

tech-i

Radio, but not as we know it

Plus

- DOING IT WITH DRONES
- WHAT BROADCASTERS WANT FROM IP NETWORKS
- AUGMENTING REALITY

and more...



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Cover Story: Swedish Radio's award-winning NXG Radio House project points the way towards an entirely new approach to radio production. See page 18. (Photo: Mikael Grönberg/Sveriges Radio)

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Intelligent media machines?

Simon Fell, Director, EBU Technology & Innovation

You may well be reading these words before or even at IBC 2017. If you're lucky enough to be in Amsterdam, please drop by the EBU stand. We're at 10.F20 as usual, right next to the sushi bar.

We have some great demonstrations: NXG Radio House from Swedish Radio, winner of this year's EBU Technology & Innovation Award; Hybrid Log Gamma HDR; FIMS in the cloud; personalization from the PEACH project; EBU Flow multi-CDN; and object-based audio from the Orpheus project. We also welcome Eurovision Media Services and the UHD Forum. Our Saturday afternoon conference session (Emerald Room, 15:15-18:00) is titled "Building future broadcast centres – bricks, bytes and behaviours". We'll hear from several public broadcasters going through the planning of new centres and focusing on IP technology for their infrastructure. Find out more on our website: tech.ebu.ch/ibc2017

I've noticed that the terms machine learning (ML) and artificial intelligence (AI) seem to be used interchangeably to describe every new service that is dreamed up. Essentially AI is a branch of computer science dealing with the simulation of intelligent behaviour in computers. ML, however, is an application of AI that allows systems to learn and improve from experience, often taught by being fed with massive data sets. The recent success of Google's AlphaGo system in defeating the world's best players of the game Go led to China announcing a plan to become the world leader in AI by 2030 and to have a domestic industry worth around USD \$150bn.

Ahead of IBC, I've been struck by the number of machine learning (ML)



solutions taking aim at our industry. All of the big players in cloud computing are presenting their solutions to our perceived problems, often with a pay-as-you-go model and with seemingly highly impressive capabilities.

Microsoft's Azure service includes emotion detection, a video API, and their consumer application Story Remix, using AI to choose the best shots and recut videos to different music. At NAB 2017, Google demonstrated their ML tools and are now offering a range of services, with 1,000 minutes of free use of their image recognition API. It determines what is in your video and produces a searchable document alongside. IBM's Watson was used at Wimbledon this year to automatically generate video highlights based on data captured in the matches. Finally, Amazon's Rekognition service includes a tool for moderating stills, looking for sensitive material and recognizing celebrities.

So, do these systems or trial systems provide all the answers? No. Do they provide an intriguing playground that shows the potential for ML and AI applications? Yes they do, and it is an area to which we should all pay close attention, since the systems being developed could have major implications in the area of news veracity and image trust. At the same time they could provide highly beneficial services, in particular for accessibility through automated subtitling and speech-to-text conversion, as well as voice interaction.

Do please say hi if you see us at IBC, and in the meantime don't forget about that *human* intelligence that keeps us all fascinated with these latest developments in media technology.



Participants at the EBU IMF Workshop, May 2017

Helping users with IMF

The Interoperable Master Format (IMF) can be used by broadcasters to improve their workflows, but the format seems to be relatively unknown among the EBU Membership, *writes Frans de Jong*. Just before summer, the EBU organized a two-day hands-on workshop to better understand what IMF offers and to discuss what may be missing for wider broadcaster adoption. Based on the information gathered at the event, there are two main scenarios where broadcasters may want to use IMF: for incoming material and to provide programmes to other parties (e.g. OTT platforms).

The incoming scenario especially applies to broadcasters taking in content from movie studios. Quoted benefits include easier audio-track handling and more automation. The outgoing model is relevant to those who sell programmes on the international market.

One important factor that may influence the adoption of IMF would be the availability of an IMF Application supporting Apple's ProRes codec, simply because there is already a considerable amount of broadcast content in this format. Work to support ProRes in IMF (sponsored by the Digital Production Partnership) is under way. Later this year, the EBU plans to publish a report on IMF for broadcasters, which will also include the learnings from the workshop. See: tech.ebu.ch/imf

HPA IMF USER GROUP

At the EBU IMF workshop it was announced that the Hollywood Professional Association (HPA) has created a User Group on IMF, bringing together content owners, service providers, retailers and equipment/software vendors to enhance and promote the use of IMF. The EBU supports this initiative. More details on the user group can be found at: imfgroup.com

Getting animated about object-based audio

The EBU's first Object-Based Audio Seminar, last May, was an animated two-day event served by excellent speakers and demonstrations, *writes Roger Miles*. The agenda covered authoring, production techniques and workflows concerning object-based audio, scene-based audio and binaural audio. For the first time ever at an EBU seminar, each member of the audience was equipped with a pair of cordless headphones, allowing them to listen to immersive audio rendered as binaural stereo, for example the BBC's *Dr Who* and music by Kraftwerk.

This technology is so nascent that everyone, experts and novices alike, could benefit from gaining a common understanding of all its aspects. The seminar was therefore organized as a linear event, with no breakout sessions.

Object-based audio (OBA) is at first sight (sic) a means of producing an all-enveloping three-dimensional sound field for cinema – as espoused by commercial systems such as Dolby Atmos, DTS:X and MPEG-H 3D from Fraunhofer and Qualcomm, to name but three. But it was both salutary and reassuring to hear from the proponents of these systems that they were equally aware of the aspects of OBA likely to be of most interest to broadcasters, namely accessibility for the hearing and visually challenged, personalization to enhance the user Quality of Experience and, not least, the “produce once for multiplatform and format repurposing” approach that is facilitated by OBA.

OBA IN ACTION

Of great utility were the description of use cases and early adopter experiences, such as the BT Sport use of Dolby Atmos to deliver immersive and personalized user experiences. An entire session was devoted to the Orpheus Project, developing OBA in practical use cases, with the future of radio services over smartphones in mind. Both DTS and France Télévisions presented and demonstrated access services.

The demonstrations were focused on innovative production, monitoring and control tools, rendering and playback of 360° A/V content, and an end-to-end chain of VR with binaural audio to head-tracked binaural reproduction, both through headphones and a soundbar.

With an attendance of more than fifty for its first outing and very positive feedback, it seems likely that this will become a regular EBU event.

EBU Members can access the presentations: tech.ebu.ch/oba2017

Broadcasters seek to leverage AI technologies

This year's EBU Metadata Developer Network (MDN) workshop confirmed that topics related to artificial intelligence (AI) are subject to intense development and integration within the broadcaster community, reports **Jean-Pierre Evain**. For broadcasters, AI primarily means automatic metadata extraction and deep learning, semantic data and knowledge representation, and big data. EBU Members plan to be data-centric media companies, and this doesn't concern only big data.

Some broadcasters say that they are not ready for service-based architectures, but at the same time want to be in the cloud. However, the "FIMS in the cloud" demonstration at NAB 2017, and planned for IBC 2017, clearly highlights that cloud implementations are service-based. More education is needed.

RECORD PARTICIPATION

The MDN 2017 workshop hit an all-time high for participation, with around fifty people joining in person or online, from Europe, North America and Australia.

This year showed a very strong presence of broadcasters from the Nordic countries (Yle, NRK and TV2 Norway) who are actively pioneering new technologies. Other



Just some of the participants at the 2017 MDN workshop

EBU Members included RAI and VRT. Joanneum Research is a long-time contributor to EBU metadata activity and a seasoned participant in MDN workshops. Presentations also came from solution providers like Limecraft, Valossa, Perfect Memory and MediaInfo.

Mikros Image, a post-production house, reported on the results of a joint collaboration of egta and the EBU around advertising workflows and EBUCore/CCDM. Reports on EBU projects covered PEACH (big data and personalization/

recommendation) and "FIMS in the cloud" (service-oriented architecture and semantic data). Tormod Værvågen, NRK, and Mike Matton, VRT, reported on activity in the EBU's MIM (Media Information Management) Strategic Programme.

MDN is a growing network of metadata developers sharing their experience. We are already looking forward to a bigger and even more successful workshop in June 2018. Presentations available:

tech.ebu.ch/mdn2017

A new Director General for the EBU

Noel Curran, the former Director General of Ireland's national broadcaster RTÉ, has become Director General of the EBU. He replaced Ingrid Deltren, who had been in the role since 2010 and decided to step down this year to focus her attention on her board responsibilities. In a speech at the EBU General Assembly in Dublin in June 2017, Mr Curran said that he sees a bright future for the EBU and emphasized the benefits it brings to its Members. "In 1987 I did my final year college thesis on the future of public service broadcasting", he said. "At that time, the main

challenge was driven by deregulation. Today it is driven by technology. But technology opens more doors than it closes."

A strong advocate of public service media, Mr Curran is also an award-winning investigative journalist and producer, and an adjunct professor of journalism at Dublin City University. In 1997 he produced the Eurovision Song Contest in Dublin. Following the financial crisis in 2008, as RTÉ's DG, he successfully repositioned the national broadcaster as a robust digital media organization.



Members' technology priorities in focus for 2017-2019

The EBU Technology & Innovation workplan for the next two years, endorsed during June's Technical Assembly in Stuttgart, takes a more holistic approach to the technology priorities of EBU Members, writes *Technology Publications* & Events Manager **Patrick Wauthier**.

The evolution of media consumption habits is challenging siloed thinking and changing the way public service media (PSM) organizations approach their work. The focus, more than ever before, is on collaboration, transversal projects and taking an agile approach to innovation.

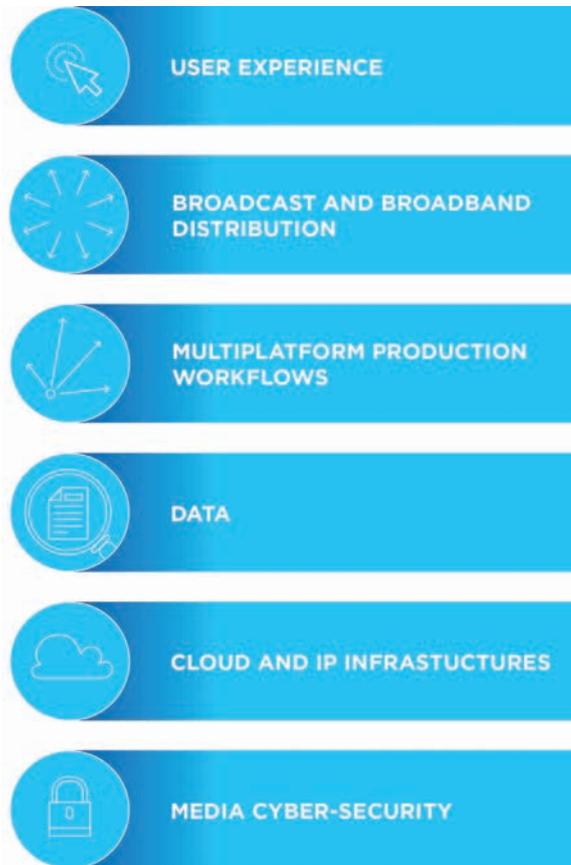
These changes are reflected in the way the work facilitated by the T&I department is now organized. While most of the technical work continues to be undertaken by Strategic Programmes overseen by the Technical Committee, the goals are now grouped under six overarching themes that together capture priorities of our Members as they look to the future.

1. USER EXPERIENCE

This theme covers technologies that aim to provide a new or improved user experience for PSM services delivered over the air or on broadband. Examples of this are personalization services for content offerings, big screen experience with immersive sound and video, mobile television and radio, and new experiences such as 360° video, VR, AR, and MR.

2. BROADCAST AND BROADBAND DISTRIBUTION

Media delivery systems, including their spectrum use and their availability, are key to how Members reach their audiences. Future



broadcast systems, mobile services (like LTE, 5G) and the organization of streaming delivery (OTT and CDNs) are central to linear and non-linear content distribution to all platforms, by all delivery methods, at any time.

3. MULTIPLATFORM PRODUCTION WORKFLOWS

This theme includes topics such as IT systems in production, agile development methods and cost-effective multiplatform and multi-format workflows for a variety of content genres (e.g. VR, UHD TV, HD and new audio formats). Work that takes place under this theme should assist Members in their transition, help them to make optimal technology investment decisions, and highlight open and standardized system alternatives where appropriate. The theme also addresses editorial, organizational and change management issues, which require cross-disciplinary efforts between

technology and editorial teams.

4. DATA

The Data theme relates to the management and analysis of data and metadata across the production and delivery chain. Special focus will be given to data analytics and related technologies such as machine learning and other artificial intelligence techniques. Note that AI/ML may also heavily influence content production in the coming years.

5. CLOUD AND IP INFRASTRUCTURES

All applications of cloud-based services across the content production and delivery chain are part of the Cloud and IP Infrastructures theme. Work in this area includes the analysis of interoperability issues, the monitoring of relevant specifications and the investigation of future business models enabled by shared facilities. It also examines models for dynamic/hybrid cloud usage (the connection of on-premises/private cloud infrastructures with the public cloud). This topic is closely linked with the move to IP infrastructures and virtualization in live studio and remote production. The overall objective in this area is to assist Members in making the right investment decisions.

6. MEDIA CYBER-SECURITY

The scope of the Media Cyber-Security theme comprises all matters pertaining to the protection of, and security threats to, Members' IT systems, and where appropriate, to users' receiving systems.

EBU Members can download the 2017-2019 workplan and track progress on its related deliverables by visiting: tech.ebu.ch/workplan

IP production – what do broadcasters want?

THE MOVE FROM SDI TO IP WILL IMPACT GREATLY ON OPERATIONAL WORKFLOWS AND SUPPORT PRACTICES. SWR'S **MARKUS OSTERTAG** OUTLINES THE REQUIREMENTS FOR A SUCCESSFUL TRANSITION.

Broadcast technology changes massively with the migration of live production from SDI into the IP domain. For EBU Members' facilities it is not a question of if, but when. Changing to IP just because it's cool technology and trendy might simply result in replacing video cables with LAN cables, rather than remodelling established workflows and leveraging the advantages of IP. It is important to identify key factors to build the business case.

FLEXIBILITY

One of the main benefits of an IP-based broadcast infrastructure is the ability to assign and implement workflows of any kind. The deployment of a new production process is "just" a matter of controlling routing tables and allocating signal processing resources, rather than re-cabling devices. It will be possible to prepare and schedule signal processing devices located in a data centre within minutes. Configuration templates for studios, galleries and signal processing resources can be prepared in advance to dynamically meet individual production and programme format requirements. Devices connected to the network will serve as a resource pool to be efficiently shared, e.g. allowing studios and galleries to be inter-connected independent of location. This new flexibility opens the door to continuous adaption and improvement of existing and future workflows.

This new world will not come for free. Common broadcast principles, with a separate control system and source signals that are pushed to the destination, will fundamentally change in the IP domain, where the

destination is responsible for signing up to a signal flow that is already available in the network. We need to model our workflows around standard IT principles. Making IT behave like familiar broadcast systems is the wrong approach.

The forthcoming SMPTE ST 2110 standard is a game changer, since it supports elementary streams for audio, video and all kinds of metadata. This will make life much easier in live production, but will also allow an entire broadcast facility to be designed around elementary streams. The trend towards elementary streams on the end device, where OTT distribution means a shift from push to pull, has an impact on the entire signal processing chain if we want to be fast and flexible for the audience. On the other hand, elementary streams make it hard to keep things in sync, e.g. to avoid audio / video delay. This old problem must be overcome and avoided by technical design. Preserving the origin time stamp of a signal stream is key, but so far very little has been achieved on this topic by the industry.

ONE NETWORK FOR ALL

To minimize administrative effort and costs one should opt for a unified network infrastructure for standard IT, audio, video, content transfer and even broadcast control. Separating media networks from the house infrastructure can only be a temporary solution, since operational control, including monitoring, will migrate towards office spaces. Encrypted protocols and authentication of operators and devices are necessary to cope with security threats. There are



Markus Ostertag, responsible for business strategy and project coordination with Südwestrundfunk.

major security concerns when we examine current IP implementations from broadcast vendors. Even if some of them are aware of the EBU Recommendation on "Cybersecurity for media vendor systems, software and services" (R 143), in most cases little has been done. Online updates and security patching of an underlying IP infrastructure in a 24/7 operation without broadcast service interruption remains a challenge.

The most important thing when adopting new technology is change management with respect to staff. Open-minded people are needed in operations and especially in support, where broadcast and IT people need to team up, to share their knowledge, acquire new skills, and develop concepts to keep your facility on air 24/7. Nevertheless, increased productivity is based on workflow optimization. The development of new workflows is tough – harmonization and deployment of new workflows is even harder.

To be successful we need to start thinking outside the "broadcast box", in functionality and services rather than devices and products; in IP packets rather than audio samples or video frames; and – most importantly – to start with a clear vision in mind.

Presentations from the EBU Network Technology Seminar 2017, including Markus Ostertag's keynote speech, are available to EBU Members: tech.ebu.ch/nts2017

SVT's CDN – How an idea came to life

BY SETTING UP ITS OWN HYBRID CDN, SWEDEN'S SVT HAS MANAGED TO TAKE CONTROL OF RAPIDLY INCREASING STREAMING COSTS. DEVELOPMENT MANAGER FOR STREAMING **DAVID KARLSSON** EXPLAINS HOW THEY DID IT.

SVT's journey to the creation of our own hybrid CDN (content delivery network) setup started with three words: Cost – Quality – Innovation.

Cost: Unsurprisingly, the increased cost for broadcasters moving their audience online is a headache for all of us. SVT calculated that one hour viewed on the internet was six times more expensive than an hour viewed on broadcast. That means major financial problems the more viewers move online. In 2015, with around 4% of all SVT's hours already consumed online, the challenge of estimating and covering future costs started to become a major concern for us.

Quality: As a broadcaster, what we actually deliver to our end users is of critical importance. How do we measure the experience? Can it be improved? Moving online means we must worry significantly more about how the actual user experience is perceived.

Innovation: SVT wants to be innovative in how we distribute content to our users. Besides the pure delivery of the video files, we also asked whether we also could make a positive impact on workflows and neighbouring systems.

In February 2015 SVT gave the green light to recruit a team that would take ownership of online distribution by developing a hybrid CDN solution. The team consists of five senior and junior developers who together have more than 30 years of experience in the streaming industry.



The popularity of services like the SVT Play video-on-demand platform means that streaming costs have become a real concern.

This means we were able to avoid a lot of pitfalls when the journey started. There are a lot of corner cases – problems that arise outside of typical operating parameters but need to be accounted for – hidden inside a complex streaming workflow.

SVT also set some KPIs that had real business value to help guide the development. One of the KPIs was a percentage of online distribution that should be offloaded through the in-house CDN after a year in production.

HYBRID SOLUTION

Development and incremental rollout took place during 2015/2016 and in April 2016 the SVT CDN entered production state. The platform is a mix of things developed in-house, alongside open source and off the shelf solutions. To serve the end users with content, SVT uses a mix of IXPs (Internet Exchange Points), PNIs

(Private Network Interconnects or private peering) and transit providers.

The decision of what to buy and what to build is fully delegated to the team using those three guiding words. Cost: can we do it more cheaply, not forgetting the cost of keeping the software up-to-date and manageable? Quality: will it have a positive impact on our end users, in terms of uptime, error resilience and so on? And innovation: does the feature/functionality in question even exist in a commercial product?

The outcome of the project after one year in production has seen it hitting or exceeding the KPIs established at the outset. This means that SVT has managed to break the rapid cost increase for streaming and now has a more controlled and predictable environment to keep growing our traffic in a scalable and economical way.

WHAT WE'VE LEARNED

- Team: you need a highly experienced team to avoid pitfalls.
- Autonomy: don't micro-manage – establish trust in both directions.
- No real standardized peering plans exist in the ISP world.
- Metrics! You can never go wrong with metrics.

The presentations from BroadThinking 2017, including David Karlsson's talk on SVT's hybrid CDN, are available to EBU Members: tech.ebu.ch/broadthinking2017

Up, up and away

AMONG THE MANY INTERESTING PROJECTS THAT PARTICIPANTS IN A RECENT EBU IOI - IMPLEMENTING OPEN INNOVATION - VISIT TO NRK HEARD ABOUT WAS THE NORWEGIAN BROADCASTER'S USE OF DRONES IN LIVE PRODUCTIONS. **JON KROSBY**, A PILOT IN NRK'S AERIAL PHOTOGRAPHY GROUP, PROVIDES THIS INSIDE OVERVIEW.

Two cross-country skiers appear from behind a pine tree, making their way down a winding slope as they fight for the best position. The camera glides down at the first turn to get closer to the skiers and then tracks along with them. Small trees pass quickly by between the camera and the skiers, showing that they are picking up speed. Then the camera moves up to reveal the stadium towards which the skiers are headed. But it doesn't stop there. Up, up, up the camera goes, clearing some tall trees and widening to show the entire Holmenkollen National Ski Arena filled with huge crowds on the stands and in the forest along the track. The two skiers become just a couple of specks in a panorama that continues to open up under the camera, which seems to float endlessly upwards until the programme cuts to a different shot.

There is no rail or crane that can achieve the complex camera movement required to tell the story in this way and give the audience such an overview of the event. Only a drone will do.

ASSEMBLING THE CREW

The road from idea to production is a long one. For us it starts with finding our crew for a specific assignment. At NRK, nobody works solely for the Aerial Photography Group. Those who work with our drones have other primary jobs: multicamera photographers, IT consultants, news photographers, etc. So, for each assignment we need to identify those who are available, trained on the equipment to be used, and willing to do the job. All our operators are certified through the Norwegian Civil Aviation Authority and have taken a theory exam to legally do commercial drone work.



Jon Krosby piloting "The Beast".

For a live production we need a pilot, a camera operator and a battery manager/safety manager. (More on this last-mentioned, yet very important person a bit later.)

Then it's production planning, with all the extra considerations that come with using a drone. Along with the usual things taken care of by the Technical Operations Manager, we need to find the right location for our base so we can cover the area wanted by the producer. Getting the optical fibre out to us and getting a signal through is not always an easy task. We also need a separate fibre pair for communication with the rest of the team.

After that we get to the drone-specific parts. We pore over maps and regulations, checking local air traffic rules and boundaries for nature protection areas and properties, and contacting the necessary authorities.

BASE CAMP

We base ourselves in a tent. This reduces sun glare on the camera

operator's monitors, protects our charging stations (we go through a lot of batteries on a normal day) and is a place to retreat to in case of bad weather. We need video signals and power like any other camera, but we are usually further away from the centre of the arena than the others and we need a lot more power. Winter sports are especially demanding, to charge our batteries quickly enough and preheat them before flight. Preheating the batteries is both a matter of achieving longer flight times as well as safety, ensuring they don't run out in mid-air.

We find a suitable placing for the landing pad, where the pilot has the best and safest overview. We unfurl copious amounts of hazard tape to keep the public out of our flying area. One of our most important rules is never to fly directly above people who have not received a safety briefing – this, naturally, means we can rarely fly over people.

Our crew and others in the production understand the risk of venturing inside our fence. But an

unbelievable number of civilians and even organizing officials fail to respect yellow and black tape saying, “Drone Area – Keep out!”. It has led me to wonder whether we should have huge signs dripping with fake blood that state, “Do not enter, or our meat grinder will cut your head off”!

SAFETY FIRST

Here is the most important job for the third person in our crew. He must make sure our area of operations is secured from unsuspecting intruders, onlookers, playful kids or officials thinking they have the right to walk anywhere, with total disregard for their surroundings. It’s not our goal to feel we have marked our territory and deliberately use our drone to defend it. However, in a live production we can’t simply stop flying to explain to everybody that our 15kg drone, known as The Beast, will fly 2m above the ground at 40-90km/h, without propeller guards (because they are too inefficient), and that they should therefore, please, remain outside our perimeter.

So, our safety manager needs to keep a close eye on people wanting to talk to us or otherwise cross the hazard tape. When this happens, he informs the pilot, who makes sure the drone is not nearby, the camera operator frames accordingly, and the production may get a different aerial



Camera operator Petter Olden.

view than intended at that time.

Making sure we get the right flight paths whenever we’re live, and being at the correct position when the producer needs us, takes a lot of rehearsing. We look for good angles and paths without being too flashy, which would risk distracting attention from what the broadcast is about. That said, we do love finding subtle ways of spicing up the pictures coming from the drone! Available time before the broadcast starts is well spent, to make sure we exploit all opportunities our designated area gives us.

When the red light comes on, and the production is live, we want to

feel like “just another camera” in the production bus. Except that we deliver cool visuals and images none of the other cameras can!

We do, however, use our communication panel more actively than the others. Either by answering the producer who’s asking for offers to fill a need, telling the production bus when we need to land for a battery swap, or just eagerly saying, “Watch this... We’ve got an idea.” When we work with producers who have experience using drones and know how to use them to their advantage, magic happens.

Rarely have I got such a good feeling in a live production as when we delivered the shot described at the start of this article. We had practiced the movement many times and did everything right when it counted the most. But when it came to ending the shot, the producer, Ola Fagerheim, spoke directly to me as pilot and Petter Olden, the camera operator, on the comms:

“Good. Now keep following the skiers. Now go up. Up. Up. Go on. Up. Up! Yeeeee, that’s it! Keep going! Up! Aaaaand cut to the next camera...”

Perfect direction, communication and execution. Success in live broadcast is seamless integration.

WHAT’S IN OUR KIT?

- Octocopter drone, eight arms for better reliability and safety, more lifting power for more batteries, custom-built for low temperatures
- MōVi M5 gimbal, camera with interlaced video out
- 30 lithium batteries, four on each flight = 23min flight time for a 15kg drone
- Tent for base, landing platform, lots of cordons to close off an area
- Three charging stations plus one for smaller batteries
- Dual monitors for camera operator, drone camera and programme view
- Communication, separate between pilot and camera operator, and camera operator and production bus

There's a new reality in town

WHETHER VR WILL BE A SUCCESSFUL NICHE FORMAT IS STILL AN OPEN QUESTION, BUT NOW AN OLD ACRONYM - AR - IS MAKING A DRAMATIC RETURN. THE EBU'S **PAOLA SUNNA** PROVIDES AN OVERVIEW OF THE LATEST DEVELOPMENTS AROUND AUGMENTED REALITY.



The Wild West is probably the most appropriate description of the current status of Virtual Reality (VR) standards. The Quality of Experience (QoE) still needs a great deal of evaluation and, at the same time, there's lots of hype about very high resolution images even though they can hardly be achieved, let alone appreciated, using today's head-mounted displays. Enter Augmented Reality.

AR has actually been around since the 1990s, but the availability of very high power, relatively cheap, fast processing has now made it possible for broadcasters to experiment with new AR formats for television. By combining powerful real-time graphics engines with sophisticated real-time 3D space mapping and tracking technologies, it is now possible to use AR for studio productions and live events, mainly

sport.

The EBU has begun collecting the views of Members about AR in order to better understand the level of interest and to draft potential use cases and their corresponding requirements.

MIXED OR AUGMENTED?

According to visual effects software provider Foundry, "*Augmented Reality is an overlay of content on the real world, but that content is not anchored to, or part of it. The real world content and the CG (computer graphics) content are not able to respond to each other.*" There is a tendency to use AR interchangeably with MR – Mixed Reality – but they are not the same thing. In Foundry's words, "*Mixed Reality is an overlay of synthetic content on the real world that is anchored to and interacts with the real world.*" Microsoft's HoloLens

and the forthcoming Magic Leap head-mounted display are the devices commonly associated with MR.

The key to successful AR is to align 3D CG objects according to, say, a smartphone's (and its user's) movements in the real world. This alignment is usually accomplished by tracking systems that exploit the phone's camera, motion and GPS sensors; the output of the tracking system is sent to a rendering engine; and the 3D objects are then appropriately overlaid on the user display. Several software development kits (SDKs), e.g. Vuforia, Wikitude and ARToolkit, are already available to develop AR applications.

THE POKÉMON EFFECT

AR on smartphones was seen mostly as a plaything for geeks until Pokémon Go became a viral phenomenon in 2016, with more than 100 million downloads in a few weeks. Pokémon Go uses GPS information to mark the player's location and to move the player's avatar, with camera functionalities used to show the characters in the real world.

In another example of AR's growing

“Playing with these frameworks will also allow us to understand whether harmonization in standards and technologies might be necessary.”



Applications like Snapchat's World Lenses allow smartphone users to play with AR.

popularity, last April Snapchat rolled out the AR-enabled World Lenses. Users can choose among different 3D objects (flowers, rainbows, clouds, etc. – updated daily) that can be inserted and positioned in their photos and videos. In the users' videos, objects resize and reposition as if they are really present in front of the lens. Technical details on how World Lenses works are not yet available but it is likely that a mix of computer vision algorithms and smartphone sensor inputs (e.g. accelerometer) are used.

At a recent Facebook event, a further two new tools were unveiled: the Frame Studio, which allows the in-camera creation of frames for video and photos, and the AR Studio. At the time of writing, AR Studio is in a closed beta version for Mac. It allows the design of location specific filters (as with Snapchat's World Lenses) along with real-time adaptive filters that can change depending on how many people are viewing a Facebook Live broadcast, what they are saying in comments, etc.

AR INTEGRATIONS

According to the available information, the technology behind Facebook's camera AR is called Simultaneous Localization and

Mapping or SLAM. It typically allows a robotic device (e.g. self-driving cars) to create a map of its surroundings and at the same time to orient itself properly within this map in real time. This is a classic chicken-and-egg problem that is solved with mathematical representations and specialized hardware (e.g. depth cameras, LIDAR, etc.) that obtains information from the environment. Currently, neither Apple nor Samsung, the leading smartphone manufacturers, include any range-finding technology in their devices, although there are rumours about next generation iPhones with an AR camera.

In May 2017, Microsoft released Story Remix, an editing tool that allows users to automatically create a highlights video from images and videos, complete with a soundtrack. It is not an AR tool but it allows the user to play with 3D objects that, for example, can be added to the video to follow a person as he moves around.

And finally, Apple announced ARKit in June 2017, enabling AR experiences on iOS with highly realistic rendering of objects as if they had been placed in the real environment. ARKit runs on Apple A9 and A10 processors; it uses

Visual Inertial Odometry to track the external world, visual features to detect horizontal planes (e.g. floors, tables), and is capable of applying appropriate lighting to CG objects based on the environment light.

I've presented here just a few of the recent developments in this space. This is a fast-moving technology and, no doubt, by the time you are reading these words, many new tools and applications will have become available.

EBU INVESTIGATIONS

Working with computer vision algorithms, 3D CG modelling/rendering and animation is not easy and requires specific skills. The EBU plans to investigate if and how these new tools can open easier paths to developing interactive, engaging and, perhaps, social AR experiences. Playing with these frameworks will also allow us also to understand whether harmonization in standards and technologies might be necessary.

Creating good VR content seems likely to be rather expensive. AR, on the other hand, could quickly enter the mainstream if it is built directly into smartphones. MR, via head-mounted displays, is probably still three to five years away.

Stronger European media innovation

A NEW EBU-LED HORIZON 2020 PROJECT CALLED MEDIAROAD WILL STRENGTHEN COLLABORATION AROUND INNOVATION. **NICOLA FRANK** (EBU EUROPEAN AFFAIRS) AND **HANS HOFFMANN** (EBU TECHNOLOGY & INNOVATION) INVITE YOU TO GET INVOLVED.



Today's convergent, multiplatform and globalized media landscape offers a host of opportunities and challenges for players to innovate across the value chain. The MediaRoad project promises to help Europe's media sector to have a greater impact and to update the way it approaches innovation, by strengthening collaboration between broadcasters and start-ups and by developing a network that spans the creative sector to shape future research and innovation priorities.

Three interconnected and cross-fertilizing project hubs, focusing respectively on innovation, policy and network-building, will take the project forwards, to give EBU Members and other European media organizations the means to strengthen their legacy for innovation.

NETWORK HUB

The MediaRoad project, led by the EBU, will be developed by a consortium of nine organizations, which includes some of Europe's most prominent broadcasters (BBC, RAI, VRT, Association of European Radios), leading media research institutes (IRT, EPFL, IMEC) and independent producers (through CEPI, the European Coordination of Independent Producers). Expanding the network beyond the original consortium is a key success factor for this initiative.

The floor is open to broadcasters, production companies, R&D institutes, journalists, social media, tech SMEs, policy experts and academia to express their interest in taking part in the MediaRoad Network.

SANDBOX HUB

Providing SMEs and innovators with access to established media organizations' infrastructure, knowledge and audience outreach offers a unique platform to test and scale groundbreaking ideas before market deployment. Starting collaboration early, in order to integrate technology and creativity from the outset, can shorten the cycle from idea to implementation and take-up.

The sandbox hub concept primarily draws upon VRT's award-winning sandbox initiative, launched in Belgium in 2014, as well as the BBC Taster platform. The VRT Sandbox has so far hosted over 60 companies and delivered several scalable concepts creating business value, content and audience reach. Success stories include the MediaHaven asset management tool for organizing content (Zeticon), the Appiness product placement app (Spott), the news content for classrooms platform (Moovly and Plantyn), and technology to offer virtual reality newscast transitions (Fisheye). Likewise, the BBC Taster Platform has provided a testing environment for new content and applications, where users are invited to sign up and test new products and innovative services prior to full market launch.

Replicating this successful model for innovation across Europe among media organizations, and EBU Members in particular, is one of the core aims of the MediaRoad project. To do so, a toolkit for the duplication of 'innovation incubators', as well as an online platform for sharing case studies, will be made available to interested parties. An award to acclaim the best projects emerging

from sandboxes will also be launched.

POLICY HUB

The MediaRoad project will also develop a long-term policy vision for the future of the audiovisual and radio sector as well as social media, covering areas such as the EU research agenda from 2020 onwards, data, 5G, security, immersive media, investment and training. Proposals would notably have the potential to shape where future EU research funding is allocated.

Future policy proposals will be the result of collaboration involving a broad network of audiovisual and radio sector stakeholders, covering technology, content production, social media and research. The policy hub will achieve this through a series of consultations, targeted workshops, reports and research updates, and will also rely on the input from the sandbox and network hubs.

JOIN US IN BRUSSELS!

The MediaRoad project officially starts on 1 September 2017. The European Commission's Horizon 2020 Research and Innovation programme provides full funding for the project over a two-year period until September 2019.

A launch event involving project consortium partners and interested stakeholders will take place in Brussels on 9 October 2017. A dedicated website will also go live by 1 October and regular newsletters will be published. **To make sure you receive an invitation to the event and/or to express your interest in joining the MediaRoad network, please write to the EBU's Eleonora Mazzoli (mazzoli@ebu.ch).**

EU-funded research in 5G broadcast



THE EBU'S PARTICIPATION IN A NEW EUROPEAN PROJECT, WITH BBC AND IRT ALSO INVOLVED, WILL HELP TO ENSURE FUTURE 5G STANDARDS MEET THE NEEDS OF PUBLIC SERVICE MEDIA. **DARKO RATKAJ** PROVIDES THE BACKGROUND TO 5G-XCAST.

Mobile telecommunications have come a long way since the days when making a phone call on the move was a wonder. Today's smartphones and tablets support countless applications of which a phone call is just one, and one that is less and less used. At the same time, watching audiovisual content on mobile devices is increasingly popular and public service media organizations are taking note.

As audiovisual content generates large data volumes, legacy mobile networks struggle to support the ever-growing traffic load. This is one of the reasons that most audiovisual content is delivered over broadcast and fixed broadband networks, often extended by Wi-Fi. Nevertheless, mobile technology is developing fast and it may not take long until it becomes capable of supporting a fully-fledged distribution infrastructure for audiovisual content and services, both linear and on-demand. Several other key aspects besides technology would also need to be addressed, in particular the coverage and reach of the network, regulatory conditions, and costs.

CHANGES UNDER WAY

The recently completed 3GPP Release 14 specifications already include a number of enhancements that might make it easier to address the above-mentioned issues. For example, Release 14 permits large cells and this might improve the economics of wide-area network coverage. Furthermore, it allows an LTE broadcast network to be deployed either in combination with bi-directional unicast functionality or stand-alone in dedicated spectrum. In addition, Release 14 enables a free-to-air delivery

of television services and permits receive-only devices (i.e. without a SIM card). It also provides a set of standardized interfaces and APIs and supports transport of any IP-based data flow even if the format is specified outside 3GPP, such as an MPEG-2 transport stream.

While 3GPP Release 14 is a major accomplishment and a key step towards making large scale distribution of audiovisual media services with mobile technologies viable, it is nonetheless rooted in 4G/LTE and the new features are somewhat constrained by the previous technology generations.

5G, in contrast, is still at an early stage of development and any desired features can be incorporated from the outset. The EBU has recognized the importance of 5G for the distribution of Members' content and services in the future. Moreover, even though it may take a number of years before 5G networks are rolled out at scale, the key 5G technologies are being developed now and broadcasters need to be actively involved to ensure that their future requirements, whether technical or non-technical, can be met in the 5G environment.

However, it has recently become clear that the initial 5G standards in 3GPP will primarily target those applications that cannot be supported by 4G. They will neither include broadcast or multicast functionality nor take forward the corresponding work carried out in Release 14.

5G-XCAST KICKS OFF

Therefore, the EBU, BBC and IRT have joined an EU-funded research project called 5G-Xcast*, that aims to develop 5G technologies for large-

scale distribution of audiovisual media content and services. The project also seeks to harmonize media delivery across broadband and broadcast networks, utilizing unicast, multicast, and broadcast mode, and caching. Where appropriate some of the requirements pertinent to public warning systems, automotive applications, and the Internet of Things will be addressed together with those from the audiovisual media sector.

The project began on 1 June 2017 and will run for a period of two years. The results will be submitted to 3GPP and other relevant standardization organizations.

The project consortium consists of 18 partners from the audiovisual and mobile sectors. The EBU, BBC and IRT will contribute to capturing the requirements, defining a content distribution framework and architecture, the development of the application layer, demonstrations and showcases, and the dissemination of the results.

From the EBU's perspective this work is complementary to the activities carried out in the *Strategic Programme on Future Distribution* and its project groups *Mobile Technologies and Standards (MTS)* and *CTN-Mobile*, under the guidance of the Technical Committee.

Further information about the 5G-Xcast project can be found at: <http://5g-xcast.eu/>; and about the EBU Strategic Programme on Future Distribution at: <https://tech.ebu.ch/groups/fds>.

* *The full name of the project is 'Broadcast and Multicast Communication Enablers for the Fifth-Generation of Wireless Systems (5G-Xcast)'*

The changing shape of radio's airwaves

NORWAY IS SWITCHING OFF NATIONWIDE FM AT THE END OF 2017 BUT RADIO DISTRIBUTION IS ALREADY CHANGING. **DAVID FERNÁNDEZ QUIJADA**, SENIOR MEDIA ANALYST IN THE EBU MEDIA INTELLIGENCE SERVICE, HIGHLIGHTS SOME OF THE TRENDS.

While all the attention is on the end of nationwide FM in Norway, digitization is having an effect on radio distribution across Europe. Here are some examples.

MW SWITCH-OFF

Medium wave is silently vanishing. It is still important to ensure coverage of isolated areas in countries such as Spain and the UK, or to broadcast specific programmes to ethnic minorities in Romania. However, 14 markets across the EBU area have stopped broadcasting on medium wave and 12 of them only have one service remaining (Figure 1). RTBF in Belgium might join the list by 2018 once DAB+ has been fully launched, following on from public broadcasters in Germany, the Netherlands and Switzerland, who decided to move their funds from medium wave to DAB+. Other public broadcasters in France and Belarus have also switched off medium wave in the last two years to save money.

DAB+ DOMINATES

The traction gained by DAB+ in the last few years is leading to the end of DAB, which has already been switched off in Norway and Switzerland (Figure 2). Turkey altered its DAB trial to DAB+ in May, and Denmark will discontinue DAB next October. The only country where it is currently

Figure 1: Availability of medium wave services (Source: EBU)



not possible to listen to DAB+ in preference to DAB is Romania. The challenge is the UK, home to 80% of the existing European DAB stations. DAB+ was launched nationwide in the UK in March 2016, where four commercial services are currently on offer, and it is being widely adopted for small-scale local services: in Brighton and Manchester all services broadcast in DAB+. However, the millions of DAB-only receivers will slow down the shift towards DAB+.

LOW ONLINE LISTENING

Most broadcast radio stations offer their live streams online. Among EBU Members, only around 2% of stations do not offer an online simulcast. However, our estimates are that on average only 8% of total time spent listening to radio is online.

Find out more in the new report on radio distribution networks (EBU Members only) at:

www.ebu.ch/mis-publications

Figure 2: Digital radio offer (Source: EBU)



One radio programme you won't want to miss

RADIO IS CHANGING, BOTH IN TERMS OF ITS DISTRIBUTION AND THE USER EXPERIENCE IT OFFERS AUDIENCES. **BEN POOR**, PROJECT MANAGER FOR DIGITAL RADIO, EXPLAINS HOW THE EBU'S STRATEGIC PROGRAMME FOR RADIO BRINGS MEMBERS TOGETHER TO HELP TO SHAPE THIS FUTURE.

In the world of radio, distribution has long been a hot topic – ensuring audiences can listen to radio content whenever they like and wherever they are. However, the consequence of our digital and connected age is that audience behaviours and expectations are changing, meaning we must focus on the entire user experience of radio.

KEEPING RADIO RELEVANT

The Strategic Programme for Radio brings EBU Members together to share their experiences and collaborate on projects. The work is focused around improving the user experience, looking at what creates the biggest impact and exploring new or improved ways of repurposing existing great content and resources, to help radio reach further. This means projects that cover:

Visuals alongside audio. A carousel of slides, rather than a high framerate video feed, equally useful in home, automotive or mobile devices, sent over broadcast or broadband. Visuals also lend themselves to sharing audio content on social platforms, where native video is preferred.

Provision of hybrid metadata directly to devices and service providers. This has the ability to be transformative for the user experience. It can enable devices that no longer separate listening platforms and instead provide a single, unified station list with appealing visuals; devices that automatically switch between broadcast and broadband reception; and devices that show the current track or artist in an enhanced way.

Personalization of content, and a backchannel from the listener. The ability to bookmark or tag content for later interaction; and devices



Ben Poor is the EBU's project manager for digital radio.

that tailor content to the listener, providing a more personalized experience.

To achieve these and other ambitions, creators and distributors of content need to work together, as well as with service providers and device manufacturers. Proprietary innovation can be effective in the short term and a great way to quickly try out new ideas, but this limits its impact.

Larger scale change and impact is possible only through open standards and transparent collaboration, by fostering an ecosystem open to anyone, big or small.

GET INVOLVED

The EBU Strategic Programme for Radio seeks to make this larger scale change happen, with projects that run across the user experience on

specific device types (automotive, mobile, home).

It also works to define open standards and collaborate on open platforms that enhance all radio experiences with additional services and functionality. These platforms should be deeply integrated, and connected with broadcasters' existing production workflows, making the best use of existing content.

Broadly supported, consistent and high quality metadata, alongside innovative services associated with existing audio and content, should be the key to engaging with current and future audiences on new or improved platforms. As a broadcaster, this should be part of your radio strategy, regardless of distribution – so come and help shape radio's digital and connected future!

See: tech.ebu.ch/groups/dr

Look forward in anger?

HOW DO YOU FIND OUT WHICH TELEVISION OR SOUND SYSTEMS ARE BEST? **DAVID WOOD** LOOKS INTO THE LATEST THINKING ABOUT QUALITY EVALUATION.



The development of new systems for images and sound assumes that we are able to evaluate how good different technical systems are. We need to do this so we can choose the best sets of technical parameter values. These might be, for example, the amount of detail needed, the level of distortion tolerable, or others.

There are methods of evaluation that rely on physical measurements. These are termed objective measurements. Probably, the simplest type is to electrically subtract the signal you want to assess from the highest quality version of it you can find – with a little processing this difference gives you the mean squared error (MSE), which is a number. If you need to evaluate the relative quality of a series of parameter values for the same image or sound, measuring their MSEs can give you the rank order of the quality of the systems.

OBJECTIVE OR SUBJECTIVE?

But life is not so simple. There can be any number of different television images or sound signals (of course!), and each can be affected in different ways by the same sets of parameter values, so simple objective measurements will often not tell you how good or bad the system will perform overall.

Another approach, termed subjective evaluation, is used in practice for important technical decisions. In this case, a large number of individuals, representing viewers or listeners as a whole, are asked to write down an opinion about the quality of a range of images or sounds, judging them to be in the range from excellent to bad, or the degree to which there is noticeable distortion. Since they evaluate a number of images or sounds, we build up knowledge of how the system performs.

But there are those who are thinking outside the box. They believe there may be better ways of evaluating alternative systems – ways that would be more meaningful than knowing what viewers are prepared to write down about what they think is the quality or level of distortion.

Conventional subjective evaluations

are a bit like opinion polls. They rely on assumptions that the sample size is representative of the population as a whole, and that what interviewees say is really what is in their mind. They are the best we can do today, but could we do better?

MEASURING EMOTION

What is it that we should we be trying to evaluate in the case of television images and sounds? What is it that actually determines whether viewers watch and listeners listen?

The answer is the *emotional* response that the service produces. It is about laughter and tears, hopes, anger, and fear. It is about anticipation and excitement. It is about wanting to own or taste what we see or hear. How can we find out the extent to which the technical parameter values influence these?

Today we have more questions than answers about this. But in Japan work has begun which may be the first step forward. What they have done at the Meiji University in Tokyo is take a specific simple emotional response, which is how much the viewer would like to eat the food he or she sees in the television picture. The viewer is now close to giving a subliminal response and, if we have a statistically significant number of assessors, we may learn something about the impact of the system parameter values.

Brain activity patterns are already being used to evaluate what happens when we view virtual reality, and it may be that some patterns can be associated with different emotional states. That said, having been plugged into the electrodes needed myself, I'll admit that I couldn't divorce my mind from the annoyance of having a hairnet full of wires, so I am not sure if my emotional state was a normal one.

How can we move forward with these ideas, and somehow evaluate how angry, afraid or happy a user is? What kind of test material would we use? Are there simple ways of assessing emotional response, such as pulse rate, breathing rate or skin temperature?

You, dear reader, will surely have lots of good ideas!

“What is it that actually determines whether viewers watch and listeners listen? The answer is the emotional response produced.”

DVB continues to strive for openness and innovation



DVB has three major meeting cycles, centred around the DVB Steering Board meetings in February, July and November, *writes Project Chair Peter MacAvock*. Although only three physical board meetings are held, the organization's structure and workflow are geared towards producing deliverables for these meetings to approve. As we enter the autumn cycle, we note that the normally quiet summer period has yielded significant developments in DVB's harmonized security

framework – the source of guidelines on security for groups developing specifications – relating to the all-important GDPR (General Data Protection Regulation), which comes into force in Europe next year.

Work also continues on other areas, such as targeted advertising, adaptive bit rate streaming and WiB (an innovative system concept for DTT which was the subject of an EBU Technical Review paper in March 2017). As part of DVB's strategy to build on its success in broadcasting

and to innovate in broadband-delivered services, the Commercial Module has started work on a roadmap for satellite technologies, a first step in providing a blueprint for possible updates to the very popular DVB-S2.

As always, DVB continues to openly publish a work plan on its website, with a view to Members tracking the development of the work, and for those outside the Project to identify areas where they could add value.

Impressions from the BroadcastAsia Conference



The Asia-Pacific Broadcasting Union (ABU) was, as usual, very active during May's BroadcastAsia events in Singapore, *writes Amal Punchihewa, ABU Director Technology and Innovation*. We were active supporters of the Broadcast IP Inter-Op Lab along with IABM and SMPTE. It gave media professionals valuable hands-on experience with the use of IP in broadcasting and was a notable success.

I had the honour of chairing the Broadcast Technology track of the BroadcastAsia Conference, addressing some of the strategic technology topics that we've been talking about for some time. These included UHD, HDR and Integrated Broadcast Broadband (IBB) services.

With a number of ITU standards now released, the industry is working out how to make best use of HDR to enhance the user experience. One critical question in our region is the use of HDR in full HD. While UHD-1 Phase 2 will include HDR and future workflows should incorporate it from production to delivery, full HD with HDR could create a "wow" factor in the interim.

Even broadcasters who still operate analogue-only services usually offer content online. How can we monetize investment on new infrastructure to support HDR and ensure user readiness to consume content on an appropriate device? To optimize return on investment, broadcasters need to offer content on multiple platforms with varying features, resolutions and interactivity to fit each platform. Though still a small percentage, users are accessing content via mobile networks. It was reported that in certain markets unicast

could not meet user demand due to lack of capacity, leading to unacceptable user experience.

HDR may not be suitable for all programmes. Among the challenges will be identifying content to be produced and delivered with HDR and managing the related signalling and data transmission issues. A delivery roadmap for HDR would be very useful.

At a time when several broadcasters are still in SD, with analogue terrestrial broadcasting, it is quite challenging to move to UHD infrastructures. Those who operate DTH services may offer hybrids of SD with upscaled and native HD. The deployment of production infrastructure needs to be supported by affordable receivers in the market. For some broadcasters migrating to UHD will be a long road.



Amal Punchihewa speaking at the BroadcastAsia 2017 Broadcast IP Inter-Op Lab

It's radio, but not as we know it

ONE OF SWEDISH RADIO'S REGIONAL OUTPOSTS TOOK A QUANTUM LEAP INTO THE FUTURE WHEN IT BECAME THE TEST SITE FOR A NEW APPROACH TO RADIO PRODUCTION. SR'S **LARS HEDH** AND **HASSE WESSMAN** TELL THE STORY.



The studios of Swedish Radio's regional station P4 West don't look much like a traditional broadcast facility. Certainly, there are mics and headphones, but the similarities end there. Mixing desks and faders are nowhere to be seen, with all operations handled via a touchscreen. And, with SR's new OB backpacks, even the building itself has become somewhat obsolete!

Our NXG Radio House – NeXt Generation – project had two main drivers: to equip our radio staff with production tools that are easy to handle, mobile and flexible; and to optimize resources by shifting to installations that are easier to maintain, with equipment in fewer locations.

Radio is changing. In the new media landscape SR faces increased competition from all sides. For local radio in particular, there is a need to get closer to our listeners and to be

faster in getting stories to air. With OB vans, of course, it has always been possible to broadcast from almost anywhere, but it took a lot of resources. We knew there had to be a better way.

REMOTE & IP

Our solution brought a number of threads together. At NAB 2013, we had seen the first solutions to control a mixer remotely. We had also been heavily involved in the EBU's work on Audio Contribution over IP (ACIP) and the work with AES 67; we wondered whether the network could carry all of our audio. We saw the possibility of doing with our broadcast systems what we had done with our IT systems five to ten years previously.

In July 2014 we signed a contract with our chosen partner Lawo, with a view to creating the first pilot installation of the NXG

Radio House in autumn 2016 at P4 West in Uddevalla. We started by building a new broadcast datacentre in Gothenburg, housing most of the hardware required. The audio processors, codecs and players could all be controlled remotely over standard networks (TC/ICP).

Our new studios include microphones, headphones for monitoring and a PC running Lawo's Vistools software for remote control of everything in the datacentre. There are also auxiliary audio inputs that can be used for other local equipment and converters from analogue audio to AoIP (AES 67). All audio is streamed over the network to the datacentre, and the remote control uses the same network.

STREAMLINED SELF-OP

SR's local radio staff work in a self-operation environment, right up to the point of delivery to the

transmitter. The new user interface, which is presented on a touchscreen, sees faders replaced by buttons along the sides of the screen. Holding the touchscreen in his hands, the operator can reach the main controls easily with his thumbs. All mic levels are controlled by an internal auto-mix function and the interface also integrates the programme rundown from the DIGAS turbo-player.

With such a streamlined set of equipment, creating a mobile solution was relatively straightforward. We came up with a backpack – much admired and appreciated by our presenters – that contains everything needed to deliver a complete broadcast from anywhere. Along with the mic, headphones and an iPad for remote control, the

pack includes an audio interface with an A/D converter, our own AoIP codec that creates EBU/ACIP audio streams, and a multichannel VPN router that also acts as a WiFi hotspot to which the iPad connects.

OBSTACLES AND CHALLENGES

The project has been a great success. The staff at P4 West seem to really like working with the new system and they helped greatly when it came to addressing some of the inevitable teething problems. To quote one of our producers at the service, Cissi Läckberg Blom: “It’s fun to be a pilot channel, to get involved and develop and stay ahead. Choosing a local channel really boosts the channel’s self-esteem.”

It was a huge project that took much more work than we expected at the outset. The more difficult challenges centred around network configuration and QoS and getting the PTP synchronization right. It helps that Sweden is a small country – from most local stations to a regional datacentre the maximum distance will be 80km, which reduces potential audio latency problems.

We have achieved our original aims of reducing the amount of hardware involved, particularly in the studios, and making it much easier to get out and about with our audience. And gaining the recognition of our public service media peers through winning the EBU Technology & Innovation Award is the icing on the cake!

In the spotlight **Judy Parnall**

HEAD OF STANDARDS & INDUSTRY, BBC R&D

WHAT ARE YOUR CURRENT RESPONSIBILITIES AT BBC?

I work on the strategy for the BBC’s input to standards and industry bodies across production, broadcast and other media spheres. I liaise with other broadcasters and media organizations to develop strategic visions for the future of media and the research programmes needed to get us there.

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

I was a key member of the team that launched digital television services in the UK, from writing the DVB standards, launching test services at the Montreux Television Festival, to writing the interoperability profile for UK DTT services (the first version of the D Book) and the third party guidelines for the UK Sky DSat service and bringing it to launch.

WHAT ARE YOUR PREDICTIONS FOR MEDIA TECHNOLOGY IN THE FUTURE?

There will be a greater move by consumers to use online distribution: both fixed and mobile. The move to IP will also have a huge effect on our productions, making it easier to be more flexible in both the forms of the content and how we make the programmes, for instance using object-based media.

WHAT, FOR YOU, ARE THE MOST IMPORTANT CHALLENGES FACING EBU MEMBERS TODAY?

The biggest challenge is how we maintain our position with the increased number and forms of content delivered to homes, offices and phones. This includes both making sure that our content is available on different platforms and that people know about it and want to find it, and then can do so easily.



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

I enjoy making music – playing the piano and violin and singing with friends and family. I also get involved with putting on local fundraising events and working with a local amateur dramatics group to put on plays (mainly behind the scenes and not on stage). I also enjoy putting on walking boots and heading off to the country and the hills.



EBU

OPERATING EUROVISION

FORECAST

“Evolution in Media Distribution”

23-24 November 2017
Geneva

tech.ebu.ch/forecast17

FORECAST celebrates its 20th anniversary in 2017, with the following topics on the agenda:

TECHNOLOGY TRENDS

Latest DTT developments, advanced satellite technologies (e.g. High Throughput Satellites, large scale Low Earth Orbit constellations), 4G, 5G, eMBMS and more.

THE SPECTRUM BATTLE

Calls to release the 700 MHz band, future use of sub-700 MHz bands, broadcaster preparations for WRC-19 and WRC-23.

REGULATORY ISSUES

The forthcoming new European Electronic Communications Code and adaptations to existing ITU regulations.

DISTRIBUTION EVOLVES

Finding sustainable media distribution business models, consequences of 5G for broadcasters successfully running OTT services.