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INSIGHT FROM EBU TECHNICAL

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Radio on the Move

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LEADING THE WAY FOR 3D NEWS AND SPORTS DELIVERY

Ericsson's Voyager II

News and sports gathering is one of the most competitive areas in the broadcast market, demanding the delivery of high-quality video in the most cost efficient method available.

Sports events are increasingly being broadcast in a mixture of HD and 3D, and there is the prospect of 3D TV growing in the future and encompassing news. Operators have to be ready to deliver the next-generation television experience that consumers demand.

As a result, the design of newsgathering systems needs to be re-thought in a way that gives operators much more flexibility, both in terms of presentation and delivery, and at the same time take into account the all-important issue of operational costs.

Voyager II is Ericsson's fifth generation DSNG and is the result of 15 years experience delivering solutions in this most demanding of markets.

To enable operators to migrate from one compression technology to another, Voyager II supports all the major compression formats, MPEG-2 and MPEG-4 AVC, in both standard or high definition resolutions as either 4:2:0 8-bit or 4:2:2 10-bit and for improved video quality.

Ericsson has been active in the 3D TV arena for some time and last year provided ESPN, the industry's first 3D sports television network, with a complete standards based video solution featuring Encoders and Professional Receivers tuned for ESPN 3D broadcasts as well as for high quality HD.

Voyager II can support multi-channel operations at up to 10-bit and 1080p50/60 resolutions and just as importantly, as demand for 3D grows, Voyager II may be adapted to deliver a dual full-resolution feed for delivery over fiber or a pre-combined frame-compatible feed for services edited and formatted at the venue.

Built on a revolutionary modular chassis in a space saving 1RU form factor, Voyager II represents the most advanced DSNG on the market, providing a simple solution to equipment re-purposing whilst delivering the best return on investment to operators and service providers through the widest range of software upgrade paths and expansion options.

Ericsson Television Limited
Strategic Park, Comines Way
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The age of IP in production

The move to fully integrated IP IT based media production can only succeed with an in-depth understanding of the technology issues involved. Who can we turn to, to make this world a reality?

The art of good communication is to explain difficult things in simple and understandable terms. The art of good engineering is to build complex systems that work in such a way that operation becomes simple, reliable and intuitive. Both are the result of deep understanding.

In the history of broadcast production technology there are examples of engineering complexity being turned into great products. Connecting together individual analogue or the first digital systems was simple. It amounted to connecting the cables, or moving one video tape out of one machine and into another. Interoperability was limited to the interface points and the exchange via baseband interfaces (since the digital compression system was particular to the manufacturer, e.g., for digital video tape recorders). But, of course, behind this lay standardisation and testing to achieve interoperability of formats and the interfaces between systems.

In a second wave of digital technology, these digital production systems became more open (the compressed bit-streams were standardised digital streams, or standardised files), and they were internally built on more and more IT hardware and software components. Specific 'digital islands' of high performance equipment were assembled, fulfilling specific requirements in the production environment. The interconnection was still built on more or less the same old concepts, but with new formats, protocols and interfaces.

The current round of technical evolution will have a major impact on the business of broadcasting manufacturers. This third wave is based on three important drivers that are shaking up the media production industry. (1) The usage of the IP protocol, equipment and networks for transferring media data, metadata and signals; (2) The usage of standard IT equipment as underlying hardware for media infrastructures and (3) the usage of more software based services (fulfilling specific tasks, and being adaptable to new business demands) that communicate via their APIs (application programme interfaces).

This third wave will create the fully integrated IP and IT based software oriented production platforms. The media production environment could be as simple as installing applications on your smartphone. The result could be more cost efficient, scalable and flexible in services. Today these kinds of solutions and architectures are still complex and not yet fully reliable. They require scalable and high performance systems or architectures. After many years of trial and error, we see the first successful implementations by EBU Members. This has been the result of many years of work in the technologies to be applied by Members.

We might have expected that traditional IT companies would have helped us forward. Some have tried but few have succeeded so far. They lack an understanding of the media industry (as indeed the media industry does of the IT industry), and they try to avoid risks. Furthermore, the media business is perceived as a small market and not sufficiently large enough to warrant important investment in research, development and testing.

We might have expected that the traditional suppliers in the broadcasting industry would help us forward. But unfortunately it is not in their business interest that the current situation should change. Their prices are high, their systems unique, and freedom of choice is limited. Introducing, at the same time, even more demanding media formats like 3DTV or UHDTV (4K/8K) doesn't help to improve the situation. These continual changes demand new systems and higher performances, so that only island solutions can meet the (created) demand. And when the focus of manufacturers is distracted by new things, nobody is studying and working on basic technical complexities of integrated file based production platforms.

One of the main obstacles that we are confronted with is an understanding of the behaviour of IP in a media specific environment. We need architectural designs for a high performance media infrastructure based on standard IT hardware, and without the need for interfaces between components and systems at the service level. If we can get to solve these technology questions, we can build complex systems doing great work in such a way that it becomes simple, reliable and intuitive.

The EBU wants to focus on this with its Members via specific activities for the coming year. We will develop a Strategic Programme Group (SPG) around 'Media infrastructures' including local and distributed media storage technologies, an SPG around 'Media Information Management' including work on software oriented architectures (AMWA/FIMS activity), and an SPG on 'quality control in file based production environments'

On top of that, EBU will work on audio issues (lip-sync) and monitor further the developments and evolution of new and immersive TV formats. These may include 3DTV, UHDTV, with extended colour range, higher bit-depth, and higher frame rates. Which one of these will provide more immersive experiences to the consumer remains to be seen. Overall we should not forget that even the best technological systems need to be judged against the business factors and opportunities they offer.

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Editor-in-Chief: Lieven Vermaele
E-mail: tech@ebu.ch
Tel: +41 22 717 2111

Editors: William Daly, Harold Bergin
Production: WHD PR
For editorial & advertising enquiries contact:
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E-mail: news@whdpr.com
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Internet Radio vs

Can Internet Radio replace Broadcast Radio? This was the question posed by EBU Technical to two leading executives whose decisions are vital to the future of radio reception for millions of listeners.

NEW times

In the argument for new technologies over old, Béatrice Merlach, CEO of MCDT (Marketing and Consulting for Digital Broadcasting Technologies), Switzerland, argues that both traditional and internet-based radio mediums will have their place in the future.

Digital radio broadcasting is mobile, easy to use, free-to-air for the consumer, and offers high sound quality, claims Merlach. She says it allows for additional services such as sending slides, text and videos, and offers secure, reliable broadcasting. "Last but not least, it is cheaper than FM for the broadcaster and it is green, since it combines several programmes on one transmitter," she adds.

On internet radio, Merlach notes it is an interactive medium, which allows personalisation and is therefore ideal for special programmes with a rather small audience appreciative of longtail content. "It combines live and on-demand listening, and offers access to radio stations worldwide for a really big choice for listeners".

Congestion danger

However, on congestion, Merlach says while digital radio is ideal for mass market communication, with internet radio there is, especially in mobile use, the danger of congestion. "With broadcast radio, quality as well as coverage is controllable and well defined. With internet radio, especially in mobile use, the quality of service is not easily guaranteed and not in the control of the broadcaster," adds Merlach.

"Broadcast radio works with well defined standards and foreseeable receiver behaviour. With internet radio, a multitude of not only open standards, but also proprietary standards, must be supported. Multiple coding of the signal is therefore mandatory to reach a device. A problem with internet radio can also be that in a working environment, listening on the computer or LAN, reception can be blocked by firewalls," she continues.

Additionally, societal issues with internet radio, such as the fact not everyone understands or has access to the web, can be a problem for this technology's uptake mainly in more rural areas, says Merlach.

She explains: "In Switzerland as well as major European countries, a majority of the households have access to the web. Enough bandwidth to allow easy internet radio listening to a mass market is mainly available in big cities, aiming at stationary use. Access to the internet can be a problem in rural or less accessible areas and for mobile use. In these cases, broadcast is the way to go.

"Even though the internet is becoming more familiar to people over 65, that age bracket uses the internet much less than younger people, so broadcast is an easier and much more familiar way for them to listen to the radio," remarks Merlach. She says in this context it is important to remember that radio is, and will remain to be, an "accompanying medium".

Internet listening is therefore a good option if the user is working on a computer and wants to listen to the radio at home or in the office, says Merlach. If the user is on the move, she advocates broadcast radio as a much better alternative, especially as it incurs no costs for the customer.

Global access

Yet a big advantage of internet radio is the access it provides to worldwide radio stations, notes Merlach. She says however, many of these internet-only radio stations are niche, music-only programmes not focusing on high quality content.

"From the broad variety of internet radio stations, the majority are computer-generated playlists. 'Real' radio stations, that have the funds and resources to deliver high quality content, are on the internet as well as via broadcast," she observes. "Of course it is possible to distribute internet radio with a very high audio quality. If these programmes are well listened to, this can lead to very high streaming costs for the broadcaster. On the receiving side, these programmes are in danger to be hit much more by congestion than low quality programmes".

Merlach says that traditional broadcast radio is able to stand up to internet radio due to the latter's inherent weaknesses. "Traditional on-air radio has many strengths and is still a vibrant medium. It is likely that it will remain an important delivery mechanism of radio content for a quite long time".

"It is not a question of internet radio replacing broadcast radio, but of combining the two technologies. Broadcasting has major strengths, as has internet radio. To combine the two technologies, with internet mainly for stationary use, and specialised, personalised needs, and with broadcast for mobile use and serving the mass market, we have two strong technologies that can give the best benefits to the user," concludes Merlach.

Béatrice Merlach

Béatrice Merlach is the CEO of MCDT. in Switzerland. In her former role as marketing and communications director at Schweizer Radio DRS (SRG SSR), where she was a member of the executive board, she has been responsible for the introduction of DAB / DAB+ in Switzerland. Within four years she managed to increase the number of DAB / DAB+ receivers in Switzerland from 15,000 in 2006 to 700,000 in spring 2011. Her responsibilities included the successful marketing activities preparing for the switch-off of the AM transmitter Beromünster and the switchover of the popular programme DRS Musikwelle with over 300,000 listeners from AM to DAB / DAB+. Merlach holds a Master of Arts in Business Administration and worked for companies like Swissair, Balair and Zurich Financial Services, always as director of marketing, communication and sales.

MCDT
Marketing and Consulting for Digital Broadcasting Technologies

Broadcast Radio?

OLD friends

The internet will not kill the radio star, says Joan Warner, CEO of Commercial Radio Australia. Warner comes down heavily on the side of traditional broadcast radio. She states: "The commercial radio industry acknowledges that radio and the internet are both instant, conversational media, but disagrees that the internet is a competitor".

Australian radio stations have long made use of the internet to engage and interact with their listeners and to offer additional information and interactivity, Warner remarks. The majority of Australian radio stations stream their free-to-air broadcast stations on the internet as it presents another way of connecting with listeners.

Strong advocates

"Australian commercial radio broadcasters have always been strong advocates and practitioners of integration, and connection with listeners, across multiple platforms. It started with use of telephones to encourage listener involvement, and evolved as technology evolved to station websites, enabling listeners to interact online, then expanded further to podcasting and broadcasting via mobile phones," says Warner.

Yet she continues to note that while there are clear benefits in using radio and internet broadcasting together, as a promotional and advertising combination, bandwidth issues mean the internet has its flaws.

Warner explains: "In spite of the vociferous support from some quarters for internet radio as a replacement for broadcast radio, it is a fact that the internet, as a one-to-millions radio broadcast medium, requires far too much bandwidth. The main issue is the bandwidth requirements for internet radio, which increases as the number of listeners increase, making it very spectrum inefficient".

Also internet radio infrastructure is built on a per listener basis, so the more listeners a radio station acquires, the more servers it requires, and therefore it incurs higher costs. For example, says Warner, 100,000 listeners listening at 48 kilobits per second (kbps) require 4.8 GB per second (Gbps) bandwidth to actually make the transmission smooth. Again, 100,000 listeners using 128kbps downstream on RealPlayer and other streaming audio players, require 12.8Gbps.

Warner notes that one server can support around 1,000 listeners, so a typical per hour metropolitan breakfast radio audience in Sydney of around 300,000 listeners would require 300 servers and a huge amount of spectrum. To serve the equivalent digital radio broadcast to a city such as Sydney would require only 48kbps audio or 64kbps for audio plus multimedia programme-associated data, she adds.

"For those reasons, as well as convenience, no cost and localism, we are yet to be convinced that internet radio is a threat, but rather it is supplementary to free-to-air broadcasts," says Warner.

"The success of radio has been built on its mobility and accessibility," continues Warner. "Broadcast radio is local and keeps the audience in touch with what's happening in the community. Broadcast radio is free. People don't want to pay an internet provider fees to listen to radio. In the spate of recent natural disasters in Australia, some of the only communication remaining in some areas was the local radio station providing emergency service information and news updates".

Loyal audience

Warner adds that digital radio provides an opportunity to distribute more and different content, and to keep the already massive and loyal audience listening for longer. Digital radio provides a unique opportunity to get even closer to our audiences and even more responsive to their needs, she says.

"DAB+ is the platform of listening of the future, and digital-only content creation in Australia is stimulating new partnership advertising opportunities. The radio industry launched digital radio with multichannelling and new digital only content from the start. Now there are up to 20 new digital-only stations in each market providing comedy, country, dance, chillout, jazz, pop, sport and more".

After just 18 months on-air in Australia, there are around 700,000 people listening to DAB+ digital radio and more than 406,000 radios have been sold. Time spent listening to radio via a DAB+ digital device is 11 hours and 11 minutes, up by nearly three hours from the same time last year. Most interesting, comments Warner, is the time spent listening to radio via a DAB+ digital device has already overtaken listening to radio on the internet by two to one.

She summarises: "There are always doomsayers as you enter an exciting new era. They used to say TV would kill radio, and then it was the iPod and the internet, and more recently podcasts. Radio has defied generations of critics. It's a fluid, free-to-air medium that often ends up complementing the technology that is supposed to kill it off, such as iPods, mobile phones and the internet. So no, I do not think internet radio can replace broadcast radio".

Joan Warner

Joan Warner is CEO of Commercial Radio Australia, which represents 99% of all commercial radio broadcasters. Warner was responsible for the planning, rollout and implementation of digital radio for commercial radio broadcasters across Australia. In her role as CEO she also oversees the whole of the industry marketing campaign, Radio Codes of Practice, audience survey contracts and industry copyright agreements. Warner is responsible for the annual National Commercial Radio Conference, Siren Creative Awards, and Australian Commercial Radio Awards. She has worked at senior executive levels in the private and government sectors and holds four degrees including a Master of Business Administration and a Master of Education.

commercial radio australia

The survival of terrestrial broadcasting

Darko Ratkaj tell us that the terrestrial broadcasting platform is under pressure, and asks will it survive, and if so what role can it play in the future.

Is there anybody who does not listen to radio in the car or in the kitchen? Or who is not familiar with roof aerials and rabbit ear TV antennas? We are all used to receiving radio and TV services over the air, wherever we are, whenever we want, for free. This is possible thanks to the terrestrial broadcasting networks.

The terrestrial broadcasting platform (as it is nowadays commonly called) is for many people the primary means of receiving broadcasting services. Even in those countries where cable, satellite or broadband hold significant market shares, terrestrial broadcasting is regarded as essential.

The terrestrial platform brings about a number of social and economic benefits[1]. Broadcasters use it because it is widely available, flexible, reliable and cost efficient. The viewers and listeners enjoy the free-to-air services with high quality and very wide reach. In most European countries terrestrial reception is available to almost the entire population, which is particularly important for the EBU Members who are required to provide their services to everyone. This is also a reason why terrestrial broadcasting plays an important role in emergency situations.

The first radio and TV programmes were transmitted terrestrially and ever since the terrestrial networks continue to develop. After a long and glorious analogue era, terrestrial networks are now turning digital. Apart from the improved technical quality the key for success is the service offering. The launch of digital terrestrial television (DTT) has provided greater variety and choice of programmes than ever before. In some countries more than 50 programmes are already available on DTT, some of them in HD quality. DTT enables portable and mobile reception and in the future we could also expect 3DTV services.

Terrestrial distribution will most certainly remain very important in the years to come. The future will undoubtedly be digital but the future networks will need to fit in a different world than the one we know today. A number of forces external to broadcasting are changing the rules and potentially working against terrestrial broadcasting.

Perhaps the most disruptive one is the internet as it enables new types of media services, innovative business models (e.g., over-the-top), nontraditional market players and virtually unlimited choice. The most important for broadcasters are time-shifted, on-demand, personalised and interactive services, commonly known as nonlinear media services. Furthermore, the internet is increasingly capable of supporting the delivery of traditional, linear broadcasting radio and TV services.

Other broadcasting platforms are gaining ground, in particular in those countries where digital switchover on the terrestrial platform is delayed.

There are signs that consumer habits are changing. With the advent of mobile access to the internet, services are accessible anytime and anywhere. Mobile internet is very popular and the growing traffic strains the networks. This forces mobile operators to extend capacity of their networks which could be done by using additional radio spectrum. The broadcasting bands, essential for terrestrial transmissions, are the first to be released.

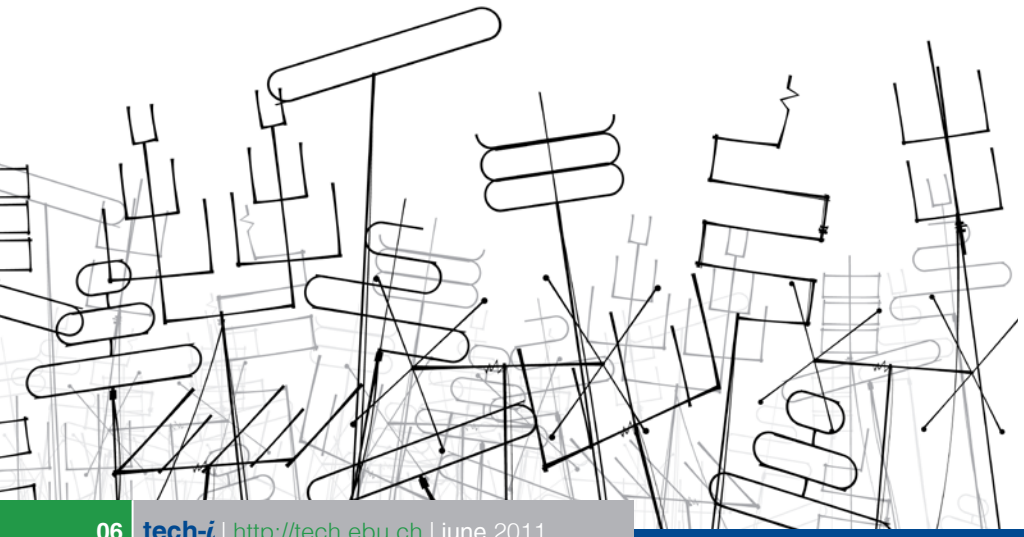
So, the terrestrial broadcasting platform is under pressure. Will it survive? The question is also which role can the terrestrial platform play in the future?

The EBU has recently set up a Strategic Programme Group to outline possible evolution trajectories for terrestrial broadcasting. Preliminary conclusions are clear: the terrestrial networks must continue to innovate to remain viable. They must enrich the content offering and increase technical quality, flexibility, and spectrum and cost efficiency.

Moreover, terrestrial broadcasting networks are well placed to complement broadband networks in a hybrid delivery environment. This would widen their already important role and safeguard their future. However, a lot of work is required to make a hybrid delivery seamless and efficient.

There is probably no single path that all broadcasters can follow but they have a lot in common. They will need to offer a full range of services, both linear and nonlinear. In order to reach their audiences they will need to respect the technology choice of their viewers and listeners. This will most certainly include broadband as well as broadcasting.

[1] Importance of the terrestrial broadcasting platform and its unique features outlined in the EBU Recommendation R 131, June 2010.



> “terrestrial broadcasting networks are well placed to complement broadband networks in a hybrid delivery environment”

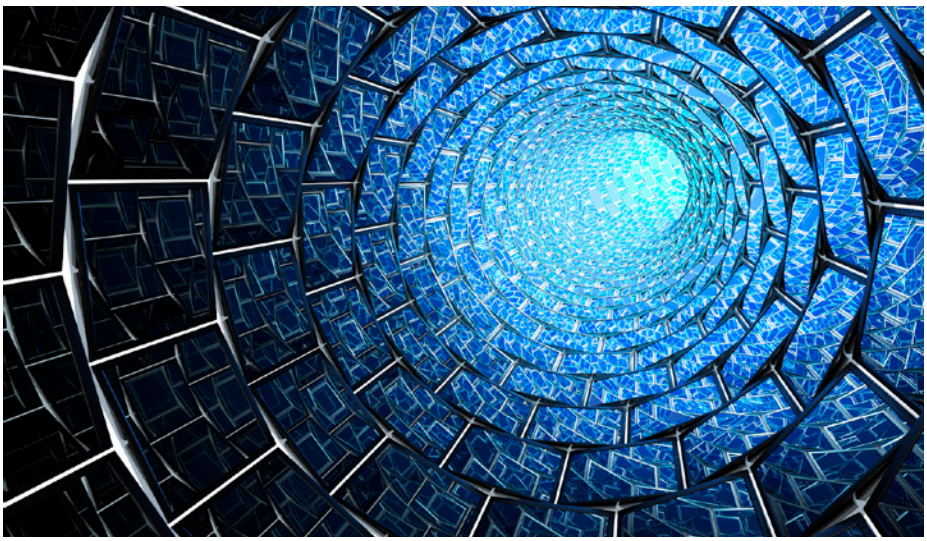
Dynamic Broadcasting – the future of broadcast?

Technische Universität Braunschweig's Ulrich Reimers gives us his own view of the future for terrestrial broadcasting.

Traditionally, terrestrial broadcast networks were planned just once, put into operation and hardly ever modified – broadcast networks used to be "static". But this tradition belongs to a time in which broadcast receivers were neither connected to broadband networks nor were they capable of storing large amounts of content. Today´s most modern receivers have broadcast front-ends in addition to built-in Ethernet and USB interfaces and/or WiFi modems. In addition, they may be able to store up to, say, 1 Terabyte of data – either internally or via an external hard disc. Hybrid broadband broadcast TV is only made possible by the coexistence of broadcast and broadband interfaces. Usually, HBB is understood as a way of providing an enhanced viewer experience such as access to iPlayers and Mediatheks, or display of in-depth information available on the broadcaster´s website. But does anybody believe that the combination of broadcast/broadband/hard disc in the TV receiver will leave the traditional broadcast paradigm unaffected? For example, what if viewers no longer use the broadcast network for watching their preferred programme, but move to broadband? Haven't you heard about NetFlix?

In addition, the pressure on broadcast spectrum is growing in many parts of the world. In Europe, many countries have recently allocated 72 MHz of broadcast spectrum to mobile network operators ("digital dividend") and more "dividends" are being discussed already.

Although broadcasters may be reluctant to accept it – the world of (terrestrial) broadcasting is changing and will continue to change. The approach of my research team at Technische Universität Braunschweig to opening new horizons for (terrestrial) broadcasting in this changing environment is to make broadcast a "dynamic" system. In Dynamic Broadcasting, terrestrial transmission is only used for live programmes and for pre-produced programme content that has not been broadcast recently and is known to be or expected to be viewed by a large number of viewers. In order to be able to do this, without jeopardising the traditional broadcast quality-of-experience (QoE), we make use of the broadband connection to



identify the media consumption patterns of the viewers and for the real-time and non-real-time delivery of certain kinds of programme content. We store a variety of content in the receiver. This content may have been delivered in non-real-time. We transmit dynamic service guides in order for the receiver to be able to identify which content is delivered via which network, or whether it is available on the hard disc already. We dynamically modify multiplex configurations, transmission parameters, etc.

But what is in this concept for the broadcasters, the consumers, the regulators or even the operators of cellular networks (Mobile Network Operators - MNOs)? For broadcasters, Dynamic Broadcasting promises either a reduction of the transmission cost, since the broadcast network does not have to be operated all the time, or it offers income from secondary spectrum users (see below). Alternatively, Dynamic Broadcasting can allow broadcasters to create additional (virtual) TV channels. Here, instead of dynamically changing the terrestrial broadcast, the available surplus capacity in the terrestrial network is allocated to deliver additional pieces of programme material, which the receiver then compiles as a new TV channel.

Ideally, Dynamic Broadcasting has no negative effect on the consumer since the broadcast QoE is maintained. Maybe he or she will enjoy a new virtual TV channel. Maybe they will be delighted to enjoy higher data rates or a wider coverage area of their WiFi-like wireless data network, which was made possible because of the dynamic release of broadcast spectrum.

The regulators in many countries look forward to creating the next "digital dividend". Rumor has it that the UHF frequencies above 650 MHz may eventually be allocated to wireless data networks. But this will not happen without serious conflict between the regulators and many other stakeholders. Dynamic Broadcasting is capable of providing a kind of soft digital dividend by freeing broadcast spectrum in a fashion that is controlled by the primary spectrum user – the broadcaster.

And what is in the concept for MNOs and other operators of wireless data networks? Instead of having to rely on the use of "White Spaces" in finding frequencies which they can use locally without the support of the primary user they can now expect to receive from the operator of a Dynamic Broadcasting network information about where and when spectrum will be made available – for which they may possibly have to pay a usage fee to the primary spectrum user.

In Braunschweig, we can demonstrate how it works – don´t say we´re dreaming.

MPEG-7 Profile for Automatic Metadata Extraction in Media Production[1]

Werner Bailer of Joanneum Research and Masanori Sano of NHK take a look at the next phase in the automation of audiovisual media production.

After building a more efficient IT-based production infrastructure, the next logical step in the automation of audiovisual media production is the widespread adoption of automatic metadata extraction tools, such as temporal content segmentation (e.g., shots, scenes, news stories), automatic speech recognition, named entity detection, copy and near duplicate detection or content summarisation. The study and evaluation of content analysis-based automatic information extraction tools is the task of the EBU ECM/SCAIE[2] group , established in 2007. A key issue hindering the exploitation of the full potential of these tools is the lack of an interoperable representation of their results, and hence, the difficulty of integrating them in production infrastructures and of automatically evaluating the performance of different tools. Thus the group addressed this issue by defining a common interchange metadata profile based on the MPEG-7 standard[3].

MPEG-7 is an excellent choice for describing audiovisual content, mainly because of its comprehensiveness and flexibility, providing a number of description tools, from low-level visual and audio descriptors to semantics. The standard has been designed for a broad range of applications and thus employs very general and widely applicable concepts. However, two main problems arise from the generic and flexible tools in the practical use of MPEG-7: complexity and interoperability issues, resulting in hesitance in adopting the standard and a lack of interoperable tools. Full interoperability is only possible with knowledge about how the standard has been used. This means that an additional layer of definitions is necessary to enable full interoperability on a semantic level.

Like in other MPEG standards, profiles covering specific applications have been introduced in MPEG-7[4]. Profiles can support interoperability by selecting tools and defining additional constraints. Interoperability can be considered in profile design by avoiding ambiguities and enforcing a single way to model semantically identical descriptions. The three existing profiles do not resolve the interoperability issues as they restrict the set of description tools included in the profile, but define only few constraints on their semantics. In addition, they exclude powerful low-level audio and video descriptors.

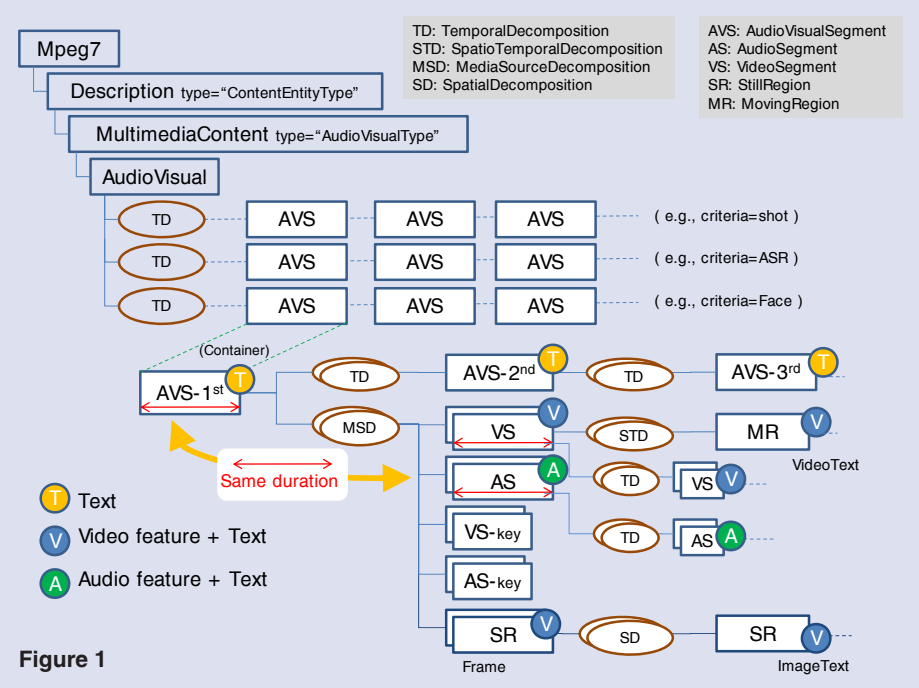


Figure 1

The profile developed by ECM/SCAIE, named Audiovisual Description Profile (AVDP), addresses these issues. It harmonises profiles developed in some of the organisations contributing to the group, and further simplifies the use of MPEG-7. An AVDP document contains descriptions of one or more audiovisual contents and/or the description of a summary of a single or a set of contents. The profile supports the description of audio, video or audiovisual content, ensuring a compatible document structure for all types. A key feature of AVDP is the modularity in the descriptions (e.g., separating metadata originating from different modalities or produced by different tools). Figure 1 visualises the structure of an AVDP document: the top level contains the temporal/editorial structure, the second level the different modalities or more detailed temporal/editorial structure, and the third the (spatio) temporal structure within modalities (if applicable).

AVDP, which is the first profile based on version 2 of MPEG-7, has been proposed as amendment to part 9 of MPEG-7 and is expected to become an ISO/IEC standard by summer 2011. A web-based service for the automatic syntactic and semantic validation of AVDP documents has been implemented[5].

ECM/SCAIE has started to collect a data set for the evaluation of content analysis tools[6], consisting of real-world content from media production and including ground truth annotations. The group is currently collecting a list of available automatic analysis tools for audiovisual content, with the aim of evaluating these tools on the data set. Both the ground truth annotations and the results obtained from the analysis tools will be represented using AVDP. For tools that are adopted in production processes, AVDP can serve as an interoperable format for representing their output.

[1] The research leading to these results has received funding from the European Union's Seventh Framework Programme under grant agreements no. FP7-231161, "PrestoPRIME" (http://www.prestoprime.eu), and FP7-215475, "2020 3D Media" (http://www.20203dmedia.eu).

[2] http://tech.ebu.ch/groups/pscaie

[3] Information technology – Multimedia content description interface. ISO/IEC 15938:2004.

[4] Information technology – Multimedia content description interface – Profiles and levels. ~ISO/IEC 15938-9:2005.

[5] http://vamp.joanneum.at

[6] The data set is hosted by the Mammie system at http://media.ibbt.be/mammie

The File Based Production Environment

NRK's Per Bohler shares his experience of IT based programme production & distribution.

Storage grid of the production server at NRK

Introduction

When NRK's IT based production infrastructure, "The Programme Bank" (PB), was launched in 2007, it was only able to handle the 576i SD picture format using the IMX codec (50Mbps MPEG-2@422; I-frame only). At the time, when the major system decisions were made, HD was not yet on the NRK roadmap. This soon changed and to make the system HD capable at a marginal extra cost, the XDCAM HD 422 (50Mbps MPEG-2, Long GoP) was temporarily chosen as the production/archiving codec/format. The wrapping for both HD and SD is MXF, Op1a.

The workflow

In today's practical file based production environment the chance of being able to use the same codec from acquisition to playout is slim. For this reason many available nonlinear editing systems (NLE) can accept a multitude of different codecs and frame rates on the timeline. This means that, at least during the finalising stage, the content from all the various formats used will be transcoded (decoded and re-encoded) to the output codec. This process is software based and is an inherent part of your system. Following this process, the resulting picture quality can be "interesting" and may vary depending on what codec, bit rate and sampling raster (e.g., 4:2:2, 4:2:0, 4:1:1, etc.) was used for acquisition. Similarly, the output codec will influence the result based on the same parameters. To make the picture even more interesting (literally), your NLE also gives you a plethora of choices (applications) for manipulating your video/audio content during editing. It may come as a surprise to some that the choices you make will influence the quality of your picture. Depending on what manipulations you perform, they leave their footprints which can be (but not limited to), loss of resolution and surface texture, increased noise and aliasing.

During the autumn and winter of 2010 NRK tested a multitude of practical workflows and their impact on picture quality. The test material used was mainly from sequences used in the EBU D/HDC project a few years ago, and was transcoded from 10 bit uncompressed to XDCAM HD422 using a Sony PDW-HD1500. For the sake of simplicity we've chosen to discuss the simplest but still realistic workflow in this article - raw footage originating on XDCAM HD422 only. Editing was on NRK's standard NLE and then exported to colour correction (CC), (which required a full decode to baseband and changing the colourspace from YUV to RGB) and exported back to the NLE. At this stage a different codec from the XDCAM HD422 was used due to lack of support for this codec in the CC software. Finally, the programme was exported from the NLE to the PB, it was played out and encoded for transmission. The reason we chose to focus on a relatively simple workflow is that the unwanted impacts on picture quality became clearly visible even here. More complex workflows would have had an even greater impact on the resulting image after transmission.

Conclusions

Our findings were both surprising and somewhat shocking - codecs that were originally tested to be quasi transparent (after up to four generations with pixel shift) did clearly exhibit visible artifacts after three generations. We believe some of this is due to the cascading of different codecs (Long GoP and I-frame only) and hence completely losing the GOP structure in the Long GOP format, which makes GOP synchronisation in subsequent encodings impossible. It is also important to remember that different NLEs will utilise different software versions of what is originally a hardware based codec and that these codecs may differ from the original. The picture quality in the masterfile for playout clearly shows that all quality headroom is lost. This has severe consequences for the subsequent TX encoding. For all but the most easy test sequences the aim of a picture quality > Grade 3.5 on the ITU-R 5 grade scale cannot be met at the end of the chain. Finally, it must be remembered that the final outcome very much depends on the available bit rate for transmission. But in our case, with transmitting three HD channels in one DTT mux (DVB-T with H.264) the bit rate budget is very much under pressure.

NRK's test facilities

Radio Activity

EBU Technical's Mathias Coinchon reports on The Digital Radio Week hosted earlier this year at the EBU.

The EBU Digital Radio Week 2011 took place from February 14th to February 17th. It was the second event in a week's gathering and meetings of radio organisations working on the standardisation and promotion of Digital Radio in the wider sense. Taking part were: Digital Radio Mondiale, IMDA, RadioDNS and WorldDMB. These four organisations are grouped in the European Digital Radio Forum (EDRF), a platform created last year by the EBU to enable discussion, exchange and possible common actions.

Workshops

This year there was also two 'hands on' technical workshops aimed at engineers and developers. The first was the Open Software Defined Radio Workshop with the Communication Research Center Canada (CRC) where participants were able to learn how to set up their own DAB/DAB+ transmission using free, open tools developed by CRC.

The second workshop was on RadioDNS to help participants learn how to use free openly available RadioDNS tools to produce basic hybrid radio applications. Using the EBU Technical RadioDNS/RadioVIS server, three EBU Member broadcasters were able to create a basic visualisation service for their stations. This experimental service created by the EBU Technical lab is intended to offer a boot solution for broadcasters and to break the chicken-and-egg situation between receiver manufacturers and broadcasters by having more broadcasters ready with the system.

Organisations' Meetings

Apart from the two workshops, meetings took place involving the following organisations: the DRM Technical Committee, where the group worked on the new DRM+ standard; RadioDNS 2nd General Assembly (RadioDNS is just one year old) where the new Steering Board was elected; The WorldDMB Technical Committee where members decided, among other things, to create a new task force to produce best practices for digital radio services. These were followed by IMDA Technical Committee, task forces and Steering Board meetings.

European Digital Radio Forum meeting

EDRF: European Digital Radio Forum

The presidents and other representatives from the four organisations of the EDRF met to discuss further actions. In particular, it was decided to soft lobby at the European level to promote radio's future, and to ensure that radio as a media is considered in the agenda of administrations. In this regard, the first meeting with Philippe Lefebvre from the European Commission took place.

The Radio Summit

In the middle of the week, the Radio Summit was open to all with presentations[1] being made on digital radio business cases, technical developments and updates as well as news on the deployment status of the different digital radio systems.

Conclusion

In 2011, one cannot say anymore that the future of radio is with one particular system, neither broadcast only or broadband only. The future is hybrid/multiplatform and we must seek convergence. Each platform has its own strengths depending on the context and it is the task of each organisation to promote their systems and make them happen in the market. However, each can act in a coordinated way to secure a future for radio beyond analogue by creating new experiences, exchanging practices, developing tools, products, doing promotion and putting it in the agenda of each country's administration. The Radio Week is an event made to help us reach these objectives and promote exchanges. Make it happen and see you next year.

Participants from Teleko (Czech Republic) producing an L band DAB transmission using CRC mmbTools on their laptop and a Universal Software Radio Peripheral (USRP black box at the front).

FM+RadioVIS service running on the Nokia N900 mobile phone with RSR Couleur3 programme.

Digital Radio Summit 2011

[1]All presentations and recordings can be found on: http://tech.ebu.ch/events/digitalradio11

Ambisonics for Broadcast

Anthony Churnside brings us up to date on the challenges facing the use of ambisonics for broadcast audio.

Video is going through an HD revolution. Some would argue it's about to have a 3D revolution. But what about sound? Sound is always the poor relation to the picture. But until silent movies start making a comeback, audio shouldn't be ignored.

The current 'state of the art' in broadcast sound is 5.1 surround. Much of the audio on the BBC HD Channel, for example, is broadcast in surround so audience members with the correct equipment can experience 5.1 surround. BBC HD programmes are often actually a mixture of 5.1 and stereo up-mixed to 5.1. Up-mixing from stereo to surround is sometimes required because a lot of the original material will only be in stereo or mono (archive footage or background music for instance).

Not all the developments in sound have been about multichannel audio. Rupert Brun, Head of Technology for Audio and Music, one of my colleagues, recently helped launch BBC Radio's 'HD Sound'. 'HD Sound' is basically a jump in bit rate. Most audio for the BBC's national radio stations is distributed around the BBC at 128kb/s using a system called Coyopa. Radio 3 has the slightly higher rate of 192kb/s. HD Sound brought Radio 3 up to 320kb/s and allowed that bit rate to be streamed over the internet.

There have been other developments in surround sound on the radio. DAB can use MPEG surround to carry backwards compatible 5.1, so audiences can listen in mono, stereo or 5.1 surround.

All of the discreet channel audio systems mentioned above define the listener's loudspeaker setup and the content distribution and creation works back from that definition. Ambisonics is an alternative format that tries to get away from defining loudspeaker positions by attempting to capture the whole sound field at a point in space. First order (or B format) ambisonics is a 4 channel signal, where the first channel represents an omnidirectional signal and the remaining three channels are difference signals in three dimensions (front-back, left-right and up-down).

Sounds can either be recorded with a microphone designed to output B format audio, or mono sources can be mathematically 'panned' to a particular position in space. I've been involved in making two productions that used ambisonics; 'The Last Night of the Proms' (a large classical music performance) and 'The Wonderful Wizard of Oz' (a smaller scale radio drama). While the producers were excited by the creative opportunities working in 3D provided, the biggest challenge for each of these productions was the lack of tools available for working with ambisonics.

Photo: Stephen Jolly, BBC

A big research question with ambisonics is how it could be distributed. Tests comparing 5.1 with B format have shown audience preference to vary with the material. Moving to a higher order would improve the spatial quality but this would have the undesirable effect of increasing the number of channels making distribution more of a challenge.

As described above, one of the big advantages of ambisonics is it doesn't depend on loudspeaker position. However, in order to decode the ambisonic signal the decoder must know how many loudspeakers there are and where they are positioned. This would require some kind of setup or calibration in the home, which is a potential drawback.

There are alternatives to ambisonics. A fairly obvious one is to use a higher number of discreet channels (7.1, 10.2, 22.2, etc.). However, the optimum number of channels is not known and we come back to the issue of having a defined, inflexible listening setup. Some research is being done into Wave Field Synthesis (WFS). WFS attempts to create a true sound field over a large area, reconstructing the exact sound waves that would occur in reality. WFS requires a very large number of loudspeakers each with its own signal source and amplifier making it a complex and expensive area of research.

The European Broadcasting Union has a group looking at a broadcast wave format that is capable of carrying speaker agnostic signals, such as ambisonics. This means that you may well be hearing voices from above sooner than you think.

Anthony Churnside is a Research Engineer at BBC R&D who specialises in audio and acoustics. He is a member of a number of EBU groups and is an active contributor to the BBC blog. Anthony was awarded Young Technologist 2010 by The Royal Television Society in the UK for his work in ambisonics and periphony. Anthony is currently involved in defining BBC R&D's long term audio research strategy. In his free time Anthony plays guitar in a band, and has directed and produced music videos which have featured in a number of international film and photographic festivals.

A clip about ambisonics is available here: http://tech.ebu.ch/events/production11/cache/off?id=14667

Digital Radio on the move at the Geneva Motor Show

For digital radio to succeed in Europe, car makers must be convinced to fit digital radios as standard in new cars. This has been recognised for many years. There are signs of increasing interest by European carmakers in including DAB+ receivers in future models. To encourage this, EBU Technical worked with other Swiss organisations to broadcast a DAB+ special digital radio services to those in the exhibition hall during the Geneva Motor Show, the place where the world comes to see the cutting edge of the auto universe. This event takes place in March every year in Geneva, and is the largest of its kind in the world. The approach was to go beyond simple digital radio, and to provide a service of illustrated radio.

Working with a Swiss radio station, Rouge FM, illustrations were added to radio programmes and were broadcast with them. People visiting the cars on show that had the appropriate digital radio could listen to the station and watch illustrations on their dashboard displays.

The combined content of audio and illustrations were sometimes assembled by journalists using a PC. Alternatively a rotating set of illustrations were used to accompany the programme being broadcast. The production process is relatively simple.

If a 'hybrid radio', which combines radio broadcast reception and internet radio, was available, the experience could be extended to internet web content. This was linked up with the radio sound and the broadcast illustration using a new system termed 'RadioDNS'. This system can use some of the normally broadcast digital signalling used with radio broadcasting to locate the correct website and bring the web content to the screen of the listener to the radio station.

A video clip about the trial can be viewed using the following URL: http://tech.ebu.ch/events/digitalradioweek11/cache/off?id=14847

David Wood

In the Spotlight

Arild Hellgren began his career at NRK as a trainee in 1967. After graduating from engineering high school in 1971, he took up a permanent position with the broadcaster. After a few years in the Technical Development and Technical Planning departments, in 1990 he was appointed Technical Director of ORTO94, the NRK organisation responsible for all the TV and radio transmissions for the 1994 Winter Olympics. In 1992, he was appointed Managing Director of ORTO94. Following the Olympics, he has held a number of different high level management positions inside NRK with the main focus on technology.

1. Can you tell us something of your current responsibilities at NRK?
I am a senior advisor to the Director General of NRK with an emphasis on technology.

2. It's always interesting to hear about 'outside interests' - what are yours?
I love the sea and I spend as much of my leisure time as possible at my cottage on the water's edge of the Oslo fjord. There I like to fish, water ski, windsurf and generally enjoy the wonderful Norwegian coastline.

3. What do you consider as your finest achievement so far in your career?
Being responsible for all Olympic broadcasts from the host broadcaster (NRK) during the Winter Olympic Games in Lillehammer in 1994. Also, to have led the development of the NRK "Programme Bank". This project was the realisation of a totally IT/file based programme production infrastructure here at NRK.

4. Why did you step forward as a candidate for the EBU Technical Committee?
I wanted to share the experience I have gained from my work at NRK and to gain a better insight into the international work carried out by the EBU.

5. What are for you the most important challenges facing EBU Members, particularly those with circumstances similar to NRK, today?
To keep up with the rapid development of receiver equipment. In particular, the developments surrounding hybrid broadcast broadband TV. It is very important that we as broadcasters recognise and acknowledge the fact that consumers are starting to change their viewing habits.

Arild Hellgren
NRK

Are you real – or is it 3DTV?

David Wood, Chairman of the DVB-3DTV Commercial Module, looks at the features that might be included in a Phase 2 3DTV system.

3DTV has taken steps forward. The DVB specification for 'Phase 1' 3DTV was approved by the DVB Steering Board in February 2011. It can be downloaded now from the DVB website, www.dvb.org. Phase 1 is a system that does not need a new home set-top box (though it could also be used if there was a new set-top box). This is a 'Frame Compatible 'system. The Left and Right images needed by the 3D display are 'spatially multiplexed' to 'look like' a normal HDTV image to the set-top box. The set-top box passes the combined image to the display, where the two pictures are unravelled, and displayed so they can be viewed with 3D glasses.

The price for making the two L and R images look collectively like an HDTV picture is that they have to 'share' the HDTV resolution, though the 3DTV results are still very good quality.

The DVB specification asks display makers to allow for eight different spatial multiplex forms, to cater for the different HDTV formats used in different countries of the world, and for the prospect that a broadcaster may also receive 3DTV content in different forms.

The specification also allows for special treatment for subtitles for 3DTV services. It will be possible to signal in the broadcast the depth location of blocks of subtitles. In this way, the subtitles can be positioned immediately in front of the particular character speaking. This will need a software upgrade of existing set-top boxes to be activated. But it is a great feature, and worth doing.

Another feature is an option of signalling to the set-top box to take one of the images of the spatial multiplex, stretch it out, and pass it to the display as a normal 2D picture. The specification explains that this is an option which may or may not be available, depending on the properties of the set-top boxes in a given market. This means it will probably be a 'national option' used where circumstances allow.

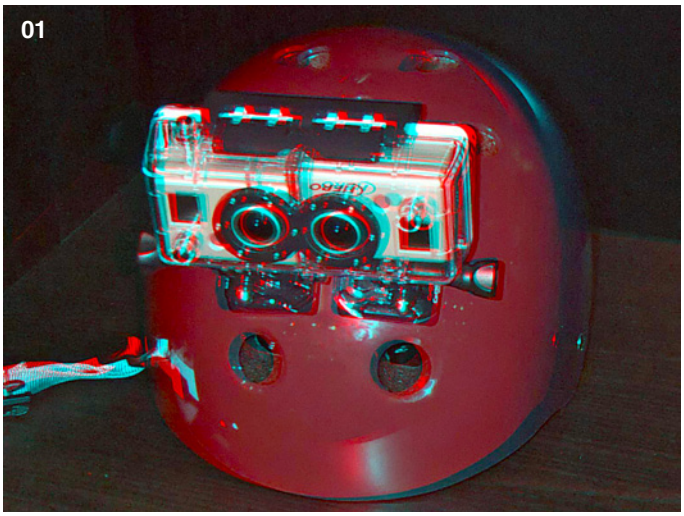
In the DVB project, attention has now shifted to a 'Phase 2' 3DTV system, for the world where it is not mandatory to use an existing set-top box. This is really exciting. Phase 1 does work very well, but now we look for additional features, provided they are commercially sound, to include in the Phase 2 specification.

One question is what picture quality it would be commercially viable to provide. At the moment most people believe it should be based on two 'normal HDTV' quality L and R images, without the limitation of sharing the HDTV bandwidth.

Another question is what 'compatibility' is required? What should still work when there is a Phase 2 broadcast? Should it be a 2D HDTV receiver (giving just one of the left and right images)? Should it be a set-top box and display that works with a Frame Compatible 3DTV broadcast? Possibly Phase 2 should actually do both.

One of the other features could be to build- in the capacity for the viewer to alter the 'depth range' of the 3DTV picture. On the remote control there would be a button to change the 3D-ness of the picture from flat 2D (good for older people?) to maximum depth range (good for younger people?). The DVB group is also looking at other elements such as creating a 3DTV picture partially by broadcast and partially by internet download. Another issue is how sophisticated 3D multimedia should be.

Probably the number one issue however is 'when should the Phase 2 system be ready'. The longer we wait, the better compression technology will become, and the more efficient the system will be. On the other hand, while we wait we are not serving the public - and (in relevant cases) not making any money. If you have a crystal ball please bring it along to our meetings.



01. Head mounted 3DTV camera on view at the NAB Convention, April 2011.
02. Viewer depth range adjustment on view at the NAB Convention, April 2011

Note: To view in 3D, red-cyan glasses are needed.

3DTV webinar available at:
http://tech.ebu.ch/events/webinar040_3dtv/cache/off?id=15132

BroadThinking Seminar

Smart Television - a saviour of broadcasting?

The BroadThinking Seminar that took place at the end of March in Geneva covered a much broader scope than originally conceived and was almost entirely oriented towards the future.

One of the key questions was what will be the role of broadcasting and the broadcasters in the overall media landscape of the future. The future of television is inevitably linked to the internet and broadband networks. Just as the smartphone has replaced the traditional phone, "Smart Television" will transform the conventional TV to a multiscreen system, enabling the users to interact and transact, and run multiple applications. Television is no longer the only service available on a TV screen. Similarly, moving images including broadcast television are available on all consumer devices including phones, tablets, gaming consoles, media players, etc. The implications for broadcasters are profound and will change the ways they capture, produce, exchange, archive, protect, secure, playout and distribute audio visual content.

The initial session titled "Broadband Landscape - how much television and radio can broadband deliver?" was about the broadband infrastructures deployed or planned across Europe and about the suitability of broadband protocols to accommodate television streams and files. It is clear that the broadband networks have not been designed to carry heavy traffic of television to the multimillion audiences in the home and on the move. Therefore broadband infrastructures need adjustments and adaptations and these are now underway both by R&D projects and commercial roll outs in several countries. Broadband will eventually become a utility like water, gas and electricity. In addition, home networks will become ubiquitous, reliable, flexible, user friendly to install and affordable.

There is a popular misconception that the internet will always be unable to cope with mass audiences watching popular television channels. In fact, it has been shown that IP multicast, CDNs, peer-to-peer, cloud computing networks or any combination of these overlay technologies can efficiently deliver high quality TV programmes to any number of users, but further improvements to these technologies are in the pipeline. For instance, dynamic HTTP streaming can significantly improve service delivery in the presence of heavy network load. IPv6 will dramatically improve internet connectivity and many broadcasters are already set to develop IPv6-based services. Fibre optic networks have increasingly large penetration to the home premises - according to the goals targeted by the EU Digital Agenda, at least 30 Mbit/s will be available to every European home by 2020. It will be possible to download multi-GB video files much faster than real-time. The multiplication of screens and the explosion of social networks are forcing broadcasters and content providers not to limit their offer merely to the TV set. Broadcasters must offer programmes for everybody and for all usages, current and upcoming, so that people might enjoy their media products conveniently wherever, whenever and on any device.

Using companion (secondary) devices such as tablets to augment users' entertainment and community experience seems to be an attractive proposition. Companion devices may be used concurrently with the principal TV show to play interactive games, show specific games, quizzes and polls. Real-time chat and TV shows, including live feeds to the companion device from leading social networking platforms, could also be included. Technical solutions for synchronous delivery of content via broadcast and broadband paths were convincingly demonstrated by Technicolor. As demonstrated by a Belgian company, Limecraft, content formats need to be repurposed automatically for a variety of companion devices by using a suitable content management system.

Broadcasters are now putting all their strengths and energies into rolling out the hybrid broadcast/broadband (HBB) services, which is a kind of Smart Television tailored to their specific needs. In HBB, connected TV devices render any broadband applications that are directly or indirectly linked to the selected broadcast channel. In this way, broadcast services can be enhanced by complementing the main TV channel with additional textual and audio visual information, while retaining consistent branding and ensuring content protection. A large majority of participants who attended the EBU BroadThinking Seminar this year agreed that this event was both highly useful and informative, and that it provided a timely and authoritative update from a variety of important media players in Europe.

The next BroadThinking Seminar will take place in March 2012.

Franc Kozamernik

Franc Kozamernik retired from the EBU Technology and Development Department at the end of March 2011. Probably Franc's greatest claim comes as the 'champion' and pathfinder of digital radio, and the founder of the collective organisation that is now WorldDMB. By transitioning his speciality to internet delivery, he did exactly what the industry itself is doing. His expertise in web and hybrid systems helped with todays' most critical areas, such as peer-to-peer delivery and hybrid broadcasting. He leaves the EBU as he began, at the cutting edge of technology.

EBU Technical welcomes...

Yvonne Thomas started working in the EBU Technical department on 1st February 2011 as a Project Engineer for European Projects, with 3D as her main subject. She is also coordinating the EBU 3DTV study group and will work on the VP8 Web codec evaluation project with her new colleague Felix Poulin.

After finishing school in 2004, Yvonne opted to be creative and follow her own ideas by spending a gap year doing voluntary ecological work. In 2005, she began her studies at the University of Applied science in Wiesbaden, Germany, where she passed her diploma in television technologies and electronic media in 2010. The subject of her graduate thesis was a "Subjective evaluation of stereoscopic disparities and a study on the acceptability for 3D". Yvonne is the author of a book on 3D that was published in February 2011.

Felix Poulin has grown up in television studios and control rooms as his parents worked in TV production. At the age of 8 he was already "helping" the technical staff and at 12 he directed and edited his first and only short movie. Felix's interest in media production and technology led to a diploma in electrical engineering at the Ecole Polytechnique de Montréal. This was followed by an internship in digital video processing at Miranda Technologies and a research project at the Massachusetts Institute of Technology. While studying, he was involved with the technical production of musicals and theatrical plays. After graduating he began work as a radio frequency and digital audio expert on national and international productions, including Cirque du Soleil.

For the last four years, he has worked for the public broadcaster CBC/Radio-Canada as a technology advisor specialising in production equipment and workflows. Felix joined the Media Fundamentals and Production team of EBU Technology and Development department as a project manager. His work focuses on IP, networks, server-storage and related matters.

diary 2011

Technical Assembly 2011
2 - 3 Jun 2011 / Tromsø (NO) / Members Only / By invitation. The Technical Assembly analyses current technology, future prospects for production, broadcast and broadband delivery, and spectrum management.

F.R.A.M.E Master Course
20 - 24 Jun 2011 / Bry-sur-Marne (14 km East of Paris). Future for Restoration of Audiovisual Memory in Europe (F.R.A.M.E) will be held from 20 - 24 June (Session 1) and from 17 - 21 October 2011 (Session 2) at l'Institut national de l'audiovisuel (Ina) headquarters.

EBU Quality Control Workshop
21 - 22 Jun 2011 / Geneva (CH) / No fee. How to best check your audio-visual content for problems? Broadcasters and solution providers share their experiences and solutions for video and audio.

3DTV Webinar
28 Jun 2011 / 15:00 (CEST) - Online / No fee / Open to all. During this webinar Yvonne Thomas (EBU) will give an update on the status of 3DTV developments relevant for broadcasters.

Networks 2011
28 - 29 Jun 2011 / Geneva (CH) / Fee. EBU Networks Seminar 2011, with the collaboration of SMPTE, is a broadcasters' annual rendezvous to monitor and discuss the latest developments in media networks, and consider realistic options for the near future.

Progress in CEPT on White Space Devices Webinar
30 Jun 2011 / 10:00 (CEST) / No fee. Dr. Walid Sami will speak on the progress in CEPT regarding the technical conditions for the possible operation of White Space Devices (WSDs) in the frequency band 470-790 MHz.

Display Webinar
07 Jul 2011 / 14:00 (CEST) - Online / No fee. This webinar will provide you with an update on professional display technology.

Further details and up to date information can be found at http://tech.ebu.ch/events

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