra cost for media enterprises, whereas any further transformation towards a customer-specific data format would come at a cost.

DEMONSTRATOR KIT

Moving from classical databases to knowledge graphs requires extending development skills from entity-relationship models to ontologies, from tables to triples, and from SQL to SPARQL (a query language for graph databases).

This is where the EBU's CorePlus Demonstrator Kit (CDK) comes in handy.

The CDK can be compared to a flight simulator: a developer can explore all the knobs and switches, playing around and practising all desired manoeuvres, but in a safe environment. The CDK is available in three deployment modes: cloud, hybrid and on-prem. It contains a graph database, populated with the EBUCorePlus ontology and some sample data. The CDK is free to use after registration (via rouxel@ebu.ch), and the cloud version does not require any installation.

So, fasten your seat belt and take off for your next destination: EBUCorePlus!

*See EBU Tech Report 041

Making progress on diversity in technology teams and activities

One year ago, in this magazine, **Françoise Davies** outlined actions planned by EBU Technology & Innovation to improve the gender balance in its work. Here she provides a progress report.

How far have we come in our first year as members of BBC's 50:50 The Equality Project? We targeted eight flagship T&I events, aiming to increase active female participation – as panellists, speakers or moderators – to 25%. We used the events from October 2020 to June 2021 as the benchmark. As of June 2022, we had achieved a 2-point increase: from 19 to 21%.

So, we are heading in the right direction. The 25% goal will remain in place for a further year, and we will continue to work hard when programming our events. EBU T&I remains committed to reaching out to female engineers and technologists to encourage them to raise their professional profiles at a European level and take part in technology dissemination.

SMALLER POOLS

The hard fact, however, is that certain fields have smaller pools of women working in them. This has a ripple effect in terms of gender balance in recruitment and consequently in participation in EBU T&I project groups and events.

Take cybersecurity as an example: according to World Bank figures, only 20% of cybersecurity professionals are women, owing to various cultural, societal and family constraints. Additionally, there are organizational and structural problems of wage gaps, delayed promotions, etc., which must be addressed to improve recruitment and retention rates for women. The statistics are even worse when it comes to software engineering, with a 2022 Statista survey showing that nearly 92% are men.

While we cannot change a whole ecosystem overnight, we can take steps in areas we



Belgium's RTBF recently hosted an EBU meeting on gender equality in PSM, with nearly 40 participants from 22 EBU Members

control. One example of this is the recent creation of the Technology Think Tank focus group (see page 4), which should serve to increase diversity and representation in EBU T&I activities.

WOMEN IN STEM

Our gender diversity action plan also has an education pillar, helping ignite change at grassroots level by showing young girls that science, technology, engineering and mathematics (STEM) fields are open to them. Since 2018, EBU T&I has participated in the International Girls in ICT (Information and

Communications Technology) Day. Earlier this year, local schoolgirls came to the EBU for a fun, hands-on, interactive day that gave them an immersive audiovisual and engineering experience. They learned how to use software tools to record, edit and mix speech and music with EBU Euroradio's Storyboard tool, which facilitates the distribution of audio on social platforms. One participant expressed an interest in a career in STEM and others were going to tell their friends about it, which can help create the necessary ripple effect. (Find a full report on the day on our website: tinyurl.com/ebu-girls-ict)

We are now starting to work on the 2023 edition of Girls in ICT Day. Let's see what next year will hold. And if you would like to partner up for future editions, just reach out to me.

As part of the EBU's Diversity, Equity and Inclusion programme, the Media Department is also supporting women in STEM areas. A recent meeting on gender equality, hosted at RTBF in Belgium, included a focused session on this. It was great to see 40 EBU Members present and implicated in gender equality in PSM content. An RTBF initiative, coordinated by Paul Harrison, proposes to bring EBU Members together to coproduce a television series to raise the visibility of women working in STEM fields, targeting a young female audience.

Change can happen: let's keep talking, let's keep taking action.

For information on how to get involved in the EBU's technology and innovation activities and/or events, contact Francoise.Davies@ebu.ch. Find more information at tech.ebu.ch. For more on PSM Diversity, Equity and Inclusion, visit ebu.ch/diversity or contact Francesca Scott, scott@ebu.ch.

Building a suite of open-source tools for 5G-based media services

A growing number of contributors are collaborating to accelerate the development of an open-software-based ecosystem for media applications. **Daniel Silhavy** (Fraunhofer FOKUS), 5G-MAG Reference Tools development coordinator, describes the work and introduces Target 2023.

5G-MAG Reference Tools is a development programme that aims to support the creation of new media services within a dynamic world of apps, software-centric solutions, and agile development. The programme aims at accelerating the ecosystem of open-software reference tools to support 5G media applications.

We've already shown this year how broadcast distribution can be integrated within the online and streaming ecosystem. For 2023, we are targeting a further expansion of the tools to optimize the online distribution of media content to 5G devices.

FIRST DEMOS

The recent IBC Show in Amsterdam provided an opportunity for 5G-MAG to show the current open-software toolbox in action. The demos shown included OTT streaming and CDN integration over 5G Broadcast with commercial media apps and the dynamic provisioning of services according to availability and user demand.

Moreover, taking a step beyond such demonstrations, the tools have also been deployed in pre-commercial applications developed by ORS, Bitstem and Fraunhofer FOKUS, active contributors to the 5G-MAG Reference Tools programme.

TARGET 2023

Having successfully established the Reference Tools programme, running since late 2021, the focus for 2023 is to expand the tools into new applications. With this in mind, last June we launched Target 2023, a process open to the media and telecom industries, to on-board use cases. It has been instrumental in drawing the picture of what 5G-MAG



(L to R): Jordi Giménez (5G-MAG), Daniel Silhavy (Fraunhofer FOKUS), Johann Mika (ORS Group) and Antonio Arcidiacono (EBU) at IBC2022

developers may be able to deliver for 2023, with the roadmap presented at IBC2022. Below is an outline of what 5G-MAG Reference Tools contributors are currently focusing on.

BBC Research & Development

is contributing to the development of baseline 5G Media Streaming features such as content hosting and media session handling, providing a framework for contributors to add more advanced functionality. Meanwhile, it is working to implement multicast-broadcast support based on 3GPP Release 17 Multicast and Broadcast Services (MBS).

Dolby is contributing with the development of a reference implementation of a DVB-I player. The implementation focuses on the support of 5G Media Streaming as an entry point to different delivery mechanisms, including unicast and broadcast. In addition, Dolby provides a free cloud-based content creation service to contributing members, supporting HDR (high dynamic range) and NGA (next generation audio) for experimentation and demonstration purposes.

ORS and **Bitstem** are contributing to the implementation of 5G Broadcast service provisioning according to user demand, leveraging QoE (quality of experience) metrics or consumption reporting and data collection. These tools will enable the dynamic service provisioning of content over dedicated broadcast networks according to user demand or the support of certain quality profiles.

Qualcomm plans to contribute to enabling new use cases around the use of DVB-I over 5G Media Streaming (unicast), DVB-I hybrid service over 5G Broadcast and 5G Media Streaming, and emergency alerts and media services through 5G Broadcast.

ITEAM-UPV plans to contribute to the fine-tuning of the 5G Broadcast transmitter according to Rel-17 specifications; initial investigations into the use of 5G Broadcast waveforms for satellite broadcast services; and the support of multicast-broadcast services (MBS) under the 5G network.

The 5G-MAG Reference Tools contributors also include **Eurofins Digital Testing**, **Fraunhofer FOKUS**, and **ID:TOLU**.

5G-MAG Reference Tools is a software development programme *open to the community*. Learn more and join the community at developer.5g-mag.com; and check out the existing implementations at github.com/5G-MAG.

Can cloud-based IT solutions make sense from a sustainability perspective?

Pioneering responsible IT since 2015 with his company e-Durable in Switzerland, **Jean-Damien Beaud**, shares thoughts about what ‘green’ data centres do and how the sustainability needle can be pushed further with reused hardware.

With the unprecedented level of digitalization of our world, including in media companies, the environmental impact of the ICT sector has captured the attention of many.

Indeed, according to recent studies (The Shift Project 2018, Green IT 2019) the global digital sector is responsible for about 4% of humanity’s greenhouse gas (GHG) emissions. This is higher than the estimated 3% from the entire air transport industry. And it’s growing rapidly, mainly driven by the increasing use of video streaming. If the current growth rate is maintained, this could mean that the GHG emissions of ICT could increase by a whopping 60% by 2040 compared to current levels.¹

GREEN HOSTING?

Several players in the industry have presented “green” or “environmentally friendly” hosting solutions. By optimizing electricity usage and mostly by improving efficiency of the air-conditioning solutions, these data centres present a greener alternative to traditional ones.

However, the real motivation behind such solutions is, in fact, the reduction of energy bills. More often than not, the environmental benefits are something of a by-product. And most of the environmental claims derive from achieving a power usage effectiveness (PUE) measure as close as possible to 1.0. The PUE is the ratio of the total amount of power used by a data centre to the power delivered to IT equipment. In theory, a PUE of 1.0 indicates a perfectly efficient data centre, in which 100% of the facility’s power is delivered to IT equipment. As of today, the best players achieve a PUE



The first generation of Recycled Cloud servers; a few are in still production, while the rest are split between providing spare parts, test servers and final disposal.

of 1.06 to 1.11.²

But according to the GreenICT foundation, PUE is not necessarily a measure of sustainability. While PUE remains a key opportunity for efficiency improvements in server rooms, the potential emissions savings from improving PUE may be less than what can be achieved from increasing server utilization or using cleaner electricity. Furthermore, PUE does not address the energy consumption or GHG emissions

embodied in the equipment lifecycles of a facility.

RECYCLED SERVERS

This is where recycling servers, that other organizations would otherwise dispose of, comes into play. And knowing that a new server emits 1.2 tonnes of CO_{2eq} during its production process³, it’s clear that slowing down the flow of new hardware is an important part of the solution toward sustainability in the data centre.

The Recycled Cloud initiative (<https://recycled.cloud>) has taken this route, with no new servers used in its facilities. In addition to GHG emissions savings, reusing servers limits the use of rare earth materials, which are present in limited quantities on our planet.

Thus, a green ICT approach can be implemented with much better results by reducing data-centre emissions in different ways:

- green energies (sourcing electricity from renewable energy and as close as possible to the data centre);
- smart use of resources (reducing power waste);
- a circular-economy plan (with the re-use of heat).

The best of the ‘greenest’ data centres are using natural cooling, creating local and reasonably sized entities, choosing electricity only from renewable sources, selecting open-source tools, and keeping local jobs and a support team close to their customers. They are a way to anchor our virtual tools in communities and regions where we operate.

1. tinyurl.com/ict-ghg-emissions; 2. tinyurl.com/pue-examples; 3. tinyurl.com/server-emissions

Playing with technology is a serious business

Giving technical teams time and space to play is the key to mastering change and disruption – and finding creative ways to stay in control – writes **Stijn Lehaen**, Director of Technology and Infrastructure at Belgium’s VRT.

Either people within your organization are playing, experimenting, testing and implementing with the newest technologies, or you are de facto a dinosaur in danger of becoming extinct. There is, today, usually no ‘safe’ middle ground where an organization can contemplate when and how it is ready to face change.

There has been an AI revolution in recent years, taking the world by storm and taking everyone by surprise, even those closely involved with AI. (Google co-founder Sergey Brin admitted in 2017 that he did not see any of it coming, even though he sat right next to the leading AI guys at Google.*) So, to entrepreneur Marc Andreessen’s 2011 statement that “software is eating the world” we can thus now add “...and AI is eating the software”.

GENERATIVE AI

Now we have another fast-growing mutation in the form of generative AI, thanks to the likes of DALL·E, Midjourney and the open-sourced Stable Diffusion, which has seen a phenomenal rise during 2022. These tools have prompted a kind of ‘Cambrian explosion’ of all kinds of AI-generated images, sounds and videos. We’re seeing even 3D content, that is not only fascinating and often



beautiful to look at but could very well lead to a profound change (or backlash?) in the way we humans create, edit and experience media and other content. Evolutions that previously took months, are now happening in weeks. You almost need AI to process all the newly published papers about AI in media creation!

In response to a fast-changing world, where nothing is certain anymore and disruptive technology and business models are lurking in droves around every corner – for both public broadcasters as well as commercial media companies – we need to be able to pivot to new opportunities and deal with this uncertainty.

At VRT, we have gained extensive experience in using different agile methodologies over the past decade, typically in those teams focused on developing and integrating software. Since more than a year, however, we now also implement, practice and preach those same core agile principles and learnings in all our technology teams across our technology spectrum.

FLEXIBLE MINDSET

We do not approach this agile transformation as a set of rules that would then change our processes. Instead, we try to make a more flexible mindset become part of our company and team culture.

It’s not a question of believers versus non-believers in change; it’s about being or not being in control. Change and disruption is happening regardless, and typically at a much faster rate than anybody likes. But if we face this hard reality, we can still find creative ways to stay in control, deal with it and even master it.

As managers, we therefore need to make sure the experts and engineers within our organization are allowed time in their busy schedules to play around, experiment and get familiar with new technology. We need to keep our teams motivated to explore and evaluate, on a regular basis, the ways in which they manage their workload and how they deliver the most value to the rest of the organization. And we need to explain and demonstrate to our internal stakeholders how this is not only time well invested, but time sorely needed if we don’t want to become obsolete as organizations.

To quote the famous designer Charles Eames, “toys and games are the preludes to serious ideas.”

* tinyurl.com/brin-ai-revolution



Data is a strategic asset at the heart of INA's mission

The Institut National de l'Audiovisuel archives, protects, digitizes and shares one of the richest media collections in the world, with a video view count of over a billion per year. **Eléonore Alquier**, Deputy Director Data & Technologies, sets out the current technical priorities.

INA, guardian of a multimedia memory of more than 20 million hours, has been transforming, in recent years, into a heritage-based and distinctive media service. Indeed, beyond the careful preservation of the content, its editorial treatment and distribution, in appropriate formats, is what gives meaning to this collection. Data management is a key asset in this strategy: the construction of a data lake, which allows both the storage of metadata and their discoverability by search engines, is essential to make content easily accessible. It is a necessity when, as INA does, you post dozens of timely and compelling articles and videos each week.

In parallel with the construction of the (meta)data lake, INA recently inaugurated a new data centre in the heart of its massive campus. It is designed to guarantee full governance of the conservation of INA's content: from the most historic elements of the collection, soon 100% digitized, to the freshest and natively digital content, acquired daily through partnerships with broadcasters. More than 30 petabytes of audiovisual content are thus accessible to subscribers 24/7 through the INAmédiapro.com platform.

INA's use of LTO (Linear Tape-Open) robotic storage helps our tech team finely regulate the facility's energy consumption. Duplicated on a remote site in order to guarantee 24/7 availability, even in the event of a



problem on one site, this storage also lends itself to experimentation, for instance with DNA storage.

DATA STRATEGY

Rethinking the management and storage of INA's (meta)data first began with the definition of a new data model, covering the entire spectrum of collections: radio and television, but also the web, as well as written and photographic collections. INA succeeded in defining a model

able to describe historical collections, going back to the origins of radio and television on the one hand, and much newer streams on the other hand. Indeed, INA records 24/7 over 100 television and 80 radio channels. From several dozen databases, tens of millions of new entities were generated in the new data lake, articulating the notions of instances, events and items.

This first step was also the prerequisite for opening the door to the use of artificial intelligence in collection management. We are currently testing technologies that are both mature enough and appropriate to meet business needs: the segmentation of broadcast flows and the segmentation of programmes are the first use cases being identified and deployed.

INSPIRING PROJECT

Another achievement resulting from this work is the data.ina.fr platform, which INA will launch in early 2023. This tool will articulate INA's know-how, from capture to indexation, and offer features like face analysis and named-entity detection based on speech-to-text.

The platform will offer the general public insights into the analysis of audiovisual media in the form of freely reusable data visualizations, (the most visible faces on television, the most covered themes in the television news, etc.), thus fulfilling INA's mission to offer engaging and helpful content to its growing audience.

The car is key for radio; and radio is key for in-car audio

The latest report from the EBU’s Media Intelligence Service looks at in-car listening trends and the impact of connected cars. **Matthieu Rawolle** shares some of the findings.

The recent EBU report *Audio in Cars* reveals that radio reaches more people in the car than at home and that radio listening clearly remains the main audio activity in the car. In other words, the car is key for radio, and radio is key for in-car listening. Nevertheless, as connectivity in the car is getting easier and easier, other audio sources are gaining ground, especially among youth.

WIDELY WANTED

Radio is the most important type of in-car listening. Close to seven in ten vehicle users say that they listen to broadcast radio in the car more often than other audio types (Figure 1). And in-car radio listeners are strongly attached to their listening habits, as 90%* think that radio should be standard in every vehicle.

This popularity is explained by qualitative studies: car users say that radio keeps them company, lifts their mood, provides relevant information and is easy and free to use.

NEW LISTENING MODES

Meanwhile, basic connectivity in the car has become commonplace in some countries and more advanced technology is almost standard among newly sold vehicles. This has a substantial impact on listening trends. In Germany, for example, the number of in-car online-audio users more than doubled between 2018 and 2021. And for a little over a quarter of them, music streaming is the most-used content (Figure 2). These new ways of in-car listening are found across all age groups but are particularly popular among youth.

The future of audio listening will depend on car-related

factors. Connectivity possibilities and the user experience for media in the car will influence listeners’ habits. If radio loses its convenience and prominence on the new dashboards, its consumption will decrease. The EBU advocates for linear and on-demand radio to remain easy to find and to use because

vehicle users massively value the seamless experience of radio (see page 6).

EBU Members can access the full Audio in Cars report by visiting ebu.ch/publications and clicking on Research.

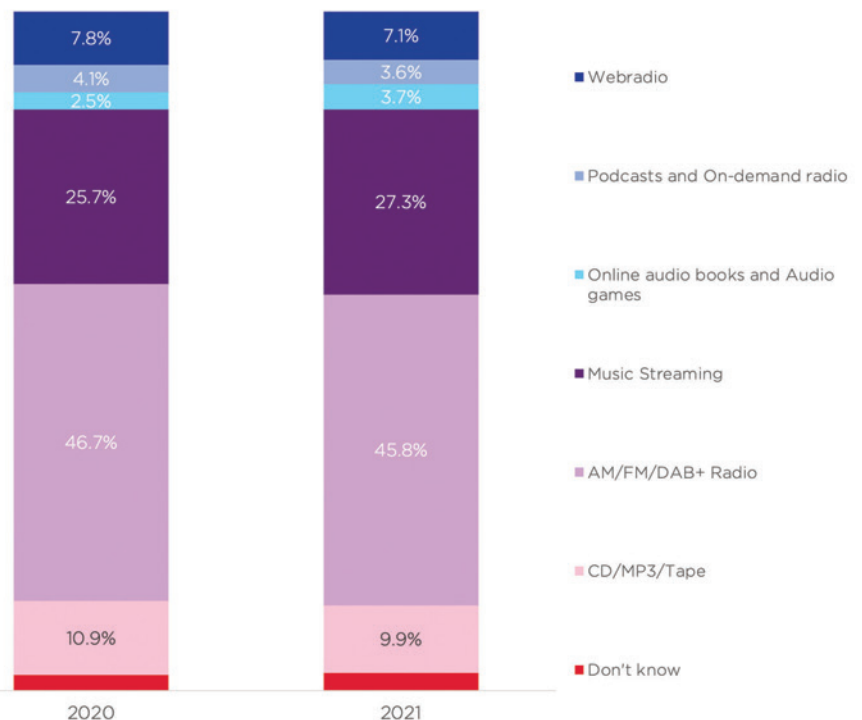
*In Australia, France, Germany, Italy, UK, US

Figure 1. “Which do you typically listen to most often in a car/vehicle?” Respondents aged 18+ who typically spend time in a car/vehicle; average for France, Germany, Italy, UK; September 2021 (1,000+ interviews in each market).



Source: EBU MIS based on Car Buyers Survey commissioned by WorldDAB, in partnership with Radioplayer, conducted by Edison Research.

Figure 2. Most used content among in-car online audio users aged 14+; per audio activity; Germany, 2020-2021.



Source: EBU MIS based on Online-Audio-Monitor (OAM) 2021, mindline media GmbH

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BUILDING RTÉ'S CDN

MICHAEL LOFTUS (RTÉ)

How the Irish broadcaster delivers its relaunched online player



WINNING THE WORLD CUP

PAUL TWEEDY (BBC)

Preparing for some of the biggest live streaming events ever



ARD AUDIOTHEK: PROJECT MANAGEMENT INSIGHTS

KRISTIN MEHNER (ARD)

What challenges does a product owner face?



DYNAMIC METADATA IN S-ADM OVER IP

MARKUS BROCKMANN & ANDY WEISS (SRF)

From the EBU workshop on personalized sound experience workflows



HACKING THE METAVERSE AND EXTENDED REALITIES

KAVYA PEARLMAN (XR SAFETY INITIATIVE)

Preparing for emerging and disruptive threats

IN THE SPOTLIGHT



Víctor Sánchez García

CHIEF OPERATING OFFICER,
RADIOTELEVISIÓN
ESPAÑOLA (RTVE)

WHAT ARE YOUR CURRENT RESPONSIBILITIES?

I oversee technical operations for TVE, with a team of more than 1,000 technicians and operational people. This includes managing the engineering team responsible for the design and commissioning of our technical systems. I'm responsible for technical investments, working also on RTVE's medium-term technology roadmap. I have been RTVE's technical and operational director in the field for large events like the NATO summit in 2022 and the Summer Olympic Games in London, Rio and Tokyo.

WHAT DO YOU CONSIDER AS YOUR FINEST ACHIEVEMENT SO FAR IN YOUR CAREER?

I would mention three, important for different reasons. For the London Olympics in 2012, I oversaw our very first deployment of a fully integrated digital newsroom, without the need to work with tapes. It was complex both technically and operationally. Commissioning and managing RTVE's Deep Archive project was also highly complex, as it affected all the productive areas of the company. Now fully operational, it stores RTVE's extensive archives and enables their use in the different production systems. Lastly, I would mention the project to convert our Barcelona production centre to IP, because

of the difficulty of the decision and the need for training in all areas.

WHAT ARE YOUR PREDICTIONS FOR MEDIA TECHNOLOGY IN THE FUTURE?

I see different trends that are consolidating. The transition from SDI to IP technology is a firm reality and will only accelerate. Cloud technology for media production has come of age and has become an affordable tool that will allow us to advance faster in workflows, in creating global platforms and in testing new solutions. And I believe that Web3 technologies (blockchain, NFT, smart contracts) will begin to be used, for example, in the purchase of rights, consumer loyalty or traceability of web consumption. As for the metaverse in the media environment, I see it as a new platform that will integrate content and people in a virtual space. It will be a new way of consuming content interactively that, I believe, will see a great boom.

WHAT, FOR YOU, ARE THE BIGGEST CHALLENGES FOR EBU MEMBERS TODAY?

In my opinion, we have a problem in the EBU in marketing our achievements with technology. I think that an excellent job is being done, but it should be communicated and promoted among the wider media community. From the technical point of view we have to compete in a global market with large platforms and must thus collaborate on technical efforts and unify projects, to gain scale and speed.

TELL US ABOUT SOME OF YOUR INTERESTS AWAY FROM THE WORKPLACE.

I am an avid viewer of series. I also like doing indoor cycling and (although it seems strange) programming in Python - but above all playing soccer with my children.

Join us and the industry's leading experts for technology updates, strategic insights and real-world use cases, plus demonstrations and networking.

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