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PERSONAL  
SCHEDULE

CONTENT SHIFTING  
STOP AND RESUME

USER'S PROFILE

## My media, any device!

Plus

- BINAURAL AUDIO
- REMOTE PRODUCTION
- EBU-TT SUBTITLING

and more...

LIVE ENGAGEMENT

BOOKMARKS  
PLAYLISTS  
HISTORY

# EBU

OPERATING EUROVISION AND EURORADIO

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**Y**ou will most likely be reading this at the time of the IBC 2015 show. As the industry assembles in Amsterdam for the annual pilgrimage to this fount of new technology, where do we find ourselves?

Broadcast stereoscopic TV seems a distant memory, and glasses are now proposed for virtual reality. Will this capture the public's imagination or be a short-term 'hmm that's interesting, but!' 4K, at least in its simplest form, is accelerating at a rapid pace. We have announcements from BT for their BT Sport UHD service to be delivered over broadband. They recommend that you need a service quality of 44Mbps over your 'fibre to the cabinet' broadband service in order to receive their 4K. How many households in the UK or elsewhere fill that bill?

At the same time, we've also heard of the first UHDTV Shopping Channel – what better way to view the glories of zircon encrusted jewellery, or maybe they could sell you a 4K television?

On a more serious note, standards groups are grappling with how and when certain developments will become part of the "full" UHDTV standard. Do we see signs of a breakthrough in the various phases of UHDTV?

Our EBU Members believe that the technical standard should contain all of the features on the near horizon in order to allow for a sustainable development arc of new services. These include:

- Increased spatial resolution (which we now have with 4K).
- Higher dynamic range: various proposals have been mooted, with some signs of progress here. The impact on high quality content is clearly noticeable on new screens, and has great creative potential – 'visible innovation' as they say.

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We're surrounded by new technology. Where do we find ourselves today?

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**Simon Fell**, Director, EBU  
Technology & Innovation

- Higher colour gamut: adds a subtle improvement, but again extends the creative potential.
  - Immersive or next generation audio: adds fantastic potential for exciting audio mixes in the home and flexible customisation of the audio mix by the listener. However, there are challenges ahead for the operational impact of producing such complex audio 'soundscapes'.
  - Finally, higher frame rate (HFR): it may be too soon yet for HFR decoders, but having seen images on one of our first prototype HFR displays commissioned by Members of the EBU Broadcast Technology Futures Group and shot with HFR Cameras at last year's Zurich Athletics, I can honestly say that the images were stunning making 50FPS (or 25i) look poor in comparison.
- We hope to have some of this on display at the EBU stand this IBC so come and see us at Stand 10.F20 (Hall 10).

Whatever the eventual outcome of the UHDTV standards debate, we must all work together in the industry to ensure that we get this right and deliver a lasting impact for viewers and consumers. We need to demonstrate ambition and vision to encourage these systems into the market whether at the professional or consumer end of the business.

There is much to look forward to in the coming months, including NHK's shoot at Wimbledon in 8K which will be most interesting to view. We also need to focus on planning the IP Studio infrastructure of the future. It will start with IP islands but eventually the promise of the interconnected studio with remote production and offsite storage will become the norm and deliver the kind of fundamental shift in capabilities that the next generation of IBC attendees will take advantage of when they incorporate and adopt the technology. IBC will be a very different place in ten years' time!

# What's the buzz?



## DEVCON 2015

**06-07 October, EBU, Geneva**

The third EBU Developers Conference will provide an opportunity to learn about best practices in software engineering and get hands-on with current development and deployment tools.

<https://tech.ebu.ch/events/devcon15>

## FORECAST 2015

**20-21 October, EBU, Geneva**

Our annual seminar dealing with broadcast technologies, spectrum management, and more. A unique opportunity to consolidate positions before WRC-15 and to discuss the future of broadcasting distribution

<https://tech.ebu.ch/events/forecast15>



"We've got plenty in store for this year's IBC. Join us at our stand (10.F20) for technology demonstrations, presentations and more!" <https://tech.ebu.ch/ibc2015> @skframe



### Open source meet-up

**16:30, 12 September at the EBU stand (10.F20)**

A series of five-minute lightning talks on open source projects and use cases from the broadcast domain, covering topics on production, contribution and distribution, such as: graphics and video play-out, audio and video encoding, transcoding in the cloud, DAB+ radio broadcasting and more!



**You're invited...**

**...for drinks, snacks and networking at the EBU stand at IBC 2015. Join us on Monday, 14 September at 17:00 (Stand 10.F20).**

**Audio and Radio – Sound progress breakfast (free session!) 08:30 – 10:00, 14 September in the Emerald Room at IBC**

Audio production and broadcasting are being transformed by new technologies. The next generation of audio experiences will be more immersive and better than ever before. It is important that broadcasters look at new techniques and file formats to deliver and produce audio in these advanced systems. This session, produced in association with the European Broadcasting Union, will look at the details and status for some of the latest audio and radio formats, including audio over IP, loudness normalisation and object-based audio for TV production.

**The Media Factory of the Future – EBU Session – 15:30 – 18:00, 12 September in the Emerald Room at IBC**

The traditional production environment is undergoing transformation. The resulting 'Media Factory of the Future' will continue to build on the work broadcasters are currently doing to integrate platforms, services and data and will add more flexibility, the ability to produce new live and on demand content and reduce costs. Through a series of short, dynamic presentations, this session will focus on the broadcasters' next move.

**#JoinUs on Twitter: @EBU\_TECH, Facebook: EBU Technology & Innovation, or LinkedIn: EBU Technology & Innovation**

# Sustainable production leads to win, win, win!

**The EBU's Strategic Programme on Sustainable Technology in Broadcasting held a webinar on sustainable production on 09 July 2015 writes Jigna Chandaria, BBC.**

Aaron Matthew (BAFTA) introduced sustainable

production by speaking about BAFTA's role as a hub for sustainable production in the UK. It coordinates a consortium made up of UK broadcasters and production companies. One of their main activities is to run *Albert*, a production carbon calculator that is free to use. Production managers provide data about the expected use of transport, hotels, studio time and so forth into an online calculator at the start of the production to generate a predicted footprint. By entering the actual values at the end they generate a final footprint. Different genres of programmes are already using different methods with their programmes – from methanol fuel cells on wildlife programmes to using local crews on international documentaries.

Nick Leslie (BBC) spoke about *Albert+*. He described *Albert* as the carbon 'scales' for a programme and *Albert+* as the 'diet plan' (i.e. a process to identify actions to reduce the carbon footprint). He emphasised the success of giving programmes *Albert+* ratings that could be used for friendly competition with other programme teams and certifications so that the *Albert+* mark could be shown at the end credits of programmes. He also gave examples of productions that had been through the *Albert+* process and the sort of improvements made. For instance, a drama programme filmed in London used only electric cars and saved £8000 in fuel costs and approximately £3000-£5000 in traffic congestion charges.

Michael Geidel (Green Film Initiative) described the range of sustainable production and education initiatives going on in the film industry internationally. In particular, he highlighted how the five big Hollywood studios all had their own sustainability initiatives and were now spreading these to their global subsidiaries. This is likely to drive significant change in the industry in the coming years.

Key takeaways from the webinar included: the importance of communication on sustainability within organizations, production teams and with suppliers; the importance of sponsorship (especially from Senior Management); starting to integrate sustainable production as early as possible in the production lifecycle; and, the need to share information and collaborate with others. The benefits of sustainable production are not just environmental but also good for audiences and staff engagement, significant financial savings, keeping ahead of legislation and reducing risk.

The webinar was well received. As Geir Børudale (NRK) stated, "I think we see several areas with benefit here, including: the green factor/carbon footprint, efficiency in production, better workflows, better production environments (i.e. less need for cooling) and security factors (i.e. less chance of fires in studios). I could keep going as there are so many positive factors. The only challenge will be that it takes time and money to implement this."

## Related documents:

1. EBU Tech 3367 – Sustainable Production: Overview <https://tech.ebu.ch/publications/tech3367>
2. EBU Tech Report 031 – Practical Steps to Sustainable Production <https://tech.ebu.ch/publications/tr031>



## Metadata makes broadcasters more efficient

**Metadata is increasingly recognized as a strategic topic. This was confirmed by the attendance figures of and feedback on the recent EBU Metadata Developer Network (MDN) and the Automatic Metadata Extraction (SCAIE) workshops. Together they attracted more than 60 participants and speakers over three days. One of the prime reasons for the growing interest in metadata is the desire to improve the efficiency of content production writes Jean-Pierre Evain, EBU.**

### METADATA IS EVERYWHERE!

Presentations have covered a wide range of domains in which metadata is essential.

Limecraft demonstrated that script-based collaboration reduces the costs of re-using content. JRS explained the challenges of preservation using the MPEG Multimedia Preservation Application Format (MP-AF). RAI reported on recent MPEG work on visual search (MPEG CDVS). BBC and France-Télévisions reported on the EBU audio data model (ADM) in ITU and integration in BWF. The MediaInfo metadata extraction tool was presented, which bridges worlds like UK DPP AS-11 and FIMS, via EBUCore. Mikros Image and RAI explained the new joint egta/EBU project on metadata for advertising (egtaMeta). The use and benefits of unique identifiers have been highlighted by EIDR. BBC reported on UK-DPP and SMPTE's metadata registers.

The Origo project is a complete reorganisation of the NRK's radio and television infrastructure, using semantic metadata based on EBU CCDDM and EBUCore. Semantic metadata is definitely gaining ground as shown by the presentations of AXIS-CRM for UNESCO's project "Memory of the World", NHK's work on educational services, the EBU ontology for sport, as well as the semantic representation and management of rights by ABC Australia and RAI, or the German Dwerft project on linked data in media production driven by the Hasso-Plattner-Institute and IRT. Europeana, the European Digital Library, is also using a semantic data model to provide interoperability for aggregating cultural heritage data.

### AUTOMATED EXTRACTION OF METADATA: MORE, CHEAPER!

Another way to improve efficiency is by using automatic speech analysis (VRT, NISV and RSI) and image analysis (NHK, University of Twente and TNO) technology. These can be especially useful for archiving and translation purposes. At the SCAIE workshop, Czech TV showed how automation can help improve the accessibility of the broadcaster's services. BBC Worldwide and Deutsche Welle explained how automatic translation can help translating broadcasters' content into the approximately 30 languages they offer their content in. NPO uses such technologies to improve accessibility. New structures appear like the VRT sandbox project to stimulate innovation and faster market adoption, or NISV's expertise in promoting the transfer of knowledge.

### UPDATE YOUR METADATA!

For more information, see: <https://tech.ebu.ch/events/mdn-workshop-2015>

# NTS 2015: Why broadcasters should go IP

**It won't make your facility cheaper. It will not be easier to understand. And you may end up changing your workflows to get the benefits. So why should broadcasters move to an IP-based infrastructure? That was the core question posed during the first day of the EBU Network Technology Seminar (NTS) 2015 writes Felix Poulin, EBU.**

## FLEXIBILITY AND EFFICIENCY

Fortunately the answer was given as well: because IP-based infrastructures will provide you with a level of flexibility that current broadcast facilities cannot offer. And that will pay off in the long-run. It promises to reduce the costs of the content produced by allowing more material to be created by the same staff for cross-media exploitation. And not only that, IP-based production also has the power to take away current production constraints and enable what Christian Adell (Catalan Broadcasting) called "Creative Innovation" in programme making.

## ADDING COMPLEXITY TO MAKE THINGS SIMPLER?

This projected flexibility in workflows and the other added value IP infrastructures promise will require an increase in complexity. As several presenters at NTS remarked, complexity can be hidden from end-users such as programme makers, but not from broadcast engineers. They will have to acquire the necessary skills to make sure their company invests in the right IP products and manages them optimally. According to John Ellerton (BT) broadcasters therefore probably best "upscale" their staff to become software engineers.



# EBU 21st Technical Assembly: How are technological developments transforming broadcast media?

**This was the key question asked by Simon Gauntlett (DTG) at the beginning of this year's Technical Assembly in Krakow, Poland. Referencing the 1985 classic, *Back to the Future*, he asked participants to think about whether or not we have reached the 'future' Marty McFly visited in the film writes Shannon Frame, EBU.**

Hosted by Telewizja Polska and a few months before Marty's future will have been realized, it was a poignant time to take a closer look at where we are today in broadcast media and how close we are to the film's predictions. We don't yet have flying cars, but what about wearable technology, video calls or virtual reality? It seems we're getting closer.

Transforming the future of broadcast media and how broadcasters are adapting to changes in media delivery were the fundamental themes of the Assembly. Mick De Valck (VRT) stressed the importance of being agile. "We need to go digital," he said and called on broadcasters to continue to improve collaboration within their organizations and externally.

As broadcasters continue to move towards IP and networked media, security remains a hot topic. A new strategic programme has been

introduced at the EBU on Media Cyber Security to further investigate this area. Andreas Schneider (SRG-SSR) gave further insights into the minds of hackers and how broadcasters can prepare themselves for the future.

The arrival – or rather the introduction – of 8K in practice and better versus more pixels were also discussed in detail. NHK Science & Technology Research Laboratories showcased their next generation TV system called Super Hi-Vision in an ongoing demonstration for participants over the two days.

Other topics of significance included advocacy for spectrum, 5G and net neutrality. In preparation for the ITU WRC-15 Conference in November 2015, the EBU continues to participate in discussions and give input on behalf of its Members in order to facilitate the future viability of the terrestrial broadcasting platform. So far, most countries oppose an allocation of the 470-694 MHz band, the core DTT band to mobile services.

Members also presented their work during the annual "Proud to Present" sessions taking place during the Assembly. A range of topics were discussed including T2 and LTE, the IP studio, digital radio, HbbTV, live streaming, personalization, visual radio and DAB+.



# Bringing the media experience into the 21st Century – Personalization

**MICHAEL BARROCO** (EBU) AND **SEAN O'HALPIN** (BBC) GIVE US THEIR ADVICE FOR BUILDING A UNIFIED, CROSS-PLATFORM, DATA-DRIVEN MEDIA EXPERIENCE

How it used to be: broadcasting schedules were fixed in frequent, smoke filled, meetings with experts pouring over the most recent audience ratings. Breakfast TV, children's programmes from 15:00-18:00, news and current affairs around 22:00 ... they all came from this process. This worked well when you had a single device – the sitting room TV set, or car and kitchen radio.

But we all have smartphones now. We are used to our extensive and in some cases embarrassing, music collections being available anywhere: car, home, and on the move. iTunes revolutionized the music experience by offering suggestions to the consumer based on their own libraries. We have also seen simple, unified experiences from Netflix and Spotify – their influence is perhaps greater than their viewing/listening figures would justify – but nobody can deny the attractiveness of their approach.

Broadcasters have a harder task though. Not only is their content proposition more varied (sports, current affairs, drama, children's programming), but they don't have control over the devices in the way the vertical operators have. By having each device permanently connected, these companies are able to track consumption habits, gathering lots of data on individual

## Use Case 1: BBC Playlister – Chris Needham, BBC R&D

BBC Playlister is an online service from the BBC that allows users to create their own playlists of music they find on BBC radio and TV, and then listen again through services such as Deezer, iTunes, Spotify, and YouTube. BBC Playlister is available on the BBC website, as well as from the BBC iPlayer Radio app for mobile devices.

Our initial user research at the start of the Playlister project found that users would want to use the service from the radio device itself. This led BBC Research and Development (R&D) to work on RadioTAG, a protocol for sharing information with a broadcaster about what you are listening to by pushing a button on the radio.

BBC Playlister uses the Cross Platform Authentication (CPA) protocol to allow the user to pair their radio with their BBC iD user account, and RadioTAG to add music tracks to the user's playlist. CPA is specially designed for devices with limited input capability, such as radios and TVs, and we have been working with device manufacturers to prototype the use of RadioTAG and CPA on radios, making the Playlister service truly cross-platform.

For more information, see: <http://www.bbc.co.uk/rd/blog/2014/09/cross-platform-authentication>

## Use Case 2: MaRTS – Sébastien Noir, RTS

maRTS is the community part of the online presence of Radio Télévision Suisse, the French speaking Swiss National Broadcaster. At the moment, it allows users to write comments about articles and media on the website and keep audios and videos in playlists as favorites for later consumption.

RTS has a major interest in CPA, so that mobile applications and HbbTV might share the online identities of the user, and provide him/her with a unified experience. It opens the way for a more personalised experience.

The first step will be to integrate a unified media history so that users can quickly find a video they recently viewed. Next steps could be to store user preferences (push notifications on mobile, for example) in a central way so that the user may tailor the experience to their expectations.

habits. User profiles lead to personalized services and targeted recommendations.

### Rise up broadcasters!

EBU Technology & Innovation is building a personalization community striving to provide the best user-centric experience and exploiting the exclusive and live content that are mainstays of broadcasting schedules.

Using standardized techniques and collaborating with each other, broadcasters are now ready to compete with new online players using standards. This would not have been possible a few years ago. Here's how.

The Cross-Platform Authentication Protocol (CPA) is a cornerstone of this strategy, defining how to associate devices with online identities. The purpose of the CPA protocol is to get an OAuth 2.0-compatible 'bearer token' onto the consumer device. This bearer token is an arbitrary string that represents the user's identity and their authorization to use a particular service. Once it has the token, the device can include it in requests to the broadcaster's internet services. Those services can then look up the token to see which user it is associated with and so identify who has made the request.

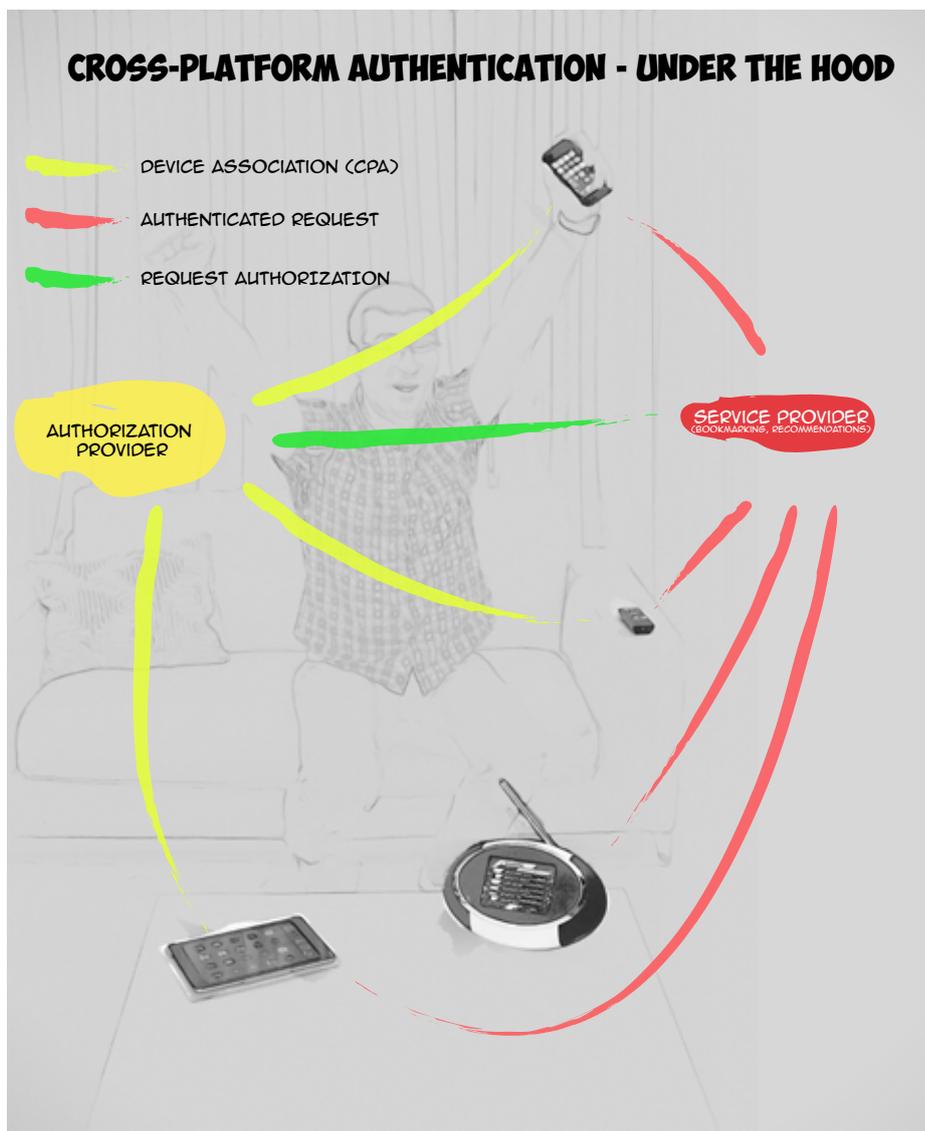
The participants in the protocol are:

- the client, which represents the user on the device,
- the service provider, which is the application provided by the broadcaster, e.g. RadioTAG, and
- the authorization provider, which issues tokens and manages the connection between the token and the user identity.

Other participants implied but not specified by the protocol are a web front end by which the user can login and enter a code (see the protocol steps below) and an identity provider which authenticates the user.

We designed the protocol to meet a number of constraints. The particular class of devices we were targeting were hybrid radios and IP-connected TVs with infrared remotes, which have either limited displays, limited input capabilities or both. CPA requires a minimal display: 2 rows of 16 characters. The only input capability required is the ability for the user to accept or reject a proposed action (e.g. "OK" or "Cancel"). We use the concept of a server-issued client ID rather than manufacturer supplied device identifier as it saves costs for the manufacturer and device identifiers are too easily spoofed.

On the server side, broadcasters can, but don't have to, share an authorization provider. There is no need to use a single central identity and authorization provider, as required by the solutions offered by Google or Facebook. This makes sharing user identities a business decision rather than a technical requirement. CPA caters



for companies who want to co-operate and those who want to go it alone.

An overriding concern was making all this work together in a way that is simple to use without compromising security. We trialled a number of methods with users and settled on the 'pin-and-pair' paradigm as the best trade-off between usability and security.

The EBU CPA protocol specification was published as Tech 3366 in September 2014. We are currently working out what is needed

for a mobile version of CPA and preparing to submit the specification to the European Telecommunications Standards Institute (ETSI).

**Want to know more about user identity management? Don't miss our next EBU DevCon taking place 06-07 October 2015. For more information, see: <https://tech.ebu.ch/events/devcon15>**

### Use Case 3. RTVE – Clan, Miguel Rodríguez, RTVE

HbbTV Clan is an application to bring content for younger viewers from the website [www.rtv.es/infantil](http://www.rtv.es/infantil) to connected TVs. Besides consuming video on demand (VOD), the user can configure a default profile in the TV, by setting the age range and language.

On the RTVE Clan website, the adult user can create personalized profiles for each of their children, providing the possibility to choose between different profiles to manage their favourite content. Once a child profile has been loaded, the child can also manage his/her favourite videos, games, series, and change to other family profiles.

CPA has been integrated with the current identity provider (IP) of RTVE and has allowed RTVE to implement the personalization functionality into connected TV. It is used to control the access authorization to the requested resources by using a security token. The integration with IP has involved developing a couple of new services in order to guarantee the secure communication between both systems and the final user. The next step is to implement the same functionality in the RTVE Clan mobile app. We are seriously considering also using CPA for this.

# Immersive audio at Roland Garros

LIDWINE HÔ, FRANCE TÉLÉVISIONS, LEONARDO SCOPECCE, RAI AND ALBERTO CIPRIAN, RAI

The 2015 Roland Garros French Open international tournament took place between 23 May and 07 June in Paris, as tennis fans will not need reminding.

The producer of the international TV signal, France Télévisions, and in particular, Francetvsport, its production unit (Tillière Production), its digital entity (FTV Éditions Numériques - FTVEN) and its R&D department (Innovations & Développements), covered seven tennis courts using five Outside Broadcast (OB) vans to produce the international HD video and 5.1 audio signals that were distributed worldwide.

Inside the Roland Garros Stadium was the RGLAB booth, created by FTVEN. This was dedicated to innovative technologies and it allowed the public to discover 360° video, live UHD TV with high dynamic range (HDR) pictures and binaural immersive sound.

During the two weeks of this event the Innovation & Développements team also experimented with binaural acquisition and an experimental 3D virtual microphone provided by our colleagues in the RAI. UHD TV pictures were produced by a locked-off camera on the main court during the championship; its signals were broadcast by DTT, satellite and IP for live reception and display on three UHD screens in the RGLAB booth, together with headphones to listen to the binaural audio coming from the main court.

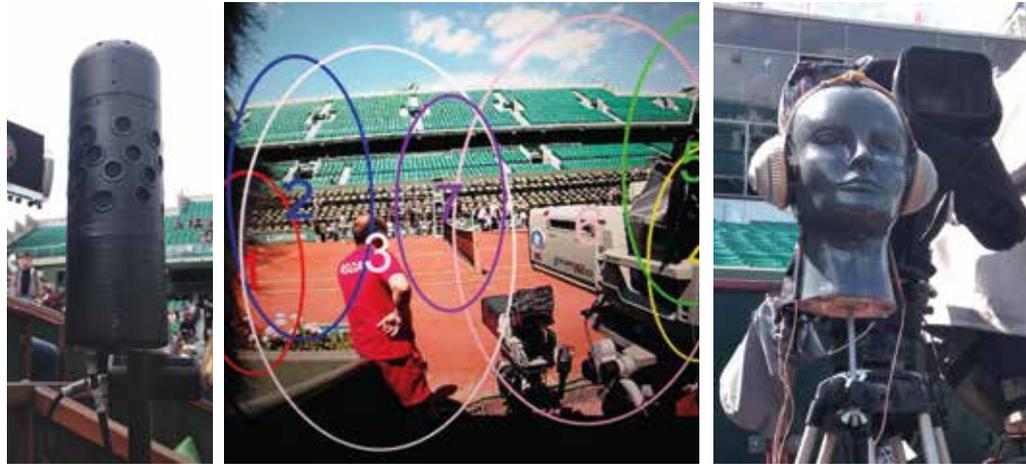
In addition, on 05 and 06 June, three UHD cameras were used to make a live UHD multicamera production from the main court.

## Binaural audio

In the context of 4K video shooting, where wide shots and slow transitions are important elements of the production grammar, native binaural miking was the simplest and most appropriate solution. In placing a binaural (dummy) head above each UHD camera, the listening and visual axes were in permanent alignment and provided a naturally immersive soundscape for the viewers equipped with headphones in the RGLAB.

Using this arrangement, the movements and distance of the tennis player were readily perceived by the viewer and the realism of the on-court voices, together with the emotions and reactions of the spectators were extremely impressive.

Electrically, each binaural, dummy head contains two microphones fitted in its 'ear canals'. The stereo signal produced was plugged directly into the camera microphone inputs; the binaural sound was then carried alongside the UHD video produced by the cameras.



On the two days of multicamera live UHD production, the camera switching on the video mixer generated a General Purpose Interface (GPI) command that was sent to the audio mixer to enable it to follow the on-air camera (the audio mixer faders were slaved to the GPI). It turned out that the major audio issues concerned the adjustment of the decay, sustain and release times associated with the audio switching; something that needed to be done manually most of the time.

It may have been a simple technique, but it allowed a strikingly immersive live soundscape to be created at minimal expense of time and technology.

Then we added 'close miked' sounds provided by the RAI's 3D Virtual Microphone System (VMS) to enhance the soundscape.

## The Virtual Microphone System

The 3D VMS device was developed and patented jointly by the University of Parma and the RAI CRIT (its Turin R&D centre). Physically it consists of a single probe fitted with 32 microphone capsules in a spherical or cylindrical array together with a processor to create a single output containing elements of all 32 microphone signals that travel down a single Ethernet cable to its complementary processing unit in the audio control room. Acquisition with this system is more akin to multichannel shooting than miking or mixing. Up to seven virtual microphones can be synthesized in real-time, but many more can be derived in post-production processing. The azimuth, elevation and directivity characteristics of each virtual microphone can be independently and freely selected in real time using the software in the control room processor that applies digital filtering to each of the 32 capsules in the 3D VMS.

The power of this technique lies in the fact that the coefficients of the digital filters are

computed from experimentally measured data rather than using the theoretical computation used in Ambisonics techniques that also employ microphone arrays. The experimental approach provides a better integration of the actual mechanical characteristics (small differences in the performance of the transducers and diffractions and reflections imposed by the body of the microphone array) of the microphone array than anything that is theoretically computed.

Additionally, there is a 360° camera in the 3D VMS (whose video signal is also conveyed in the single Ethernet cable) which aids in visualising the placement of the 7 virtual microphones on a screen.

Software modules are being developed for use with the 3D VMS. One of these performs automated tracking of actors or singers in a scene using a face recognition engine. The spatial coordinates of the person are then computed and are used to drive the position of each virtual microphone appropriately. Another software module aims at optimizing the spatial coverage of the sound along the three (X, Y, Z) axes so that a top view and a side view (corresponding to camera positions) may be generated in addition to the front view that is present.

Experimenting with the 3D VMS at Roland Garros was very informative and it points the way to new approaches to acquiring immersive audio.

## The future is object-based audio (OBA)

In addition to the three binaural stereo signals and the outputs of the 3D VMS there were all the outputs of the numerous conventional microphones that are usually rigged throughout the tennis court by the international signal producer. All these audio resources were separately recorded in the OB van and they will be used later for OBA applications and experiments.

# Remote production – The key to delivering more live content



FREDRIK SALLSTROM, NETINSIGHT

The live events industry has grown dramatically, driven by demand, changes in viewing behaviour, and new revenue streams. Broadcasters face fierce competition from new media players such as over the top content (OTT) distribution which provides a more cost-efficient alternative to dedicated distribution platforms that deliver a richer content to a global audience. As a result, broadcasters are faced with the challenge of a decreased customer base and less advertisement revenues.

To address these challenges, broadcasters are looking to provide more live sports content, as live sports still attracts a large and dedicated TV consumer base. However, live event production is resource intense and in order to effectively increase live event productions, broadcasters must address and eliminate bottlenecks in their live production workflows, which currently limits the amount of live events they can produce.

Remote production is the ability to produce live broadcasts at a distance from the actual event, by transmitting raw (ISO) feeds, audio, and equipment control over a telecom infrastructure to a central studio facility.

## Remote production – Produce more live events with less

The main obstacle hampering the growth of remote production has been the level of technology and the availability of network capacity. Technology has been limited by legacy interfaces for audio control, clear channel, TALLY, video, and more. New low-latency compression techniques such as JPEG2000, however, reduce required network capacities without degrading signal quality or increasing delay times. With the current build-out of telecom infrastructure, even large multi-camera productions can be made more cost-efficient using remote production.

## Remote production concept

With remote production, raw camera feeds are delivered to central broadcast facilities, either uncompressed or lightly compressed, to ensure the lowest possible end-to-end delay. Because the actual production and control of on-site equipment is created at the central studio, having a low delay in remote production is key.

In addition to raw camera feeds, audio and control data must be handled just as it is in traditional event productions. Control of on-site equipment previously handled by production crews in outside broadcast (OB)



vans must now be accomplished at central studios. Production audio must also be brought back from the venue, either embedded in the video feed, or as discrete native audio formats. Audio for intercoms is also critical for ensuring that producers, technicians, camera crews, and reporters communicate efficiently.

## Benefits of remote production

Remote production offers the potential for higher productivity and huge cost savings for live production, in terms of both operating expenses (OPEX) and capital expenses (CAPEX).

## Reduce production costs

Remote production eliminates the need for large technical crews and large OB vans on-site. Instead, limited numbers of highly specialised staff can be deployed centrally. Similarly, production equipment can be used more efficiently from a central location instead of being tied up during transport between venues.

Only cameras and camera crews are required on-site. As a result, existing production infrastructure at central studios can be utilized and OB vans already owned by broadcasters can be parked at broadcast facilities to be used to further increase remote production capacity.

## Produce more live content

The cost savings offered by remote production workflows can deliver more content from venues. Instead of large technical crews on site, a broadcaster can send more journalists and editorial staff to capture more and better content, and cover more events.

## Produce better content

Designating central broadcast facilities for production purposes and giving direct access to

central archives and other in-house resources enables broadcasters to produce richer content. Investment in studio equipment can also be utilized more efficiently, and by implementing uncompressed or lightweight compressed production workflows, the quality of final productions can be improved. Furthermore, tier-1 production talent is scarce, and by using remote production, these valuable resources remain in-house to potentially cover multiple events per day.

## 4K production readiness

Live production in 4K Ultra HD requires a major investment in cameras and production equipment.

The cost for upgrading an OB Van to 4K is massive and upgrading an entire OB Van fleet prohibits scaling up 4K operations. By upgrading the central studio facility to 4K enables live 4K Ultra HD remote productions on a large scale with limited investment. And, by using compression techniques, such as JPEG2000, the cost for network capacity should not be prohibitive. In fact, remote production is perhaps the most significant enabler for live 4K productions.

The benefits that remote production brings are clearer than ever for broadcasters and media operators. Remote production for live events is driven by the industry's eagerness for greater efficiency, the demand for more live content, the need to harness valuable resources, and ultimately to bring down costs and ensure each and every live event is as profitable and competitive as possible.

In the future, remote production will be as commonplace as the current established way live events are produced. Innovation will see to it that remote production surpasses the traditional approach to live event production sooner than we think, as it becomes necessary to produce more and more live content.



## DAVID WOOD LOOKS AT HOW THE SUCCESS OR FAILURE OF PAST TV SYSTEMS MAY HELP US TODAY

# In my opinion Are there lessons from TV's history?

When is 'good enough', good enough? Deciding when you have the 'right' balance for success, between TV image quality and the complexity needed to achieve it, has been vexing the broadcast community for decades. It is no less of an issue today with next generation audio and Ultra High Definition Television.

The ITU-R basic UHDTV image formats include a number of features – levels of higher spatial resolution, wider colour gamut, higher frame rates, and a higher dynamic range feature – the exact form of which is still under discussion. Added to this, we can add 'next generation audio'. All of these features will come at a price in the TV set, and the name of the game today is to decide which should be affordably 'in', and which should be un-affordably 'out' of the UHDTV delivery format or formats.

### Can we learn anything from history?

We can recall the bygone days of colour television. In the 1960s, there was PAL and SECAM – both major quality improvements over monochrome TV. But, there were several variants of 'PAL'. They allowed different amounts of horizontal detail – probably a range of about 10-20%, which seemed important at the time. They were each used in different countries. This meant that TV sets tailored for colour TV in one country (say, West Germany) could not be used in another (say, the UK). In use we could doubt if Joe Public was ever able to tell the difference in picture quality between them.

### What conclusions could we draw?

In the 1980s, a new more complex TV broadcast system was developed - MAC. Many claims were made for it. One was that the public would find it a serious improvement on PAL. The second was that the image quality would seem as good as HDTV at average TV-to-viewing- chair viewing distances. And if so, why bother with HDTV, the question was asked? MAC pictures had similar horizontal spatial resolution to PAL, but were less susceptible to 'cross-colour' - an image defect that some types of actors' clothing caused.

For the first claim, one entrepreneur offered one million dollars to anyone who could systematically tell the difference between PAL and MAC. As far as I know, nobody ever won the money. For the second, we can only say that MAC had a life of but a few years, so a major quality wow factor

similar to HDTV may not have been there. Is there a lesson in this story? By the way, there was an extension of MAC, HD-MAC, but it was never broadcast and was overtaken by digital TV.

Later in the 1980s, what was thought to be the step beyond PAL was developed: 'PAL plus'. There were claims that the public would see an obvious difference between PAL and PAL plus. Also that for the public, the images would be as good as HDTV – and the sets much less expensive. A distinction of PAL plus was that the images would be wider than PAL (16:9 - like HDTV images).

The initial design for PAL plus had the screen image reduced in height to create the wider images, and in the blank spaces above and below where image used to be, additional detail (the 'helper' signal) was hidden that would add to the detail in the main image.

But, some argued that this additional detail was not something the public would ever notice, and so it was dropped. Ideals for quality went down in a series of steps in quality from HDTV, to Palplus with helper, to PALplus without helper. What happened to PAL plus? It found some services but soon faded from the scene.

Digital television has succeeded - both services in standard definition and those in high definition. The success of the standard definition has been arguably because it allows many more channels to be available. The success of the HDTV has been due to several elements - the additional plus of 'flat screens', the quality jump making watching television a genuinely more involving experience, and because the complexity barrier has been overcome as volume production has reduced set costs to affordable levels.

So when it comes to UHDTV, how much of a quality and complexity jump is needed for success? How many features do we need to add to be sure it doesn't go the way of PALplus or MAC?

Drawing on history, one conclusion could be that if the quality improvement is small, it may be hard to make the system successful, unless it provides a bonanza of new channels. The corollary is that the more features and quality improvement you add, the greater is the chance that the system will be successful - provided it is affordable.

So, should our bet be on a large step in quality, assuming that volume manufacture will drive costs down? Or, is it better to make it a small step, and begin with more affordable TV sets? What do you think?

# CasparCG as playout server from Telewizja Polska S.A.

JERZY JAŚKIEWICZ, POLISH TELEVISION

CasparCG is an open source graphics and video playout software developed in 2006. For some time Telewizja Polska S.A. (TVP) has been looking for a uniform cost-effective play-out solution to implement in its 16 regional branches responsible for producing and broadcasting their regional channels under the corporate label 'TVP Regionalna'. The topic became even more pressing when the DTT switchover started in 2011.

A series of tests confirmed that CasparCG was able to drive playout from file sources using relatively cheap hardware. The only drawback was that there were no automation playout clients – the available clients were designed to support studio production.

Currently, TVP regional branches air about five hours daily, while relying on common programming in the remaining time. They are using relatively old, SD-only and rather dilapidated automation systems based on Grass Valley's K2, with no redundancy, and only 20 hours of content on storage. Another challenge was that the old system did not easily support file-based ingest (although K2 itself allows this).

Therefore a decision was made to use CasparCG – the most cost-effective solution – and to develop TVP's own automation system based on this software to run playout in TVP regional branches. The assumption was that it should be easy to operate, maintain and support file-based ingest, including Sony XDCAM devices. It also should not contain a single point of failure – all its components have to be redundant.

In early 2014, the newly developed client was installed in two regional branches – TVP Gorzów Wielkopolski and TVP Łódź – initially with limited capabilities. Since then, many improvements have been made increasing system stability and introducing new features. Another installation was done in Cracow.

As anyone could predict, not everything was as simple as it seemed to be. Few of these concerned CasparCG itself – they were relatively easy to fix thanks to open source. For example, the release version could not seek files with long GOP.

Now, our CasparCG client has grown to a rich-featured playout automation server. The feature list contains a multi-channel playout with two redundant players each, channel branding, GPI triggering, convenient time calculations and event

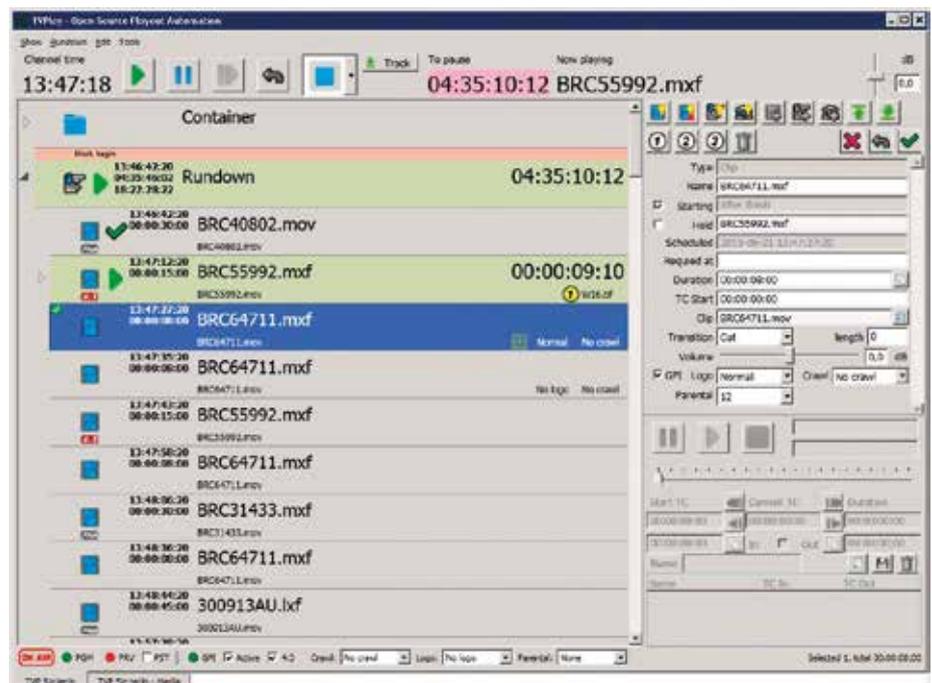


nesting. Each channel has its own media manager, which allows for ingest from folders and FTPs, maintain clips metadata and provides basic archive functionality. For XDCAM decks, ingest supports clip and EDLs. It also allows for volume level (according to the R.128 recommendation) checking and adjusting. A lot is ready, but there also remains much to be done: full CG integration, partial clip ingest, sophisticated ingest file validation, system configurator, separation between user interface and automation engine.

Based on our experience and our appreciation of the SVT team for the release of CasparCG, TVP decided to share its automation client too. It is available on GitHub and through <http://playoutautomation.tvp.pl>. Any help with further development of it is welcome, even if it would concern only a bug report or language translation.

*Erratum: Please note that a small typing error was found on page 5 of tech-i 23. The date in the sixth paragraph should read 2030 (not 2013). We thank you in advance for taking this into account.*

"Each channel has its own media manager, which allows for ingest from folders and FTPs, maintain clips metadata and provides basic archive functionality"



# Lessons learned from LTE-800 deployment in Europe

**NATALIE MOUYAL**, DIGITAG PROJECT OFFICE



Since 2011, countries across Europe have begun to deploy wireless broadband services in the 800 MHz band. While this band had traditionally been reserved for broadcast services, national administrations decided in 2007 to update the ITU Radio Regulations to allow for a co-primary allocation for broadcast and mobile broadband services in the frequencies 790 – 862 MHz (i.e. the 800 MHz band). In May 2010, the European Commission followed with a decision (2010/267/EU) requiring all member states to clear broadcast services out of the 800 MHz band by 01 January 2013 and instead use the band for mobile broadband services based on an agreed set of harmonized technical conditions.

Using the 800 MHz band for mobile broadband services has several advantages. First, it helps satisfy the expected demand in mobile broadband services as forecast by the mobile telecom industry. Second, national administrations have generated significant revenue by auctioning these frequency licenses. For example, the auction generated €2.6 billion in France and €3 billion in Italy. Finally, these services can potentially reduce the so-called 'digital divide' by allowing households in rural areas to access broadband.

However, any use of the 800 MHz band by mobile broadband services requires the implementation of safeguard measures to protect broadcast services located in the frequencies below 790 MHz from interference. While national administrations have put in place certain obligations on mobile telecom operators to protect the DTT platform, conditions have varied between countries. And as LTE technology is deployed, it is now possible to assess its impact on the DTT platform and the effectiveness of the safeguard measures.

## DigiTAG study on LTE-800 interference

In 2014, DigiTAG began to gather data to evaluate the consequences to the DTT platform

of deploying LTE services in the 800 MHz band. The survey sought to better understand the legal framework and licensing regimes implemented, the safeguard measures put in place and their effectiveness, as well as the identification of any best practices. The ten countries participating in the survey included Finland, France, Germany, Ireland, Italy, Norway, Poland, Spain, Sweden, and the United Kingdom.

## LTE-800 licensing requirements and deployment status

Germany was the first country in Europe to launch mobile broadband services in the 800 MHz band. Other countries soon followed, such as France and Sweden in 2012, Italy and the United Kingdom in 2013 and Norway and Finland in 2014. Poland and Spain are launching their services in 2015. In most countries, deployment is still underway.

While most regulators have defined minimum population coverage for LTE services, it is not yet clear whether mobile broadband services have reduced the 'digital divide' in rural areas, since the license requirements for "white areas" coverage and minimum bandwidth offer are limited. Radio waves in the 700 MHz band give the possibility to reach far and wide. However, current LTE deployment has mainly occurred in highly populated areas, often in small cells to increase service capacity. Not deploying large cells to reach wide geographical areas leaves part of the released spectrum unused.

## Protection provided to DTT reception

In most of the countries surveyed, national administrations have sought to provide DTT households with protection against interference from mobile broadband services. However, this protection is generally limited to fixed, outdoor rooftop installations. In the United Kingdom, protection is only given to those households relying on the DTT platform for their primary television reception while in Finland, France, and Italy, protection is afforded to all households.

Only two countries, France and Germany, put in place a systematic procedure that requires national administrations to approve LTE base station deployments. In other countries, mobile telecom operators can roll-out their base stations without approval or conformity checks prior to launch.

## Handling interference to the DTT platform

Nearly all countries surveyed have set up a procedure for handling interference to the DTT platform. In some cases, the response to the interference problems is handled by the telecommunications regulator (France, Germany) while other countries (Finland, Italy, Spain, Sweden, UK, Norway) have set up a specific organization.

In all countries, mobile telecom operators are expected to solve interference issues and the installation of filters is the preferred method for mitigating interferences. However, while call centers and installers are authorized to order filters in five countries (Finland, France, Italy, Norway, UK), how filters are ordered and shipped is not clearly defined in the remaining countries.

Limited information is made available to the public and DTT stakeholders regarding mobile broadband roll-out plans.

## Financing interference mitigation

Mobile telecom operators are required to finance the cost of the organization/call center responsible for handling interference to DTT reception in all countries where such an organization exists (Finland, France, Norway, Italy, Spain, Sweden, UK).

The cost of supplying filters to viewers is covered by mobile telecom operators in seven countries (Finland, France, Norway, Italy, Spain, Sweden, UK) while the cost of installing the filters is only covered by mobile telecom operators in five countries (Finland, France, Norway, Spain, Italy). Costs are borne by the viewers in Ireland and Poland.

It is not clear what happens when filter do not solve the interference problem and, for example, a new antenna must be installed. The cost of supplying new antennas is only covered by mobile telecom operators in three countries (Finland, Norway, UK).

## Current levels of LTE-800 interference

Very few official publications and statements are available regarding the number of reported cases of interference. Much of the available information has been reported by the organisations responsible for handling interference issues.

Precise information is currently only available in Norway (1332 reported cases per April 2015), the United Kingdom (6,199 reported cases per May 2015) and France (29,596 reported cases per October 2014). Very recently, the Swedish regulator reported 870 cases where filters were shipped to users, while Swedish retailers reported 32,150 filters sold since LTE

launch, not taking into account amplifiers and antennas with LTE filters. Note that France is the only country reporting an estimated number of households (123,268), thereby including communal aerial reception. The majority of interference cases have been resolved with filters although it is not known if all cases are reported. Instead, some households may be migrating to other television delivery platforms.

### Lessons learned

It is clear that mobile broadband services operating in the 800 MHz band are causing interference problems to the DTT platform and filters are an effective means to mitigate the interference. However, the measures implemented to mitigate interference to the DTT platform vary significantly between countries.

Based on the DigiTAG survey, several factors have emerged that are important to ensure the safeguard of the DTT platform:

- First, a national organization needs to be put in place that can handle interference cases.
- Second, households must have access to certified filters that can protect DTT reception from frequencies above 790 MHz. Mechanisms should also be put in place to assess possible interference cases so that those households can be contacted directly. Alternative methods to mitigate interference should be defined for cases when filters do not suffice.
- Third, DTT stakeholders and telecom operators deploying mobile broadband networks should be required to cooperate.
- Fourth, finally, financial responsibilities must be clearly defined.

In order to guarantee that these factors will be successful, regulators in each country need to specify clear requirements in the licensing conditions prior to releasing the spectrum to mobile broadband services.

### Is DTT below 790 MHz safe?

It is not yet clear to what extent the DTT platform has been negatively impacted by the deployment of LTE services in the 800 MHz band. Few cases of interference have been made official and filter appear to solve most problems.

However, it is not known if all cases of interference to DTT reception are reported. Call centers may not be equipped to identify all problems and it is costly to mitigate interference problems unresolved by filters. As a result, it is possible that households are migrating away from DTT to other television delivery platforms.

It will be necessary in the coming years for the DTT platform to co-exist alongside mobile broadband services. Further interference issues will emerge as mobile broadband networks are deployed. And, with some national administrations announcing plans to allocate the 700 MHz band to mobile broadband services, lessons learned from the deployment of such services in the 800 MHz band could be adopted.

# Latest news from ABU Technology

**DR AMAL PUNCHIHEWA**, DIRECTOR OF TECHNOLOGY (ABU)

The Asia-Pacific Broadcasting Union (ABU) held its Technical Bureau meeting in Kuta, Bali, Indonesia hosted by Radio Indonesia-RRRI. The Technical Bureau is the administrative body of the technical committee of ABU. A number of decisions were made in relation to surveys carried out investigating ABU member needs in early warning signaling and broadcasting for future digital broadcasting. Those involved also decided to investigate character set requirements for digital radio in the Asia-Pacific region, especially those which would be useful in disaster communication as an access technology.

Digitalisation, net neutrality, social media and human capacity building were some hot topics for the ABU tabled during WBU-TC meetings. ABU is continually campaigning to secure frequency spectrum for needs of future broadcasting. ABU Technology raised its concerns that broadcasters have to work with respective regulators in their country to secure spectrum for digitalisation and future broadcasting needs. As well as these, ABU Technology represented Asia-Pacific broadcasters at the ASEAN Broadcasting Regulation forum held in Bangkok on 07-08 July 2015.

The last three months was a very busy period for ABU Technology as it actively took part in a number of events including

the Asia Media Summit in Kuala Lumpur, Broadcast Asia in Singapore, WBU-TC and EBU-TA in Krakow. Detailed articles on each of these activities are carried in the ABU Technology Technical Review which can be accessed online. This issue also carries two articles; one on the DOCSIS 3.1 and the other on high dynamic range image sensing. This issue also carries an interview on net neutrality and an article from EBU providing an update of the European broadcast situation.

**To find out more, visit our website at [www.abu.org.my](http://www.abu.org.my)**



## Join us at our upcoming events

### ABU Technology Webinar Festival 17 August – 21 September 2015

The ABU Technology Webinar Festival is a series of online webinars offered free of charge to those interested in broadcast technology. The month-long festival will include presentations on different aspects and applications of broadcast technology.

The webinar sessions will provide information on new technologies and developments in the industry. They are open to participation by all ABU members and those in the industry who are interested in broadcast technologies and their applications. For more information, see: [www.abu.org.my/webinarfest2015](http://www.abu.org.my/webinarfest2015)

### Regional Workshop on OTT and IBB Hybrid Technologies for Broadcasters 29 September – 01 October 2015, Kuala Lumpur

OTT and IBB Technologies can be regarded as an opportunity for broadcasters, many of whom are embracing the platforms. Implementing these technologies can help increase a broadcaster's reach and at the same time provide an enhanced experience for the audience.

The three-day workshop will introduce the IBB technologies and address some of the main issues that broadcasters may face when wanting to introduce OTT and IBB services within their portfolio. It will not only explore the technology but also look at other value added services and business opportunities that broadcasters can explore to attain a competitive edge in the market place.

Please register by 11 September 2015. For more details, please go to ABU website: [www.abu.org.my/OTT](http://www.abu.org.my/OTT)

# Wireless distribution of audio-visual media services

DARKO RATKAJ, EBU

Audio-visual media services have always been popular because storytelling is essential to our social interaction and culture. A good narrative is compelling whether it is news, documentary, fiction, sport, or entertainment. As viewers and listeners we derive value from content and the way we experience it.

The technological developments have enabled traditional linear radio and TV to evolve and a variety of on-demand, hybrid, and data services to be offered to audiences.

At the same time, users have at their disposal a growing range of devices, including stationary and portable radio and TV sets but also personal computers, smartphones and tablets, and a host of streaming devices that can connect to a TV set.

Furthermore, with on-demand services they are no longer bound to the broadcasters' schedule and with mobile devices they can enjoy watching their favourite content outside of their home.

The growing capabilities of user devices coupled with an increasing choice of high quality content continue to drive users' expectations and influence their habits. Given the chance, users will always prefer higher quality, wider choice, convenience, and lower costs, which together contribute to the user experience. Better user experience leads to higher engagement and loyalty to the brand or service.

Content and service providers know this and seek to provide the best possible experience irrespective of where the users are and which device they use. This can only be achieved by using multiple means of distribution as no single delivery platform is capable of effectively serving all use cases<sup>1</sup>. Wireless distribution platforms have a particularly important role to play.

Audio-visual services have been distributed wirelessly for more than a century. Radio broadcasts began in the early 1900s, followed by terrestrial TV in the 1930s and satellite TV in the 1960s. The latest addition is wireless broadband which really took off after 2000.

Satellite networks provide a very large coverage and have a large capacity but, generally, can only reach stationary receivers with an outdoor antenna. They are particularly suitable for linear services with national or international footprint.

Terrestrial broadcast networks have the flexibility to provide national, regional, and local services. They can provide both indoor and outdoor coverage and can deliver not only to stationary but also portable and



mobile receivers, if the networks are so designed. In addition, terrestrial broadcasting is the only platform that everywhere provides free-to-air services<sup>2</sup> which is particularly important for Public Service Media organisations.

Broadcast distribution networks are purpose-built to serve large audiences in a cost-effective way. Whilst they carry the majority of linear services<sup>3</sup>, they currently cannot deliver on-demand services.

The opposite is true for broadband networks. They are designed as the general purpose networks which support many different services and applications but are not optimised for any one of them.

Delivery of live content over broadband networks is constrained because it does not scale up well for large audiences. In addition, as broadband networks operate on a best-effort basis, it is difficult to ensure consistent and predictable quality of service hence the user experience may vary depending on the available network resource at any given moment.

Nevertheless, broadband networks are currently the only available option for the delivery of on-demand services. As their capabilities and reach continue to improve their importance for the distribution of audio-visual content and services will further increase.

Wireless broadband networks are essential for reaching mobile devices, in particular

smartphones and tablets. They come in two main varieties: cellular mobile networks and Wi-Fi. Whilst both of them are normally available indoors, only the cellular networks (e.g. 3G and 4G) provide wide area outdoor coverage.

Most of the traffic to mobile devices goes over Wi-Fi which provides larger capacity and lower costs than the cellular networks, it is available indoors where most viewing and listening occurs, and the quality is, in general, satisfactory. Even though the mobile networks, in particular 4G, may be able to provide a better user experience, the high prices of mobile data and the comparatively low data allowances are often prohibitive.

Broadcast and broadband networks are complementary as the strengths of one correspond to the shortcomings of the other. They often seek to address the same audience hence it may be beneficial to use them in combination. However, there are significant obstacles that prevent their further integration and a better cooperation between the broadcast and the mobile industry would be necessary to overcome the current difficulties.

As both broadcast and broadband technologies continue to evolve, substantial work will be required to find effective and sustainable solutions for the scale distribution of audio-visual media services in the future.

The related EBU activities are carried out in the Strategic Programme on Future Distribution Strategies<sup>4</sup>.

<sup>1</sup> A detailed analysis of use cases and distribution options is provided in the EBU Report 026 <https://tech.ebu.ch/publications/tr026>.

<sup>2</sup> Free-to-air services can also be delivered via satellite. However, this is generally not the case as the signal is usually encrypted even if services are provided on a free-to-view basis. Notable exceptions include Germany and the UK where PSM content is delivered unencrypted via satellite.

<sup>3</sup> Linear services are also delivered via cable and IPTV but these platforms are not universally available. Live streaming still represents a very small part of the total linear viewing and listening.

<sup>4</sup> <https://tech.ebu.ch/groups/fds>



# Networked media and joint task force update

FÉLIX POULIN, EBU

When asked in a casual survey “Do you believe your broadcast studios will be IP within 5 years?” Most of the technical managers polled responded “Yes”. This strong majority indicates that the transition to IP for live production is being taken seriously by most of the broadcasters who believe they will have to start taking investment decisions very soon.

If the past was a guarantee of the future, we could predict the transition to the all-IP plant will span a period of time, starting with islands of proprietary solutions and evolving to a full deployment when the technology gets mature to enable interoperability. It would be no different than the analogue to digital, tape to file and SD to HD transitions.

But maybe one big difference from the previous transitions will be that this “digital shift” should bring an unprecedented level of flexibility that will pave the way for a continuum of changes in our media production plants. A mix of multiple formats with more distributed, collaborative and remote production workflows, new data-rich content offerings, on the fly repurposing of infrastructure resources, personalization of operating user interfaces, and more may make the current model feel like it was rigid and old fashioned!

## Technology

On the technical front, there is not much to invent. Plenty of technologies, protocols and standards are out there that can do the job. The issue is “How can I build a system which integrates components from different vendors, so that I can select the best of breed component for my needs, avoid vendor lock-in and future proof my investment?”

As this market emerges and while standardisation and harmonization is being worked out, we can see a two-step evolution.

### Step 1: Continuity of current workflows

This evolution has been happening for many months already. Most of the first propositions from the industry is built on transport of the current Serial Digital Interface payload over IP. SMPTE 2022-6, originally designed for long-haul contribution links, simply instruct how to packetize the pure SDI payload, including all the ancillary data space and therefore the embedded audio. This transport mechanism is usually offered in combination with the Precision Time Protocol (IEEE 1588v2) that is a way to distribute a common time reference over a network in order to synchronize the end-point devices or to time

stamp the packets at acquisition for proper alignment at presentation time. This approach avoids the need for a separate time reference cable. SMPTE has developed a set of media specific constraints to the widespread PTP in SMPTE 2059-1/2.

This direct adaptation of the current transport method to the new network infrastructure will likely reproduce current workflows with the aim to keep the same level of performance and reliability. It will ease building hybrid SDI/IP systems and therefore offers a straightforward migration path towards networked media with the positive consequence to make a broadcaster jump into a network infrastructure that can then be scaled up later.

However, the full potential of flexibility and new workflows will have to wait for the next evolution cycle.

### Step 2: Internet technology native

In order to get the flexibility and new business opportunities that are expected by the digital shift, live media production technology needs to be re-thought from the perspective of Internet Technology (IT) and data center infrastructure. This means using best practices from the IT world and reusing existing standards and protocols. This is the “Internet of Frames” as envisioned by one vendor a couple of years back. This is also the approach taken by the BBC R&D IP Studio project. Moreover, the Video Services Forum is developing a new flow-based transport of video that may become the post SDI over IP transport mechanism.

This IT-native approach will be formalized in the Networked Media Reference Architecture v1.0 of the EBU/SMPTE/VSF Joint Task Force on Networked Media that will be published by IBC 2015. The documents will offer a number of foundational models and frameworks to drive the industry towards interoperable, thus flexible systems integration.

In conclusion, the transformation to networked media will bring much more than just a technology transition. It will complete our “digital shift”, providing the media organization with additional capacity of adaptation to cope with our fast changing industry. As with previous transitions, this will take a few steps. And thanks to the effort deployed last month with the industry-wide Task Force JT-NM, we will get a clearer picture of the future networked production plant.

For more information, see: [tech.ebu.ch/jtnm](http://tech.ebu.ch/jtnm)

Example of a typical, real-world subtitling workflow represented with four nodes



# EBU-TT subtitling goes live

FRANS DE JONG, EBU

How do you carry live subtitles in a broadcast infrastructure from the authors to the subtitle encoder in a flexible, future-proof and standard way, compatible with EBU-TT? That in brief is what the new EBU-TT Live (Tech 3370) v0.8 publication defines. It is especially relevant in the light of the increased demand for improved quality, because the EBU-TT Live specification allows for automatic ‘improvers’ that can adapt live subtitles on the fly. Here is how it works.

## Connecting the nodes

The first thing EBU-TT Live provides is a system model; an architectural view of how the different processes in a subtitling workflow interact. This is represented as a collection of interconnected nodes (see image above).

Two subtitle authors are creating subtitles using their workstations, both of which are connected to the broadcaster’s play-out centre via a hand-over manager. The resulting subtitles are sent to an encoder. The subtitlers may be working from home or another remote facility. It does not matter for the system model, as long as they are connected. The hand-over manager makes sure the subtitlers can take over from each other seamlessly and that it is clear at any time who is in control.

## Sequences of small documents

The subtitles themselves are sent between the nodes as a sequence of documents. These documents can be sent as often as desired. For live subtitling typically many small documents will be sent, e.g. a new one every time a few words have been created by an author. An example of such a document is shown opposite.

The documents comply with the W3C TTML standard, but to keep things simple, not all TTML features are allowed. This is the second thing the EBU-TT Live specification provides: a document profile.

The document profile is based on EBU-TT Part 1, with some additional features related only to live contribution, and some constraints relaxed to take into account the complexity of creating live subtitles. This means it should be relatively simple to create Part 1 compliant archive versions of the live subtitles, and also that, for distribution, a similar approach can be used for creating EBU-TT-D from EBU-TT Part 3 as from EBU-TT Part 1 documents.

## Improver nodes

The third thing EBU-TT Live specifies is a way to improve the quality of subtitles. With (live) subtitling being increasingly available, attention is shifting from the quantity of the subtitles to their quality. Important

quality aspects include time alignment and the absence of errors in the text. Automatic spell-checkers can help catch typos, while delays can be used to improve the alignment of subtitles with the related audio and video. The extent to which this is possible varies between facilities (e.g. the available video encoder delay), but the EBU-TT Live specification explicitly supports such scenarios, amongst others by allowing detailed timing parameters to be retained from the authoring station.

## Mixed-mode operations

Of course EBU-TT Live can also handle non-live subtitles. The difference is merely a workflow question. You can imagine sending prepared subtitles out ‘as live’ using the same infrastructure as used for ‘live subtitling’. Mixed-mode operation (e.g. cueing prepared subtitles, complemented with partly live subtitled content) is a common use case for many broadcasters.

## Mapping to transport

The EBU-TT Live specification does not include an explicit mapping to lower-level transport protocols. However, experience from implementation tests using WebSocket are currently being gathered for the creation of such a mapping document. Mappings to other protocols may follow, depending on demand. The goal of the EBU group creating the EBU-TT specifications is to focus as much as possible on common needs. That was also a reason to publish EBU-TT Live as a v0.8 draft version, to allow implementers and users to provide feedback. The end goal is to allow media companies to handle live subtitle flows in a more flexible, future-proof and standard way than the current practice, which often is based on proprietary protocols or teletext data.

## EBU-TT presentations at IBC 2015

At IBC, Nigel Megitt (BBC), Pierre Lemieux and Andreas Tai (IRT) will be presenting different aspects of subtitling, including EBU-TT Live and the need for distribution profiles of TTML and how they can work together.

- Friday 11 September, 14:00 hrs – EBU-TT Live
  - Saturday 12 September, 14:00 hrs – EBU-TT-D, MPEG-DASH & HbbTV
  - Saturday 12 September, 16:30 hrs – Open Source Meet-up (incl. subtitling)
  - Sunday 13 September, 10:00 hrs – EBU-TT-D & IMSC
- All presentations will take place at the EBU stand (10.F20).

## Part of a family

EBU-TT Live is part of a wider family of EBU subtitle standards:

- EBU-TT Part 1 (Tech 3350) is the core specification for production, archiving and exchange;
- EBU-TT Part 2 (Tech 3360) gives guidance for converting STL into EBU-TT Part 1;
- EBU-TT Part 3 (Tech 3370) is the new Live specification for authoring and contribution;
- EBU-TT-D (Tech 3380) is the distribution version of EBU-TT, used for e.g. HbbTV, online players, etc.

## IBC 2015

More on EBU-TT subtitling will be presented at the EBU stand (10.F20) during IBC 2015. On Friday, Saturday and Sunday a different aspect of EBU-TT subtitles will be explained. For more details on EBU-TT, and to give feedback, see [tech.ebu.ch/ebu-tt](http://tech.ebu.ch/ebu-tt) or send an e-mail to: [subtitling@ebu.ch](mailto:subtitling@ebu.ch)

## Next steps for EBU-TT Live

The EBU will continue to gather feedback on Tech3370 v0.8 until September, while at the same time working on v0.9, which we intend to be 'feature complete' by the end of 2015. That means there is an opportunity to have your feedback incorporated, if you send it soon. Slated for v0.9 are topics including a more layered approach to handover, specifications for what 'carriage specifications' should consider, possibly more improvement techniques, and more worked use cases and examples.

## EBU Webinar

If you want to learn more about EBU-TT Live and the upcoming features, then you may want to join the

### EBU-TT Live Webinar on 05 October 2015, 16:30 CET.

The webinar will be presented by Nigel Megitt (BBC) and last ~30 minutes, after which there will be room for Q&A. Registration is open via: [tech.ebu.ch/ebu-tt](http://tech.ebu.ch/ebu-tt)

Example of a small document

```
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http://www.w3.org/ns/ttml#parameter" xmlns:ctm="http://www.w3.org/ns/ttml#metadata" xmlns:ebuttm=
"urn:ebu:tt:metadata" xmlns="http://www.w3.org/ns/ttml" xml:lang="en" ttp:cellResolution="40 24"
ttp:clockMode="local" ttp:timeBase="clock" ebuttm:sequenceIdentifier="testSequence_1431684628"
ebuttm:sequenceNumber="10738568">
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      <style xml:id="baseStyle" tts:backgroundColor="black" tts:color="white"/>
      <style xml:id="s1" tts:backgroundColor="black" tts:color="yellow"/>
    </styling>
    <layout>
      <region xml:id="r0" tts:extent="35c 2c" tts:origin="4c 16c"/>
      <region xml:id="r1" tts:extent="35c 2c" tts:origin="4c 18c"/>
    </layout>
  </head>
  <body begin="09:21:22.08">
    <div>
      <p region="r0">
        <span style="s1">position on this. What do you think</span>
      </p>
      <p region="r1">
        <span style="s1">of the result?</span>
      </p>
    </div>
  </body>
</tt>
```

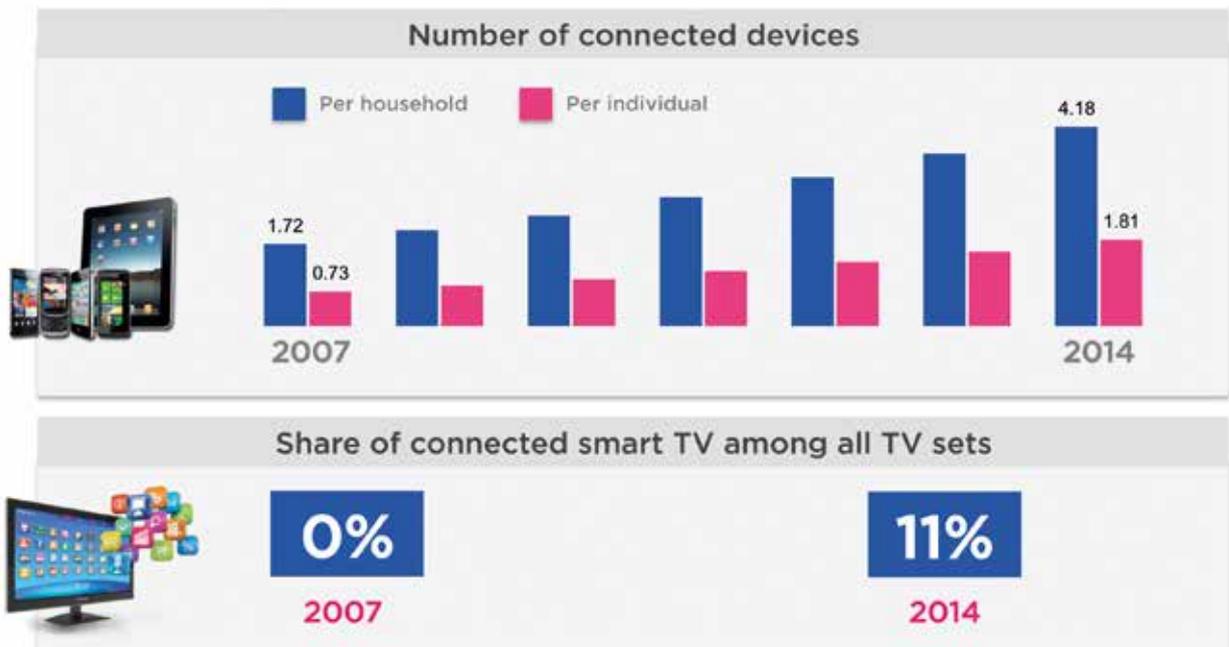
An example EBU-TT Live document created from a Teletext-based source

# Video on demand: myths and realities

VIDEO ON DEMAND IS ONE OF THE MOST POTENTIALLY DISRUPTIVE ELEMENTS OF THE TRADITIONAL TV ECOSYSTEM. IT IMPLIES CHANGES IN DISTRIBUTION BUT ALSO IN CONSUMPTION AND IN THE PLAYERS INVOLVED. THE MEDIA INTELLIGENCE SERVICE OF THE EBU IS ABOUT TO LAUNCH A NEW REPORT ABOUT THE DEVELOPMENT OF THE VIDEO ON DEMAND MARKET IN EUROPE. TAKE A SNEAK PREVIEW BELOW.

## ENHANCED CONSUMER EQUIPMENT

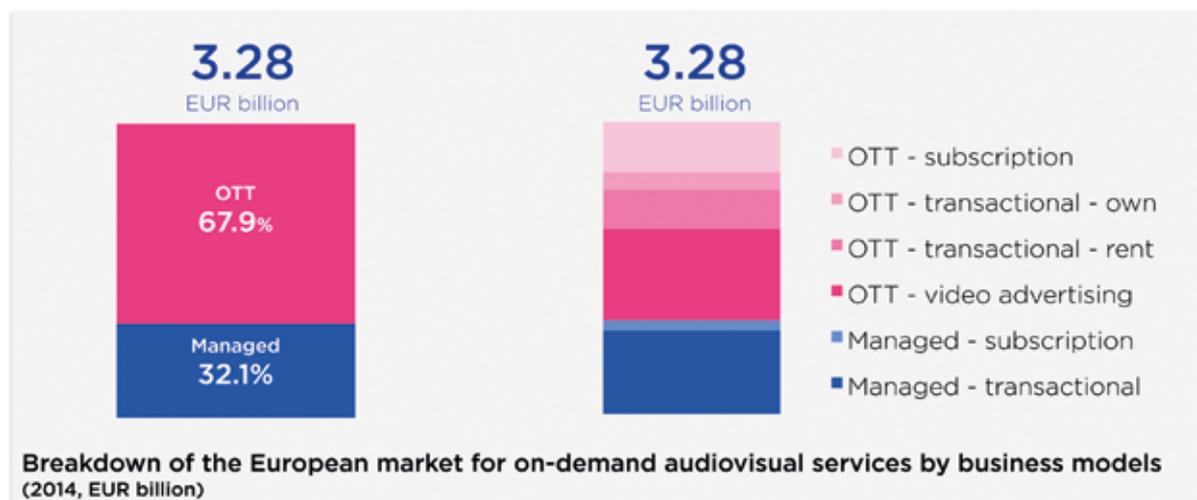
Consumption habits of audiovisual media services are mutating due to the growing basis of connected devices owned by European viewers.



## A MARKET DOMINATED BY OTT

OTT distributed services represent **two thirds** of total on-demand revenues in Europe.

On-demand via managed networks is **transaction-driven**, whereas OTT on-demand is more evenly split between **transaction- and subscription-driven**.





## In the spotlight Sébastien Noir

IN EACH ISSUE OF TECH-*i* WE ASK A MEMBER OF OUR TECH COMMUNITY TO STEP INTO THE SPOTLIGHT. SAY HELLO TO **SÉBASTIEN NOIR** (RTS).

### WHAT ARE YOUR CURRENT RESPONSIBILITIES AT RTS?

I am currently Head of Programme Data and Interactive Services/I am a product owner for sports: web and mobile applications.

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

I do not make achievements alone. I had the pleasure to participate in the maRTS Project, the community part of our website and I am now taking part in the EBU Cross-platform Authentication Project which is currently being adopted by several broadcasters. It allows us to build services tailored for the user, and offer a cross-platform, cross-device seamless experience. I value these achievements because they are the result of joint efforts, teamwork and collaboration. When such projects succeed, there is joy for all those who took part, not just the individual.

### WHAT ARE YOUR PREDICTIONS FOR BROADCASTING TECHNOLOGY IN THE FUTURE?

I tend to believe that things will radically change. We are currently making the transition from offering linear services on TV and radio to a broader offering on numerous devices. We will have to offer the right content, on all devices, everywhere. To do so, we need to better understand our public and deliver valuable content not just to the majority, but to every age group, culture, and social level of our audience. In the digital world, it's not only our current abilities, experience, broadcasts and offerings that matters, it's our capacity to change, evolve, innovate and be creative that will help us to face the challenges of the big internet players in the future.

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

The challenges are bigger, and for most of us, the resources are shrinking. We need to learn how to share our experience, ideas, tools, and code to be more efficient, and to provide our public with more value for less cost. We need to work with one another, not against each other or alone.

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

Time with my family is really important for me. I like photography and filming, from the ground, or in the sky with my new drone!

## Interested in advertising in our next issue?

Founded in 1950, the EBU (European Broadcasting Union) is the world's leading association of national broadcasters with 73 active members and 21 associate members from 56 countries in and around Europe. It promotes cooperation between broadcasters and facilitates the exchange of audiovisual content.

EBU Technology & Innovation helps to accelerate technology innovation, delivering superior expertise, quality and commitment to Members. We support Members in critical situations, deliver reliable and innovative services and stimulate the exchange of ideas and best practice. We also promote the core values of the organization and foster co-development and cooperation.

Our quarterly tech-*i* magazine aims to give Members and the wider media community a platform for sharing best practice and updates on the latest advancements in broadcast technologies. The magazine is published four times per year and distributed to an audience of more than 6000 interested broadcast professionals each issue.

Copies of tech-*i* magazine are also widely disseminated at internal seminars, conferences and events (on average 10 per year with 100+ participants) and externally at conferences such as IBC. The magazine (and all previous issues) is also publically available on our website at [tech.ebu.ch/tech-i](http://tech.ebu.ch/tech-i).

To place an order for advertising in the next tech-*i* magazine, please complete the Space Order Forum available online at: [tech.ebu.ch/tech-i](http://tech.ebu.ch/tech-i).

All advertising and editorial queries should be addressed to:

**Ms. Shannon Frame**

Technical Editions Manager

[frame@ebu.ch](mailto:frame@ebu.ch)





# DevCon 2015

06-07 October, EBU



# Forecast 2015

20-21 October, EBU