tech-i

Meet 2020's T&I Award winners

Plus

- **CR42: the control room reimagined at RTBF**
- **Unlocking the potential of AI for data journalism at France tv**
- **The growing problem of Cyberattacks on EBU Members**

and more...

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A vaccine against misinformation

Antonio Arcidiacono, Director of Technology & Innovation, EBU

I believe that we are on the cusp of a revolution in media innovation in Europe. At its core, this vision is about taking the original and trusted content produced by public service media (PSM) and amplifying its reach and accessibility using automatic translation and recommendation, leveraging the continuous and tangible progress in artificial intelligence. This recipe, applied first to news content, can also prosper in the domains of education and entertainment. It is one of the key means by which EBU Members can remain strong in the face of increasing competition from global media technology companies with deep pockets.

Europe is changing. Tensions are bubbling to the surface and often spilling over as misinformation (and sometimes deliberate disinformation) fuels polarization, populism and protectionism. This is happening against a backdrop of significant demographic changes. European countries are seeing a growing proportion of their populations coming from other countries and cultures; at the same time, improvements in health and wellbeing mean that the 65+ age group will often represent 25% or more of the population by 2030. These are the audiences that PSM must continue to reach and serve while at the same time redoubling efforts to reach younger audiences in general.

The gradual replacement of national and uniform communities by a multi-cultural and multi-generational society means that the ability to personalize content and make it understandable in multiple languages becomes crucial. And it is here that the EBU and its Members can have a massive positive impact.

TRUSTED INFORMATION

As a starting point we have the aggregation of multiple trusted sources of information. The ability for a European citizen to access content coming from different cultures and languages, but made available in their own preferred language, represents not only a wider choice but also a unique democratic weapon underpinned by the ability to compare trusted and often independent information sources.

EBU Members are in a position of strength to deliver on this vision: PSM in Europe produce strong trusted digital content delivered via trusted digital platforms. What has been missing – until now – is strong digital collaboration. Throughout 2020 we have been working on leveraging the tools developed in the EBU PEACH and EuroVOX projects to offer – first to journalists and editors, but hopefully later to the public – access to the latest news produced by Europe's biggest network of newsrooms.

VALUING DIVERSITY

Language barriers can be rendered invisible by the application of translation tools; and diversity can be assured through recommendations generated not with the goal of driving simply more and longer consumption but built on public service values. The PEACH recommendation engine provides a way to guarantee a neutral and open offering of content.

EBU Members invest almost EUR 20 billion annually in Europe. However, this co-development and sharing of content, products and services is not just an economic imperative; it is also a way of serving the interests of citizens while securing cultural diversity. I firmly believe that educating new generations to the real value of media is the best life assurance against future attempts to polarize information and is the natural vaccine against misinformation.

Recommendation on cybersecurity for media vendors and systems

The EBU Media Cybersecurity (MCS) group has just published a new version of R 143, a recommendation that outlines a set of cybersecurity safeguards that media companies and media vendors should apply when planning and designing their products and services. It is composed of a comprehensive and detailed list of vendor and product security requirements.
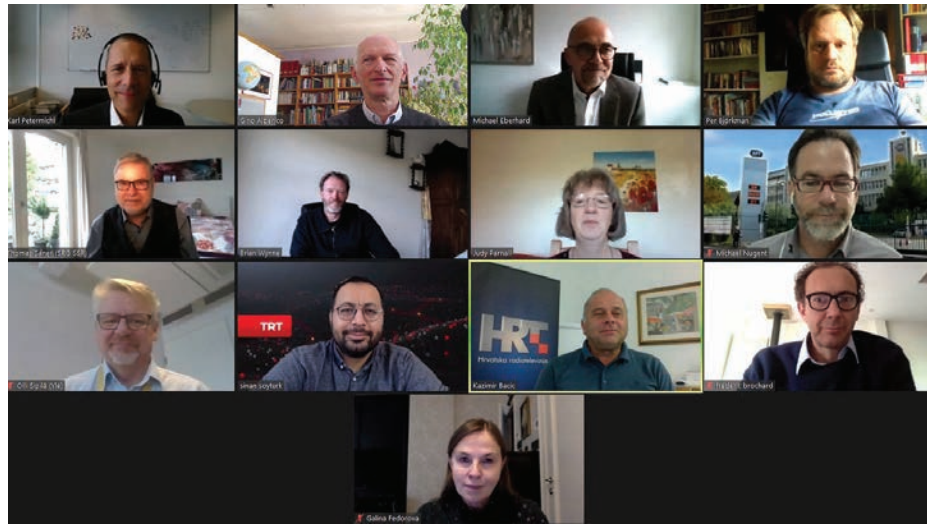
The EBU recommends that media companies require potential vendors to declare their ability to comply with R 143 when responding to tenders or requests for technology, by completing the security controls assertion spreadsheet attached to the recommendation. Media companies can then define their minimal vendor system acceptance level with full awareness of the potential risks.

R 143 is available for download at https://tech.ebu.ch/groups/mcs#deliverables.

RTBF and France tv joint winners of T&I Award 2020

Three new faces on the EBU Technical Committee 2020-2022

Elections for a new Technical Committee (TC) took place during the 26th EBU Technical Assembly on 6–7 October, later in the year than usual and online for the first time. The new TC includes three newly elected members and one change among the leadership team.

Judy Parnall of BBC was re-elected to serve a second term as chair of the TC. Michael Eberhard, from German broadcaster SWR/ARD, was elected as one of the two vice-chairs, the other being Olli Sipilä from Finland's Yle, now serving a second term in the role.

The three new members of the TC are Sinan Soyturk of TRT in Turkey (see page 15), Frédéric Brochard of France Télévisions, and Karl Petermichl of Austria's ORF.

The screenshot above shows the full Technical Committee 2020–2022 at its first virtual meeting.
Pictured are, from left to right and top to bottom:
• Karl Petermichl, ORF (Austria)
• Gino Alberico, RAI (Italy)
• Michael Eberhard, ARD/SWR (Germany, Vice-chair)
• Per Björkman, SVT (Sweden)
• Thomas Saner, SRG SSR (Switzerland)
• Brian Wynne, RTE (Ireland)
• Judy Parnall, BBC (United Kingdom, Chair)
• Michael Nugent, ERT (Greece)
• Olli Sipilä, YLE (Finland, Vice-chair)
• Sinan Soyturk, TRT (Turkey)
• Kazimir Bačić, HRT (Croatia)
• Frédéric Brochard, FTV (France)
• Galina Fedorova, RTR (Russia)

This winners of year's EBU Technology & Innovation Award were announced during the Technical Assembly, held online in October. As two projects received an equal score when independently assessed by members of the Technical Committee, it was decided to have joint winners. The winning projects were Room 42, a software-based control room designed by Belgium's RTBF, and AI-based tools for data journalism developed at France Télévisions.

Three further projects were named as runners-up, having also received an equal score. They were an AI-driven system for the automatic creation of media subtitles from NPO in the Netherlands, the standardized mobile journalism kits – 'MoJos' – used extensively by Yle's regional news teams in Finland, and a BBC trial to allow UK viewers to adjust the relative levels of the television audio mix to their needs.

Antonio Arcidiacono, Director of the EBU's Technology and Innovation Department said: "The large number and quality of the projects submitted shows that even in these difficult COVID-19 times, the skills and creativity of our Members' engineers have not been checked."

The EBU Technology & Innovation Award was created in 2016 to recognize, encourage and support outstanding technical solutions developed by Member organizations.

Articles on the two winning projects and the three runners-up can be found on pages 5 to 9 of this issue of tech-_i_.

CR42: the control room reimagined

Belgium's RTBF has created a software-based control room that symbolizes the digital transformation of broadcast production, allowing users to design the interface that works best for them, writes **Hugo Ortiz.**

Control Room 42 – or CR42 – was born out of RTBF's desire to reinvent its working methods by taking advantage of the latest technological developments on the eve of the construction of its new Mediasquare production facility. CR42 represents a new approach for creating flexible, easy-to-use and universal media production control rooms, adapted to the convergence of media.

In a classic production environment, the user works at a technology workstation dedicated to a single specific task and must learn the proprietary techniques of the equipment manufacturer. CR42 allows each user to configure their multi-task workstation in the most appropriate and ideal way, whether they are producing television, radio or digital content.

On the front end, we have replaced traditional equipment with a unified universal user interface. On the back end, all the processing is done by real-time software cores running on IT servers.

EXTREME CUSTOMIZATION

Each interface can be built from a blank page, programmed in a simple and user-friendly way. The operator can customize their tool to the extreme, deciding what priority and visibility they want to give to each function. They can then concentrate on getting on air with an intuitive tool that is controlled at the touch of a fingertip.

Automation and manual control are natively mixed in the same ecosystem, shared by all users, enabling the construction of complex scenarios specific to each production, while retaining the improvisation capabilities essential for news production.

CR42 offers a lighter, more flexible and more scalable tool that adapts easily and quickly to user needs. It becomes possible to start a simple production in a few minutes with just one operator, and dynamically grow this production as additional operators come in.

Using compressed IP streams for monitoring feeds, CR42 can be used for remote production, allowing the control room to be moved away from the studio. Control interfaces can also be accessed from home through the internet, something that has emerged as a key feature during the COVID-19 crisis.

CR42 symbolizes the digital transformation of broadcast production. All its core processing is done by real-time software running on standard servers, removing the need to renew expensive dedicated equipment that requires complex learning.

Audio, video, live graphics, lighting, interactive sets, virtual reality: all these elements are integrated and controllable within a customizable single paradigm.

With CR42 we can rapidly build and test new ideas in a real production environment. Its role as a laboratory projects RTBF into a digital future, where the synergy of artistic and technological talents enables us to achieve our ambitions of modern public service, in line with the expectations of our audiences.
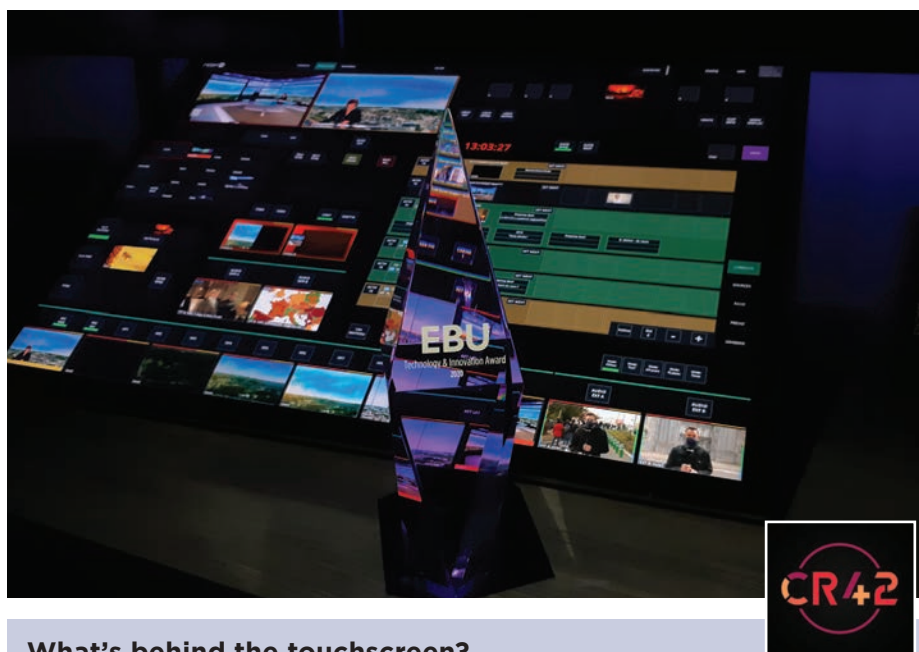
What's behind the touchscreen?
CR42 brings together several software building blocks. On-Hertz's Artisto provides the real-time audio engine; the live graphics and virtual studio environment come from Smode; and the user interfaces and video core are designed using TouchDesigner. While processing is done on uncompressed signals in the data centre, audio and video transport to the control room is handled via Dante and NDI on the RTBF campus network.

Unlocking the potential of AI for data journalism

Journalists at France Télévisions were provided with new ways of telling stories during the 2020 municipal elections thanks to a newly created team dedicated to leveraging AI technologies. **Matthieu Parmentier** explains what was done.

At the start of 2020, France Télévisions decided to create a new department. Called DaIA – *Data et Intelligence Artificielle* – it consists of a team of about fifteen specialists: data scientists, data engineers, data analysts. It functions as a centre of excellence at the service of the company's project teams, collaborating with all of France tv's research units and subsidiaries.

The rise of AI tools has created powerful new possibilities for the classification and analysis of content. At a time when the Big Tech companies are developing ever more sophisticated AI-based offerings, it is critical for public service media organizations to equip themselves with their own resources. Such resources must be adapted to the needs of producing media content on a day-to-day basis. This was the driver behind the creation of the new department.

POLITICAL DEBATES

The municipal elections that took place shortly after the creation of the DaIA team provided an opportunity for a first research project to explore how journalists could be empowered with new information and analysis.

As political campaigning began across 36,000 French cities, almost 200 debates were hosted on the regional channels of the France 3 network. The candidates took these opportunities to raise a very wide range of topics. The debates were thus ideal source material for testing a range of tools and techniques that would enable comparative analysis across thematic, geographic, political, and demographic axes. To be of maximum use to journalists and editors the analysis needed to take place quickly.

Face recognition was combined with text recognition – applied to the 'lower thirds' or captions – to identify the speakers. Speech-to-text technology was used to conduct automatic transcription of what they said. Natural language processing was used to analyse the vocabulary, both to detect noteworthy terms and for categorization of topics.

DATA VISUALIZATION

By recognizing and classifying topics associated with their respective speakers, these tools allowed the production of meaningful statistics for each debate. All of this information was made available to data journalists. Combining data from several debates enabled new stories to be told, making use of data visualizations such as charts, timelines or maps.

This system also benefited from experience gained through research carried out previously in the Information Department, the Innovation Department and the MediaLab on the subject of indexing and the rapid availability of content for the editorial staff.

The analysis tools are now are in production, available for other applications. Beyond political debates, the same tools help with describing content and extracting insights to enrich metadata. They can serve concrete use cases such as indexation, recommendation or marketing. They were used, for example, to analyse the 16,000 sentences written by France tv employees asked to describe their work experience during the COVID-19 lockdown.

Left, face recognition combined with text recognition to identify speakers; above, the new DaIA team at France tv.

Licence to roam: Yle's mojo-enabled reporters

Jarno Tahvanainen explains how mobile journalism – 'mojo' – using standardized kits, has become the norm for Yle's regional news operations.

Yle operates more than twenty regional newsrooms around Finland. Distances are vast, yet Yle aims to be where people are in their daily lives. Our vision is to increase the use of lightweight devices and mobile production methods to reach this goal. We strive to get out of our editing suites and into the world. The less our reporters and visual journalists sit inside, the better!

The organization has developed the skills, workflows, and tool sets needed for mobile journalism over several years. 'Mojo' has become a natural part of our everyday operations. Mobile phones, along with location-independent media asset management and editing environments, are used on a large scale to produce footage for all of Yle's platforms.

STANDARDIZED KIT

To make all this happen, mobile equipment and workflows must be simple and standardized. Each Yle mojo set is identical so that technical support is available and malfunctions are easier to resolve remotely. Finland's long, cold and dark winters are challenging for mobile devices in many ways. Ensuring the functionality of the equipment in all conditions is an important and ongoing development process. Software upgrades and rapid hardware development require constant monitoring and response and keep our experts busy. The core team consists of individuals with technical, journalistic and visual skills. Their most important asset is listening carefully to users' wishes and ideas.

We have come a long way in more than four years of development. The novelty inspired by a few active people has expanded to become a

Jarno Tahvanainen (right) on the mobile multicam production Voters' Sofa

standard way of operating in regional offices. The Yle mojo-community already comprises over 350 members, and training is provided on a regular basis. Mojo equipment is not only used by mobile journalists, but also by videographers in their daily work alongside traditional ENG equipment. Also, mobile multi-camera productions are already a common way to produce live streams from all over Finland. The most extensive mobile production to date, "Voters' Sofa", included 12 episodes filmed in ordinary Finnish homes across the country in 2019. The series brought voters and parliamentary election candidates together in the ordinary citizens' living rooms. The production method made it possible to shoot the multicam-series in small spaces, over a short period with a small production crew.

READY FOR COVID-19

Mojo readiness ensured a smooth transition to working remotely in regional news desks when COVID-19 broke out; every journalist had a smartphone, cloud-based video editing tools, and proven workflows already in place. Most of the regional staff

are still telecommuting. Yle plans to acquire dozens more mojo sets for those working remotely. We are currently working on a new version that will be even more user-friendly for those who have no previous experience of the mobile filming gear.

During spring 2020, Yle's regional news desks did on average more than 250 mojo productions per month. The figure includes gathering footage, editing stories and live broadcasts. Since there are some 200 journalists working on regional news, mojo production is an integral part of content production. There are some 70 standardized mojo equipment sets in use in regional news.

Mobile journalism is about more than the convenience and technical advantages of lightweight gear. It enriches storytelling and allows us to react quickly. It also frees other journalistic resources for wider news coverage. Mobile journalism is a community-driven way of working and we are more than happy to share our experiences and learn from others. Contact us directly (jarno.tahvanainen@yle.fi) or participate in the EBU T&I Slack hub!

Ronnie Holmgren

Automated subtitles on a 24/7 news channel

Always at the vanguard when it comes to subtitling technology, Dutch broadcast organization NPO has broken new ground with its *Autotitling Live* solution. **Erik Buitinga** describes the journey taken.

NPO Access Services provides accessibility services, including SDH (subtitles for the deaf or hard of hearing) for seven television channels and the NPO Start streaming platform. We have quite a history when it comes to applying speech technology to subtitle production. The 2002 Winter Olympics marked the full-scale introduction of speech recognition software for live subtitling and the kick-off for re-speaking as the single mode of production for both live and pre-prepared content.

EARLY AUTOMATION
In 2009 NPO participated in the NEON project. The aim was to run video through speech-to-text, speaker diarization and alignment processes and present the outcome in a UI as editable subtitles. As a demo, NEON was a success; as a production tool it was nowhere near competing with traditional modes of subtitling and their throughput times. But from 2012 onwards we deemed automatic speech recognition (ASR) technology mature enough to deploy 'assisted subtitling' – ASR-based subtitle production – on applicable content only.

Until recently NPO employed the now defunct *eCaption* service. It provided a web-based authoring platform for ASR-generated subtitles and a fully automated subtitle workflow for pre-prepared content servicing political news channel NPO Politiek. (This was presented at the EBU MDN Workshop 2018.)

When NPO put out a tender for *Autotitling* in 2018 we knew that, as a channel, NPO Politiek had the potential to take the next step, to fully automated subtitle delivery. The content

Spraaklab output with punctuation: "Anyway, what does this mean?"

Maar goed, wat betekent dit?

was very ASR-friendly: excellent audio quality and professional speakers to boost transcription quality, predictable subject matter allowing lexicon customization, and large amounts of training data for machine learning (ML) purposes.

We also knew this next step would be as controversial as it was ambitious. The accessibility community questions automatic subtitling, as it clearly fails to meet professional standards at times. On the consumer side, surveys indicated our target audience could tolerate automatic subtitling for *some* time, but not *all* the time, and only if it had *sufficient quality* (i.e. low on word errors and in-sync with audio). So, we were in for a treat.

FIVE-SECOND DELAY
We involved both groups, editors and audience, in validating and ranking examples from different vendors at different stages of the project. Their voice was not decisive, but

as a preference it was authoritative. Acceptance was the keyword. However, all solutions offered were unacceptable. Only after introducing a fixed five-second delay on the broadcast signal, enabling in-sync subtitle delivery, were results rated as adequate.

Eventually, the *Spraaklab* solution came out as a 'winner' offering 24/7 automated subtitling on NPO Politiek. It runs as a redundant system in our media gateway hosted by local service provider *MyBit*. Input is SDI video, output is subtitles in the Cyclone, Newfor and EBU TT-live protocols. The system is tunable.

Since its implementation in October 2019 the system has been enhanced with a punctuation model and an ML loop was set up using our own datasets.

What can we say after one year of service? It is not flawless, but it is pretty neat, and it will only get better.

Putting clearer audio at the fingertips of all viewers

Recent BBC trials have used Next Generation Audio technology to put the television viewer in control of their audio experience, greatly improving accessibility. **Matthew Paradis** (BBC R&D) and **Lauren Ward** (University of York*) describe the project.

The Accessible and Enhanced Audio trials represent a great advancement in personalized audio – putting the viewer in control of their broadcast audio experience. The project successfully developed and tested a novel approach, providing the viewer with a simple, single-slider control with which they can adjust the complexity of the audio mix as easily as changing the volume. By engaging directly with production teams and end users, this approach addresses an ongoing broadcast challenge: to improve the experience for viewers with hearing loss.

Hearing impairment affects the ease with which one in six people in the UK access audiovisual content. Hearing impairment not only causes the sounds in the world around you to be quieter but can often cause speech to become jumbled and unintelligible, particularly when there are many other competing sounds. This is why increasing the volume doesn't necessarily make the content easier to understand – it just makes everything louder. To make content accessible, audiences need to be able to adjust the level balance of different audio objects.

AUDIO OBJECTS

Using Next Generation Audio (NGA) codecs is what makes this possible. Our approach allows content producers to embed the narrative importance of different audio objects into metadata. This improves on previous approaches, where content producers were not as involved. Our approach ensures that producers' creative intent is retained while comprehension of the narrative is maintained for the viewer.

This work represents a big step forward in accessibility, which our research shows is welcomed by viewers: 92% indicated they wanted to see more content like this. The first trial, in 2019, reached an audience of over 6,200 and gained high-profile media attention. Responses were overwhelmingly positive, with 84% of respondents saying the control made a difference, mostly either making the content more enjoyable or easier to understand.

"We are in charge of what we hear, and I think that's quite empowering." These were the words of a participant in a hard-of-hearing focus group in 2018, describing what this type of audio personalization offers. The benefits go beyond this, as user trials show, with young normal hearing listeners seeing the advantage of adapting the audio to their preferences and listening environment. Production teams, too, see this as "liberating for the content creator, who could make a mix more like the one they love without having to worry quite so much about those with hearing difficulty or in a noisy environment" (production staff survey participant, 2019).

By giving the audience the tools to adapt the media to their individual needs, broadcast content can not only be more accessible, but also offer a more inclusive experience. In the words of Gabriella Leon (pictured below), deaf cast member of the long-running medical drama series Casualty, "the potential of this technology is incredibly exciting!"

We are grateful to the colleagues who worked with us on this project: Ben Shirley (University of Salford), Dafydd Llewelyn (Casualty Producer), Loretta Preece (Casualty Series Producer) and the Casualty post-production team.

Lauren Ward was at BBC R&D and University of Salford until June 2020
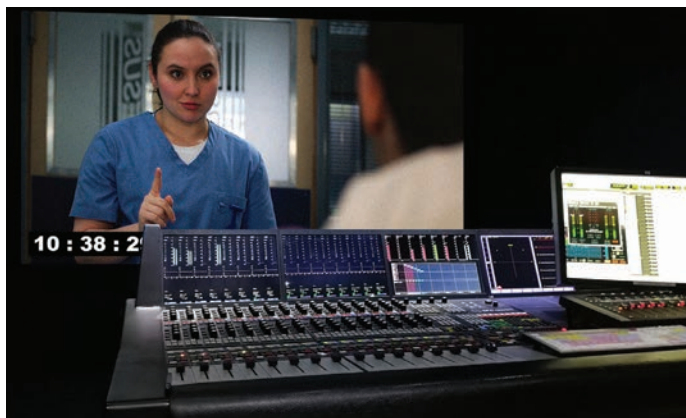
The BBC series Casualty was used to trial the new approach.

A single slider controls the complexity of the audio mix.

Stuff happens (to EBU Members too)

Cyberattacks on EBU Members, whether specifically targeted or as victims of a scattergun approach, are more common than you may think. VRT's **Gerben Dierick**, co-chair of the EBU Media Cybersecurity group, describes some of the most frequently used techniques.

It has been five years since a devastating cyberattack took TV5MONDE's television broadcasts off air, defaced their social media accounts and crippled their IT systems. Big media players like Sony Pictures and HBO have also made the headlines, suffering serious reputational and financial damage after cybercriminals spread unpublished media content and confidential data online. Luckily, no EBU Member has generated such headlines until now.

RANSOMWARE

Taking files hostage using ransomware is still one of the most popular techniques for cybercriminals looking to make money. Their strategies range from casting a very wide net to infect random internet users to patiently infiltrating a large network.

Most EBU Members will have had to dispose of infected systems on their network, restoring the encrypted files from a backup. But sometimes these attacks stumble upon production systems, potentially disrupting the production workflow. One EBU Member saw its TV playout machines infected, but fortunately the malware did not target the MXF files containing the media content. Another Member had a network share containing music files encrypted and was briefly unable to play music on one of its radio stations.

Exploiting gullible computer users is another way online criminals cause damage and steal money. All EBU Members are seeing these attacks, some very generic, others targeted at high profile staff. Unfortunately, most Members will have had employees accidentally disclose their login credentials. The result is typically multiple attempts to change banking details to divert the payment of salaries or invoices. Some of these have been successful, resulting in losses up to several tens of thousands of euros.

DATA LEAKS

Several Members have accidentally disclosed sensitive data. Programming mistakes in web applications have allowed miscreants to steal personal data. Luckily most of these issues can be fixed after being reported by well-meaning ethical hackers. Many Members have had to send reports to their national data protection authority, and at least one was actually fined following a data breach.

The above examples are by no means broadcast-specific: such attacks can happen to any organization or even any internet user. Often the attacker does not realize he has acquired access to a broadcaster's system. Nevertheless, sometimes broadcasters *are* a specific target. We have seen attempts to change the content of web pages, leak unaired content, influence radio music track selection, and steal sensitive data from journalists.

The blame for all of these incidents lies with the cybercriminals, but sometimes we make it far too easy. Some successful attacks were possible because production staff did not have or take the time to follow basic security measures. We've seen cloud-based broadcast equipment, accessible from anywhere, still using the default password.

IT staff also need to keep up: we must ensure that software is kept up to date and that VPN access is possible only with multi-factor authentication. Last, but not least, every user has to be careful, for example not to be tricked into disclosing sensitive data, not to reuse passwords, and to follow all security guidelines.

Join MCS group (tech.ebu.ch/groups/mcs) to hear about EBU Media Cybersecurity (MCS) events, projects and publications. If you are a Chief Information Security Officer (CISOs) from an EBU Member, join the MCS CISO group (tech.ebu.ch/groups/cybersecurity_ciso) to regularly share information and experience with peers, develop best practices and contribute to making the media industry more secure.

Videos from the recent Media Cybersecurity Seminar 2020 are available to view at: tech.ebu.ch/mcs2020

Contact Lucille Verbaere (verbaere@ebu.ch) for more information.

Setting standards for tomorrow's broadcasting models

In our latest Partner Profile, ETSI CTO **Adrian Scrase** discusses the role of 5G in broadcasters' evolving strategies for wireless content creation, distribution and consumption.

Established in 1988, ETSI – the European Telecommunications Standards Institute – produces globally recognized technical standards for ICT-enabled systems, applications and services that are widely used across all sectors of industry and society. Officially recognized as a European Standards Organization, our outputs include standards for fixed, mobile, broadcast and internet-based communication technologies. ETSI's 900+ international membership includes companies from the manufacturing and service sectors, regulatory authorities and government ministries, SMEs and start-ups, alongside universities, R&D organizations and societal interest groups.

ETSI AND THE EBU
ETSI's close partnership with the world's leading public service media alliance dates back more than twenty-five years. Today we are united with the EBU and the European Committee for Electrotechnical Standardization (CENELEC) in a Joint Technical Committee (JTC) that coordinates the drafting and maintenance of technical specifications used by broadcast transmission and reception systems, including consumer equipment. The scope of this standardization work embraces television, radio and services, including DVB and DAB as well as other terrestrial, satellite and cable platforms.

ETSI is also one of the founding partners of 3GPP, the body that unites regional standardization organizations to develop technical standards for advanced mobile communication technologies. These include 5G and its eventual successor 6G –

Adrian Scrase, CTO of ETSI

scheduled for deployment within the next decade – that is already the subject of considerable international research efforts.

In an era of fragmented content consumption, the television and radio industries are looking beyond the limitations of traditional distribution models to satisfy today's audiences. Viewers and listeners expect to access content wherever and whenever they wish. To reach the largest audience possible – including those in areas not currently covered by 4G – broadcasters are focused on providing the best quality content and service experience to users without being tied to a specific technology.

Standardized globally by 3GPP and ETSI, 5G has plenty to offer broadcasters looking for greener, more sustainable alternatives to traditional 'high-tower, high-power' transmission paradigms. The speed, capacity, mobility and security of 5G are also of interest to broadcasters in the realm of content creation, including OB and studio-based production.

5G FOR MEDIA DISTRIBUTION
A major area of interest for the JTC – and a current focus of 3GPP standardization activities – is the distribution of linear television and radio services using 5G radio and core network technologies. An example of this is the ability to distribute free-to-air services over cellular networks to devices that are receive-only. A number of 3GPP specifications address broadcasters' requirements, including receive-only mode devices and services, extended numerologies for large inter-site distances, and new core network interfaces and content transport mechanisms.

To explore this topic further, an ETSI specification based on 3GPP Release 16 is scheduled to be published by the end of 2020. Titled *5G Broadcast System for linear TV and radio services; LTE based 5G terrestrial broadcast system*, this new specification is intended to help broadcasters leverage the fast-evolving capabilities of 5G mobile broadband to engage with their audiences. Leveraging existing 3GPP standards to enable the deployment of linear media services, the specification [ETSI TS 103 720] also offers user equipment and network implementation guidelines to support broadcasters, vendors and infrastructure providers with timely rollout.

An increasingly complex picture for video codecs

David Wood looks at the new options for video compression and which of them broadcasters may use.

Deciding on the video compression technology – or codec – to use for broadcasting used to be relatively simple. The relevant standardization bodies seemed to have joined forces, and the trajectory of improvements seemed predictable. Not any longer. The internet world of multiple video codecs, and arguably more difficult choices, may be coming to our sector. Will packages of some or all of the different candidate video decompression systems be needed for future generations of broadcast and broadband receivers, or will there be a 'winner' or 'winners'?

COPING WITH COMPLEXITY

Over the years, some of the basic compression techniques have remained the same, but the total complexity of the processes of compression and decompression has risen proportionately with each new generation of codecs. Nevertheless, coping with the increased complexities as they came along did not prove insurmountable. Moore's law of integrated circuits observes that the amount of space needed on a circuit board for a given number of gates reduces by half every 18 months. More complex new codecs could be introduced at appropriate intervals. New television systems usually used the most recent codec that could be readily implemented in hardware decoders.

1990 saw the birth of the then revolutionary MPEG-1 DCT video compression system, driven by the new IEC/ISO JTC1 standardization committee. Since then, new compression systems have been developed and agreed in JTC1 at almost regular intervals, each about 50% more bit-rate efficient than the last. 2020 sees the publication another 'descendent' of MPEG-1, which by my reckoning would be MPEG-7 if the naming system had not been changed. It is formally called H.266/VVC[1] and is the result of joint work by two standards' organizations, the ITU-T and the aforementioned JTC1.

The earlier 2013 codec from the same joint activity, H.265/HEVC[2] (which we might think of as MPEG-6), has not had such a large take-up as the preceding codec developed in 2003, H.264/AVC[3]. There is an argument that this is due, in part, to the more complex licensing arrangements with H.265/HEVC. There were separate groupings of licence holders. Yes, the licences needed to be available on FRAND (fair, reasonable, and non-discriminatory) terms, but interpretations of the word 'reasonable' can differ. In short, there was uncertainty about how much it would cost to include HEVC decoders in equipment. The take-up has been less than originally expected.

OTHER OPTIONS?

The options may not stop with H.266/VVC and antecedents; there are other prospective codecs too. There is the codec developed by the Alliance for Open Media, the AV1 codec (published in 2019), the older VP9 codec, and additional codecs developed in the ITU-T/JTC1 activity, EVC and LC-EVC. The MPEG sister committee, famous for still image compression, JPEG, has also developed a codec. And there is more. In the final stages of the H.265/HEVC work, former MPEG leader Leonardo Chiariglioni set up a new separate body, MPAI, to develop an AI-based codec system – arguing that the advantage will be that licence costs will be known up-front.

Taken overall, it may be difficult to imagine a future converged media delivery world where multiple decoders are not needed in consumer equipment. This may be something we cannot avoid. But perhaps the future would be an easier world to understand if there were a simpler naming system for the codecs, so we do not have to find ever more superlatives for each future generation?

1 Versatile Video Coding
2 High Efficiency Video Coding
3 Advanced Video Coding

> "Yes, the licences needed to be available on FRAND (fair, reasonable, and non-discriminatory) terms, but interpretations of the word 'reasonable' can differ."

Shooting drama sustainably in France

Mathieu Delahousse of Secoya Eco Tournage describes how a television series shot on location in and around Strasbourg embraced sustainability through a range of measures.

When it came to shooting the second and third episodes of the France Télévisions police drama *Disparition Inquiétante*, series producer Stéphane Strano (of the independent production company De Caelis) decided to embrace sustainable production. To assist with this, he engaged the support of Secoya, a consultancy that specializes in advising and mentoring productions in their environmental transition processes.
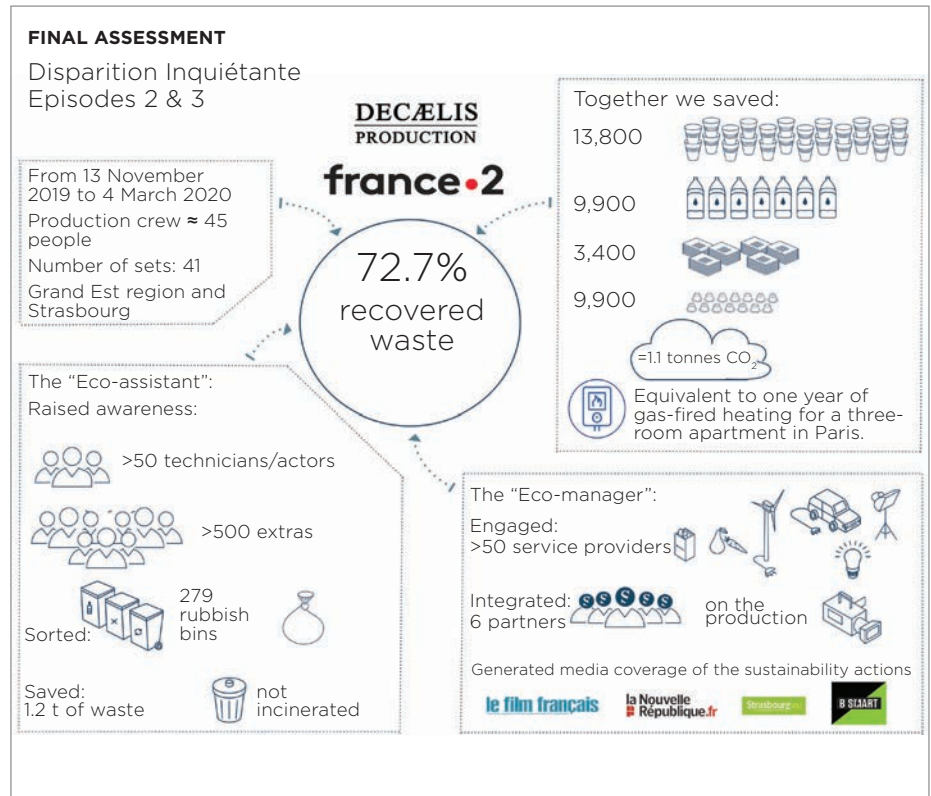
The project involved supervising the sustainability aspects both internally, with the production and technical teams, as well as with external stakeholders such as service providers, local institutions, etc. The aim was to optimize the implementation of concrete and targeted actions that would achieve the project's ecological goals.

THE FOUR RS PRINCIPLE
The starting point was the application of the "four Rs" principle to all departments and stages of the production:
• Reduce – waste, rubbish, transport
• Reuse – integrating the logic of the circular economy
• Recycle – think about the end-of-life of sets and materials from the outset
• Reinvent – question habits and behaviours to enable change
A letter outlining the aims of the project was sent to all stakeholders to raise awareness, provide information and secure their engagement. Subsequently each department was provided with a document setting out how it could contribute to the application of the four Rs. And finally, concrete actions were evaluated with respect to: their merits for this production

FINAL ASSESSMENT
Disparition Inquiétante
Episodes 2 & 3

DECÆLIS PRODUCTION
france•2

From 13 November 2019 to 4 March 2020
Production crew ≈ 45 people
Number of sets: 41
Grand Est region and Strasbourg

72.7% recovered waste

Together we saved:
13,800
9,900
3,400
9,900

=1.1 tonnes CO₂
Equivalent to one year of gas-fired heating for a three-room apartment in Paris.

The "Eco-assistant":
Raised awareness:
>50 technicians/actors
>500 extras
Sorted: 279 rubbish bins
Saved: 1.2 t of waste not incinerated

The "Eco-manager":
Engaged: >50 service providers
Integrated: 6 partners on the production
Generated media coverage of the sustainability actions
le film français | la Nouvelle République.fr | Strasbourg | B-SMART

in this region; the additional costs implied; their ecological impact; and their contribution to awareness-raising and communication.

Proposals were submitted across seven themes: food, waste, energy, mobility, responsible purchasing, carbon and social impact. They included, for example, establishing a partnership with Ecosia to offer the team an alternative search engine that takes account of the impact of digital technology. With the set design crew, we worked to adopt an approach based on the circular economy with regard to the scenery (rental, reuse, upcycling, donation, etc.) thus minimizing the generation of waste.

LOCAL ECONOMY
We also worked with institutions and communities to integrate local resources, particularly with

regard to waste management. This involved optimizing waste recovery, favouring the local economy and fostering structures that employ social workers. This made it possible to address the issue of waste reduction and the value of sorting while talking about inclusion via service providers.

The initiative generated significant coverage in both the specialized and general media (weekly trade magazine *Le Film Français*, business channel *B-Smart*, newspaper La Nouvelle République, etc.).

With the filming of these two episode, De Caelis Production has demonstrated that an ecologically responsible project involves above all defining the motivations for the commitment, from which the objectives will emerge and which will enable the appropriate actions to be put in place.

Original content dominates for PSM VOD platforms

The rise of VOD platforms is among the most significant developments in media distribution of recent years. **Léa Besson** here shares insights from a new report published by the EBU.

The video-on-demand (VOD) landscape has undoubtedly changed over the years, as have audiences' consumption habits and their expectations. Like other market players, public service media (PSM) have adapted to those changes by putting effort into their VOD players, especially in terms of content.
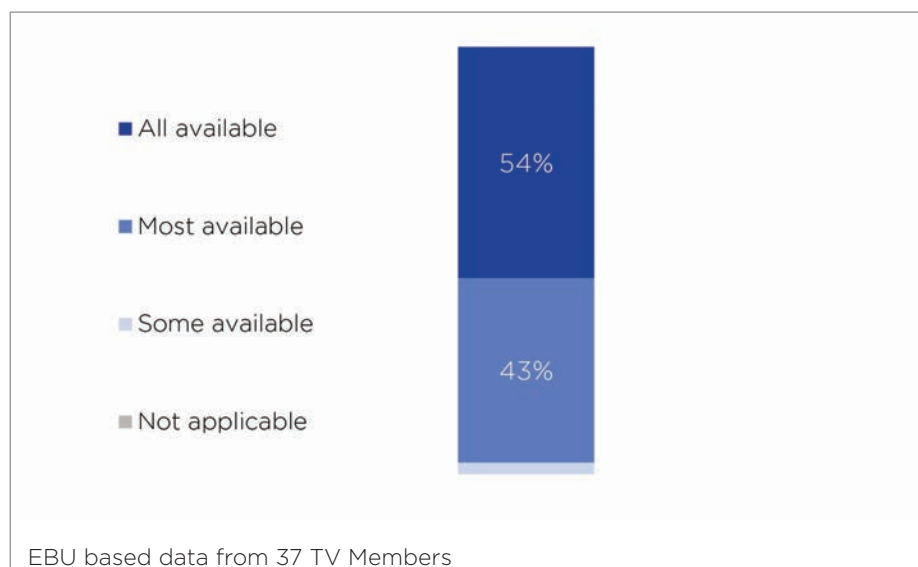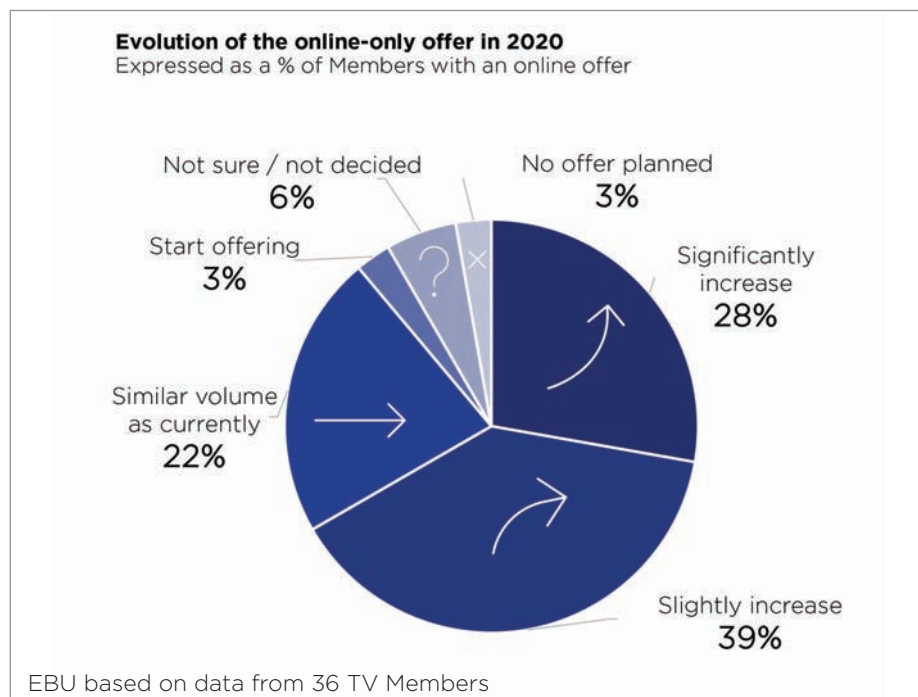
The well-known maxim that 'content is king' also applies to VOD platforms. It's no surprise, therefore, that 90% of EBU TV Members now stream online-only video content on their players. This content, only available on their on-demand platform, encompasses a wide variety of genres, from news to fiction and children's programmes. Entertainment is the least well-represented genre when it comes to online-only content.

Online-first is also a popular strategy in PSM VOD offers, with three quarters of the EBU TV Members releasing content on their VOD platforms before it appears on their linear channels. This content strategy applies especially to fiction, factual and children's programming.

These approaches that prioritize Members' online platforms are set to develop further: most plan to increase their online-first and online-only offers in the coming year. And this is not only to please young audiences, with 50% indicating that they target a general audience with their online-only content.

CATCH-UP IS CORE

While online content is gaining ground, PSM VOD players still rely strongly on their catch-up portfolio to offer a wider catalogue to the public. Their original programmes, in particular, are at the centre of their catch-up offer, especially entertainment shows, and are often made available indefinitely. In contrast, acquired content tends to have less availability on catch-up, pointing to difficulties in securing on-demand rights.

While catch-up television remains the core of PSM VOD platforms, the fact that content tends to be grouped by genre and format indicates that such platforms tend to distance themselves from linear television services. Channel brands are typically not the preferred way to display content.

These insights are drawn from the recently published report on the PSM VOD Landscape from the EBU Media Intelligence Service and Media Department. See: ebu.ch/publications/research

Evolution of the online-only offer in 2020
Expressed as a % of Members with an online offer

Not sure / not decided 6%
No offer planned 3%
Start offering 3%
Significantly increase 28%
Similar volume as currently 22%
Slightly increase 39%

EBU based on data from 36 TV Members

- All available — 54%
- Most available — 43%
- Some available
- Not applicable

EBU based data from 37 TV Members

Conference videos on demand

A selection of recent additions to our rich library of videos from EBU Technology & Innovation events, available to Members from: **tech.ebu.ch/presentations**

THE FUTURE OF CONTENT TECHNOLOGY AT SKY
CHRISTINA GOMILLA (SKY UK)
How remote and cloud-based production deployments have accelerated.

AUDIO DEFINITION MODEL FOR ABSOLUTE BEGINNERS

A webinar addressing producers and implementers of innovative audio content and technology.

BLOCKCHAIN IN MEDIA
MICHELLE MUNSON (ELUVIO)
Technology foundations and developing a new substrate for a decentralized media supply chain.

IN THE SPOTLIGHT

Sinan Soyturk

HEAD OF THE MEDIA TECHNOLOGY AND OPERATIONS DEPARTMENT, TRT, TURKEY

WHAT ARE YOUR CURRENT RESPONSIBILITIES?
Recently, I have been promoted to Head of the Media Technology and Operations Department at TRT. I am managing broadcast engineering, broadcast IT, and studio and media operations with a team of 1000+. Alongside that, I am responsible for technical investments.

WHAT DO YOU CONSIDER AS YOUR FINEST ACHIEVEMENT SO FAR IN YOUR CAREER?
I would say the best decision I have made so far is to move from the manufacturing sector to the broadcast industry. However, I hesitate to use the term *achievement* because, first, it's never personal, there are other people involved, and in general it is a never-ending process. We set goals both in our professional and private lives and try to reach them. It's like climbing to the top of a mountain: I've always wondered what was behind the mountain. From what I've seen so far, behind a mountain there is always another mountain.

WHAT ARE YOUR PREDICTIONS FOR MEDIA TECHNOLOGY IN THE FUTURE?
As parents, unless we limit kids (aged between two and seven in my case), they can spend five to ten hours a day in front of tablets, mobile phones and TVs. In contrast, I remember my childhood playing with wooden sticks, sand and stones in the garden from sunrise to sunset. What a big change! Media volume, content formats, entertainment levels and distribution speeds are growing exponentially. Individuals become producers of assets and sources of information in place of organized media companies. The production and consumption behaviour of future generations and the instruments they use will be completely different to what we have today. We're thinking and talking about reinventing the wheel in terms of how we can adapt our workflows and infrastructures to rapid technology evolution, but maybe soon the wheel will become irrelevant. Isn't it the right time to switch drive mode off and fly mode on? We must work on 'drones' of media technology by adapting to the new paradigm shift. The future will be more digital and more mobile with its tools such as virtual and augmented reality, artificial intelligence, machine learning, cloud, and 5G.

WHAT, FOR YOU, ARE THE BIGGEST CHALLENGES FOR EBU MEMBERS (OR PUBLIC BROADCASTERS IN GENERAL) TODAY?
The COVID-19 pandemic brought new challenges and opportunities to our industry. I think, during the year we did well on the transformation of workflows, remote work and production. Latency, compression, efficiency and costs are areas we should work on.

TELL US ABOUT SOME OF YOUR INTERESTS AWAY FROM THE WORKPLACE.
Spending time with family is crucial. I like playing chess, cooking and walking in nature.

PR(O)DUCTION TECHNOLOGY SEMINAR
AN EBU EVENT

tech.ebu.ch/events/pts2021

26-28 January 2021, online

DIGITAL RADI(O) SUMMIT
AN EBU EVENT

tech.ebu.ch/events/drs2021

17 February 2021, online

BR(O)ADTHINKING
AN EBU EVENT

tech.ebu.ch/events/broadthinking2021

23-25 March 2021, online

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

tech.ebu.ch/events

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