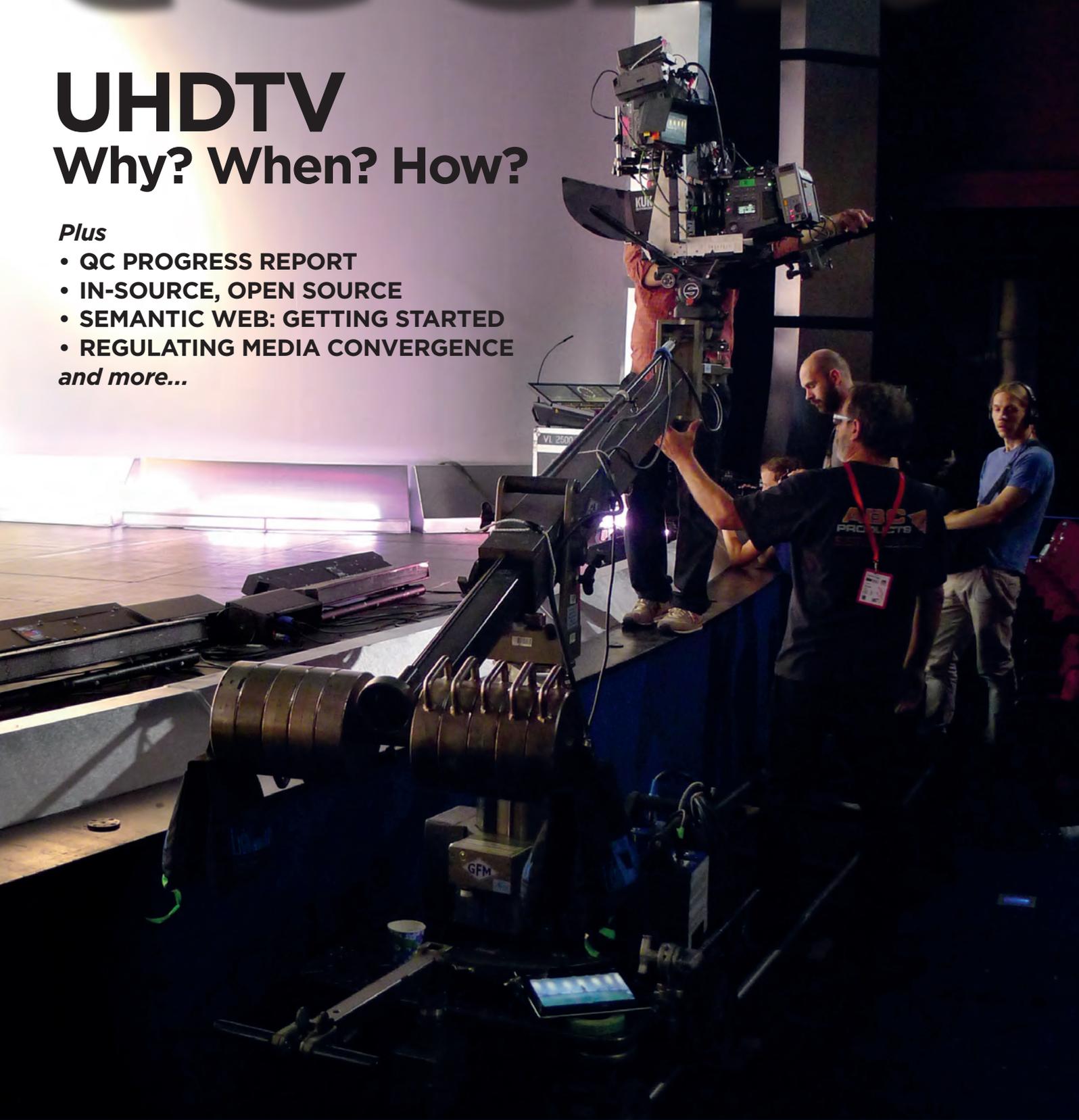


# tech-1

## UHDTV Why? When? How?

*Plus*

- QC PROGRESS REPORT
  - IN-SOURCE, OPEN SOURCE
  - SEMANTIC WEB: GETTING STARTED
  - REGULATING MEDIA CONVERGENCE
- and more...*



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**Cover Story:** This issue of tech-i takes a closer look at some of the issues surrounding the development of UHD TV technology. Among the articles is a report on the recent shooting of the Eurovision Young Dancers contest. Our cover photograph was taken during that shoot. See page 12.

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## A future based on running code

Lieven Vermaele, EBU Director of Technology & Innovation



At the helm of the EBU's technical activities I've witnessed much change in the industry. For the majority of our Members, to a greater or lesser extent, we're now firmly in a post-analogue era of file-based production and digital delivery, and in some cases, HDTV. Progress with digital radio broadcasting has been slower, and I could not claim to have an easy answer. But, as I hand over the reins to a new Director of Technology & Innovation, I will be following carefully how a recent phenomenon plays out: the growth of the software-driven broadcaster.

At the EBU we see media production starting to become more software and application-oriented. Media client services are also moving in this direction, with plenty of evidence available from our EUROVISION colleagues. One future scenario at the centre of our long term strategy for Technology & Innovation is "media production as simple as a smartphone". For the Members this will demand new competencies and a different way of managing their architecture. At the EBU, we too have to adapt our services to cope with this evolution, and in the last eighteen months we've been taking the first steps into this new era.

In the traditional world of SDI cables and islands of dedicated specialized hardware – the historically familiar architecture of most broadcasting organizations – our project groups and standardization activities have served the Members well. The recommendations, interoperability guidelines and common standards defined and approved via these groups have reduced the costs of connecting, interchanging and integrating.

But how can we help in a more software-oriented world?

Companies make and sell their own proprietary software, but there is another

way that may lead to better and cheaper software. This is the open source software world. Here there is no permanent infrastructure for defining standards in the traditional sense; no standards committees; no physical meetings. Instead, progress is based on shared best practices, on available code, definitions and tools. And, based on their success in the community, these best practices become de facto standards – standards by practice.

With this in mind, our job must be to foster a platform where the code that is most relevant for our industry is maintained and developed. As in our physical groups, we should facilitate discussion about requirements and code, but now such discussion should take place almost entirely online. We have taken already some steps towards instigating an online community of software development and sharing during 2012 and 2013, and we have exciting new developments in the pipeline (see page 6).

This aligns well with the priorities of the EBU, where Members act at different speeds and under varying circumstances. In our community we should learn from the leaders and help those that are further behind. A platform where we can share features, apps and code can create the opportunity for Members to stay ahead of the game. Members' in-house developers will have access to the code; but the wider community of 'geeks' will also contribute and bring their fresh and innovative ideas.

Such a platform can shorten the learning curve for Members, giving them access to better solutions that can also prove to be cheaper. Though broadcast equipment vendors will need to change their role in this new world, it also opens up new possibilities for them. They can build products and service offerings based on the open source approach.

In the past, the "paper" produced by the EBU has been the basis of a justifiable worldwide reputation for expertise and leadership in media technology innovation. Our recommendations, reports and guidelines will continue to play a key role. But we shall add to that a new dimension, where the EBU acts as a custodian of open source code, equipping its Members to gain maximum benefit in the world of software and apps. I wish Simon Fell and his team success in this brave new adventure.



## ROUND-UP OF THE MEDIA & IT RENDEZVOUS

The move towards increased use of IP networking and cloud computing by broadcasters brings a need for greater awareness of security issues. In his keynote at this year's Network Technology Seminar, BBC's Andy Leigh outlined where the new opportunities can also mean new risks. It was a hugely useful overview of what's certain to be an area of growing concern.

Security concerns aside, NTS 2013 brought plenty of examples of how the media industry can benefit from the use of innovative network technologies – but also where tried and trusted methods are still the best. For example, the use of IP for audio and video contribution is on the rise, with a better understanding of Quality of Service requirements and well-adapted Service Level Agreements. However it seems that, for now, some “conventional” methods like DVB-S, SDH or DTM remain the best for low latency, high quality and high reliability applications.

It's not only in contribution that IT-based technologies are making inroads. The next media frontier they are set to cross is the live production environment. NTS delegates heard about the various initiatives under way to identify the technologies and standards required to make fully networked production environments a viable proposition.

Storage is another big topic covered by the NTS radar. The storage requirements of broadcasters are continuously growing with modern production methods generating huge amounts of data, including very large files. A session dedicated to the topic explored some of the technologies that might address these needs, including cloud and object storage and Erasure Coding techniques.

All EBU Technology & Innovation seminars are expected to look into the crystal ball to identify possible future trends. Among the technologies put forward as possible solutions for media network needs in future was optical switching, particularly for cost-efficient high-bandwidth applications. More generally, delegates heard about the potential for open source solutions that provide customization while avoiding vendor lock-in.

Finally, and more important than IP networks, there was plenty of human networking! Around 110 people attended our *Media & IT Rendezvous* this year, sharing the ideas and experiences that make the EBU Network Technology Seminar such a valuable event.

The presentations are available to EBU Members from <http://tech.ebu.ch/nts2013>. Next year's event will take place on 24-25 June.



**WEBINAR: WRC-15**  
27 SEPTEMBER @ 14:00 CET

A number of agenda items at the World Radiocommunication Conference 2015 (WRC-15) will impact on broadcasters. This free online webinar provides an insight into the key issues.

<http://tech.ebu.ch/webinar-wrc15>



**WEBINAR: MEDIA DISTRIBUTION VALUE CHAIN**  
25 OCTOBER @ 14:00 CET

As EBU Members increasingly reach beyond traditional linear television and beyond the living room, this free online webinar will explore similarities and differences between the traditional broadcast distribution model and the internet distribution model.

<http://tech.ebu.ch/webinar-mdvc>



**FORECAST '13**  
6-7 NOVEMBER, GENEVA

The EBU's annual seminar dealing with broadcasting technologies, spectrum management and related topics, bringing together broadcasters, network operators, regulators, policymakers, industry stakeholders and analysts. This year's theme: Mission Critical for Public Service Media.

<http://tech.ebu.ch/forecast13>



**EBU DEVCON**  
18-19 NOVEMBER, GENEVA

Learn about best practices in software engineering for media and get hands-on experience with some of the tools and topics that broadcasters will be tackling in future.

<http://tech.ebu.ch/devcon13>



**UHDTV: VOICES & CHOICES**  
25-26 NOVEMBER, GENEVA

Building on the success of the joint EBU/DVB fact-finding workshop held in London last May, this workshop aims to find agreement on the detailed technical parameters required for UHDTV services.

<http://tech.ebu.ch/uhdtv13>

## Looking further ahead...

**PRODUCTION TECHNOLOGY SEMINAR 2014**  
28-30 January  
**DIGITAL RADIO SUMMIT 2014**  
12 February  
**BROADTHINKING 2014**  
26-27 March

**TECHNICAL ASSEMBLY 2014**  
12-13 June  
**NETWORK TECHNOLOGY SEMINAR 2014**  
24-25 June

MDN WORKSHOP 2013

MEANINGFUL EXCHANGES ON METADATA

The EBU's Metadata Developer Network held its third annual workshop in Geneva at the start of June, writes NRK's Tormod Værvågen (MDN chair), focusing on metadata in media production, distribution and archiving, and related software developments. There were more than 25 participants, including experts on various aspects of metadata.

A programme with 11 contributions and demonstrations formed the basis for two days of discussions. Discussion is central to this event where, unlike a typical conference setting where panellists take a few questions from the floor, the whole group is engaged. The presentations are prepared in a way that accommodates a meaningful exchange of knowledge – even the presenters themselves are given food for thought.

As EBUCore becomes a mature standard, several contributions covered the projects and tools that support it. These included mapping tools and the ongoing day-to-day use of the standard, but also how its extension mechanism and ability to link to third party dictionaries help to bridge cultural differences among broadcasters that might

otherwise find cooperation difficult.

Rights metadata has been a huge challenge for broadcasters. Contracts developed by legal departments don't translate easily to machine-readable XML covering the legal meaning of the contract. However at this year's workshop, two different projects targeting this challenge demonstrated possible solutions.

Description of audiovisual material is always a question of "How much?" and "How often?" The description of a particular programme's topic can be one data element applying to the whole programme, but other aspects change more often, in many cases even frame by frame. One of the contributions to the workshop showed how this vast amount of data can be stored, analyzed and queried.

The presentations from this workshop are available from <http://tech.ebu.ch/mdn2013>, and many other resources can be downloaded from the workspace of the Metadata Developer Network. See <http://tech.ebu.ch/mdn>.

IBC 2013

SEE YOU IN AMSTERDAM

The EBU stand at IBC is always a hive of activity throughout the event, being an essential stop-off for anyone interested in media technology developments. Along with regular presentations in our on-stand theatre covering a range of different topics (see full schedule at <http://tech.ebu.ch/ibc13>), we will once again have a set of demonstrations based on the activities of our working groups. They include:

- High Frame Rates – judge for yourself the impact that higher frame rates have on the viewing experience
- HEVC for UHD TV – see how HEVC video compression has progressed, making it possible to deliver UHD-1 content at bit rates comparable to today's HDTV
- Binaural audio – hear the highly immersive audio experiences broadcasters can deliver to a pair of headphones
- Quality Control – play our QC Checks game and learn about our work to support robust automated QC in file-based production, including interfaces to the FIMS environment
- Fully Networked Studio – a demonstration from BBC R&D showing how high bit rate signals can be exchanged in real time, without the need for HD-SDI interfaces
- Broadcasting from the Cloud – a prototype scalable cloud infrastructure from the EBU, based on open protocols, to enable virtualised services like encoding and distribution
- Digital & Hybrid Radio – the latest developments in radio technology, including progress towards radio becoming an integrated hybrid app in mobile devices

Visit us at IBC. Stand 10.F20.



TECHNICAL ASSEMBLY 2013

BACK FROM BAVARIA

The 19th EBU Technical Assembly brought around 110 participants to Munich on 13-14 June. The comfortable surroundings of Bayerischer Rundfunk's *Großen Sitzungssaal* provided an ideal location for two days of presentations and discussion around technology-related topics of strategic importance for public service media today.

From Andreas Gall's somewhat provocative keynote about Red Bull Media House's approach to production and distribution, through two well-received strategic focus sessions, and on to a highly appreciated set of presentations on coping with change, high levels of attention and engagement were in evidence throughout.

As usual there were plenty of opportunities for those responsible for technology decisions at EBU Members to network and exchange, both in the formal setting of the Assembly itself and in the more relaxed environment of the various social events. Delegates were also provided with memorable Bavarian experiences, both at Friday night's Sony-sponsored gala dinner in the Augustiner-Keller and Saturday's excursion to the Wendelstein Mountain, courtesy of Rohde & Schwarz.

Next year's Technical Assembly will be hosted by Czech Television, taking place in Prague on 12-13 June.



BR'S PRODUCTION AND TECHNOLOGY DIRECTOR PROF. DR. DR. BIRGIT SPANNER-ULMER, WITH (RIGHT) HER PREDECESSOR IN THE ROLE HERBERT TILLMANN AND (LEFT) CHAIRMAN OF THE EBU TECHNICAL COMMITTEE ARILD HELLGREN (NRK). © BAYERISCHER RUNDFUNK / ULRIKE KREUTZER

## DIGITAG



## NEW DIRECTOR

### WELCOME SIMON!

During August 2013 Simon Fell took up the post of Director of Technology & Innovation, replacing Lieven Vermaele who leaves after six years at the EBU. Simon brings with him a wealth of experience in broadcast technology, most notably at EBU Member ITV. During his time with the UK-based broadcaster, he was Director of Future Technologies (2008-2009) and Controller of Emerging Technologies (2004-2006). Prior to that he worked for Carlton Television, the ITV franchise holder for the London region, where he held several executive roles linked to operations and emerging technologies.

Simon is the current chairman of the Technical Council at the Digital Television Group, the industry association for digital television in the UK. His career has already brought him into contact with the EBU, where he sat on the Technical Committee on behalf of UK broadcasters between 2006 and 2009.

On his appointment he said: "Public service media companies throughout Europe face a changing technological landscape now more than ever. I am looking forward to leading the EBU's great technology team as we navigate the future and guide the membership towards the right technology choices for digital media production and delivery."

EBU Director General Ingrid Deltenre said: "We are confident that in Simon we have found a proven leader who can guide EBU Technology & Innovation through the challenges that lie ahead. He brings a broad portfolio of highly relevant experience, and the EBU executive team looks forward to working with him."



## SPECTRUM MESSAGES DELIVERED AT LUNCHTIME TALK

DigiTAG brought the issue of spectrum and its use to the forefront in Brussels at an EBU Lunchtime Talk on 6 June 2013. It was part of DigiTAG's *Broadcasting reaches...* campaign. Lieven Vermaele, who is the president of DigiTAG, presented alongside Anthony Whelan, the new Head of Spectrum Unit of the European Commission. Each speaker delivered his view of the future of spectrum use and the role broadcasting has to play.

The debate raised some interesting issues. Mr Whelan set out clearly the time frame for the European Commission's work on spectrum until the end of 2013. He stated that coming to the end of the year there will be further discussion on telecoms regulation and that a new study on broadcast and broadband convergence has been launched. The Commission is also convening a high level group of representatives from the broadcast and telecommunications industries to discuss issues now arising with possible convergence in the spectrum bands.

Lieven Vermaele's presentation focused on the future, where there is "an imminent media-delivery traffic jam if the synergies between broadcast and broadband media delivery cannot be duly appropriated". He called for broadcasting to remain part of the EU Digital Agenda. His views were echoed by members of the audience who wanted the Commission to bring clarity to the debate and set a clear roadmap for the future.

The event was well attended and a follow-up is planned later this year. Details will be available from the DigiTAG website by the end of September ([www.digitag.org](http://www.digitag.org)).

DigiTAG will also be taking the *Broadcasting reaches...* message to IBC this year, encouraging the broadcasting industry to work together to protect the DTT platform and to emphasise the important social and economic role it plays in many markets. Visit DigiTAG at IBC on the DVB stand (1D.81).

*Broadcasting reaches...* one message, one industry, one voice For a full report on the EBU Lunchtime Talk visit: <http://tinyurl.com/digitagjune>



CTO OF RED BULL MEDIA HOUSE ANDREAS GALL (ABOVE LEFT) SHARED HIS IDEAS ON HOW A MODERN MEDIA COMPANY SHOULD OPERATE, IN A KEYNOTE PRESENTATION THAT WAS BOTH INSPIRING AND PROVOCATIVE. THE PROUD TO PRESENT SESSION SHOWCASED PROJECTS FROM MANY DIFFERENT MEMBERS, LIKE SVT'S OPEN ARCHIVE, WHICH WAS INTRODUCED BY GÖRAN LINDGREN.

# Broadcasters know nothing about Software Engineering ;-)

BROADCAST ENGINEERING IS NOT BROADBAND ENGINEERING. BUT WE CAN LEARN A LOT FROM THE METHODS USED BY SOFTWARE DEVELOPERS, AND PARTICULARLY THE OPEN SOURCE COMMUNITY, SAYS THE EBU'S **MICHAEL BARROCO**.

**B**roadcasters are accustomed to strict deadlines, big releases, long-term investments and the highest expectations in terms of service quality. On the other hand, the broadband world tends towards small iterations, flexible schedules and the use of cheap commodity hardware rather than high-end custom-built systems.

Looking at the approach of big players in the internet world, we can see that they scale their systems horizontally rather than vertically, as in broadcasting. Instead of buying the best machine, they will build a distributed system and run it on several standard servers knowing that some of them will eventually fail. That's not a problem since the system is developed in order to handle such failures without impacting the service. Netflix pushes things even further with their development of a project called Chaos Monkey to stress-test their infrastructure. The test consists of randomly shutting down some servers in order to simulate unexpected failures – and create the fix – rather than waiting for the real failures to happen.

## IN-SOURCE, OPEN SOURCE

At this year's OSCON, an annual convention on open source technology, we heard about a major car manufacturer who lost all its code and its engineering knowledge during the economic crisis since they outsourced their development to external contractors. After this episode, they hired a chief information officer who had an excellent track record in the retail and IT industries. He started to in-source the development and IT operations and created a centre of innovation in order to rebuild and safeguard their engineering knowledge.

In-sourcing is a matter of culture too. Being able to manage internally a team using Scrum and Agile methods enables iterative development and short-term roadmaps. It improves the efficiency of the team as well as the flexibility of the projects. Moreover, test-driven development ensures that the team working on your project can easily scale.

Another trend is to prioritize the features according to user behaviour. It is called data-driven development,

THE PROFESSIONAL FACE OF THE OPEN SOURCE ECOSYSTEM CAN BE SEEN AT THE ANNUAL OSCON EVENT.



**EBU DevCon 2013**  
Software Engineering for Media  
18-19 November, Geneva  
[tech.ebu.ch/devcon13](http://tech.ebu.ch/devcon13)

with success dependent on driving the development roadmap according to user behaviour, drawing on business intelligence techniques. And last, but not least, open sourcing internal projects can improve the code quality since external people will review it. In order to be sharable, the project will be forced to comply with commonly used practices.

## PEOPLE, NOT CODE

At the EBU, we are investigating a new model for development, inspired by open source organizations like the Apache Software Foundation. Apache hosts a lot of the most famous and widely used open source projects like web servers (httpd and tomcat), Hadoop and many others.

The model consists of building a community around a common problem and outputting a piece of software or a runnable project. Every step of the project from selection to its publication as a top level project is handled by a community. The development is based on a kernel of developers who organize and drive the project. The community can contribute by submitting improvements, bug reports and fixes.

When successful, this kind of project generates a wide business ecosystem that provides support and guarantees, such as Service Level Agreements. Companies are then able to either hire contractors or build a team to integrate and adapt the product for internal needs, while a community of experts maintains the core features. It is easy to find skilled people since the technologies are open. Moreover, evolution and customization are almost unlimited.

Imagine having a team that could tune and fix your system without waiting five months for the promised release. Even better, this fix can then be shared with other broadcasters and solve the same problem for other EBU Members. At the Technical Assembly, we heard some small members saying that commercial solutions are very expensive and that developers are cheap. (For others the situation is exactly the inverse.)

At the EBU, we are starting to connect these people. The initial point is to identify which kinds of project could gather the support and interest to kick off a pilot. We will use crowd sourcing methods among our network to curate the interesting projects and organize a workshop to put interested people around the same table. A dedicated platform will host all software-based information in one place. For more information see: <http://tech.ebu.ch/io>

# TDA – Télédiffusion d'Algérie

**DR. CHAWKI SAHNINE**, DEVELOPMENT AND STUDIES DIRECTOR OF ALGERIAN BROADCASTING PROVIDES THIS OVERVIEW OF THE ORGANIZATION'S PAST, PRESENT AND FUTURE FROM A TECHNOLOGY PERSPECTIVE.

**T**élédiffusion d'Algérie (TDA) is the result of the restructuring of *Radiotélévision Algérienne* in 1987. TDA operates and transmits, nationally and abroad, public TV and radio services. It will also be responsible for transmitting private TV and radio channels to be licensed in future. In addition, TDA represents the Algerian state in the international radio communication regulation bodies and is responsible for bilateral coordination of TV and radio spectrum.

After Algerian independence in 1962, a small TV service, inherited from the colonial period and based on the French standard of 819 lines, was operated across the north of the country, with limited coverage, from three stations at Algiers (centre), Oran (west) and Constantine (east). Interestingly, the 20h00 news was transported by train or plane to Oran and Constantine for delayed broadcast (the next day) because of the absence of a national transmission network.

Radio coverage, consisting of three radio services, was limited to certain regions in the north via three medium wave (MW) transmitters in Algiers and two MW transmitters in Oran and Constantine.

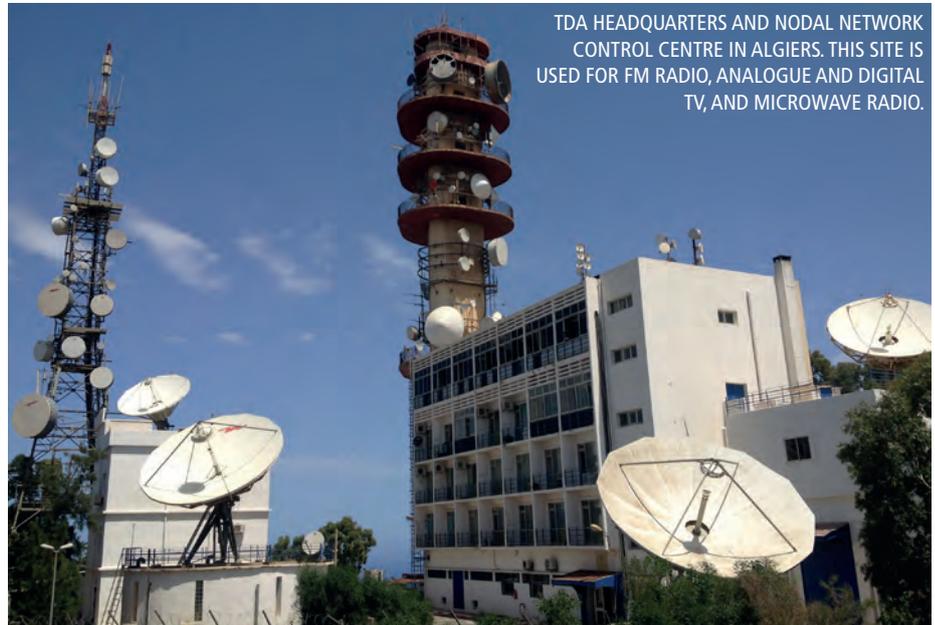
## 50 YEARS LATER

An analogue microwave radio network was deployed in 1970, allowing for the first time to create a unified national television broadcasting network. The microwave network was digitized in the late 90s.

Concerning terrestrial TV broadcasting, about 95% of the population, more than 37 million inhabitants, is covered by analogue TV and more than 50% of the population is currently covered by DTT (digital terrestrial television). The goal is to extend this to more than 90% of the population by the end of 2014. The first multiplex is based on a DVB-T/MPEG-2 MFN (multi-frequency network) allowing the broadcast of six TV services in SD.

Turning to radio broadcasting, 20 high and medium power MW transmitters, three long-wave (LW) high-power transmitters and a national FM network (started in 2002) allow TDA to broadcast three national radio services, 48 regional radio services and four thematic services.

Two 600 KW MW transmitters, renewed in 2009, are DRM (Digital Radio Mondiale) ready. In addition, the national FM network is being upgraded to enhance



TDA HEADQUARTERS AND NODAL NETWORK CONTROL CENTRE IN ALGIERS. THIS SITE IS USED FOR FM RADIO, ANALOGUE AND DIGITAL TV, AND MICROWAVE RADIO.

the coverage areas and to increase the number of transmitters to six per broadcast site.

By 1975, distribution of the national TV service to the transmitters located in the south was provided by satellite. Today, TDA operates two satellite earth stations, for content contribution, distribution and for DTH broadcasting of five TV services and 55 radio services, as well as service to the Algerian Press Agency.

## CHALLENGES AHEAD

The Information Organic Law of 2012 established the opening up of the media landscape. This regulatory change gives rise to a new market and a new audiovisual industry, and for TDA, new customers and new challenges to meet.

In addition, technological developments and global changes impose strong constraints on the development plans of our company and therefore dictate the strategy. To this is added, as a public broadcaster, the obligation to cover the entire population spread over an area of more than 2.3 million km<sup>2</sup>, with a heavily mountainous area in the north and desert area in the south of the country.

To achieve these objectives, TDA has a significant workload in the upcoming years:

- Deployment of a second DVB-T2/MPEG-4 AVC SFN DTT multiplex for SD and HD channels;
- Analogue TV switch-off and deployment of digital terrestrial radio based on T-DAB+ in the VHF-III band;

- Deployment of a multiservice (audiovisual, data and value added services) hybrid/packet-based microwave radio network;
- Realization of two high power shortwave DRM stations;
- Realization of six high and medium power MW DRM stations in short term and ten new DRM stations in the medium term;
- Renewal of existing LW and MW stations to DRM;
- Enhancement of DTH satellite capacities for SD and HD TV channels as well for radio channels;
- Enhancement of satellite contribution capacities and deployment of a MENOS (Multimedia Exchange Network Over Satellite) network ;
- Implementation of large-scale mobile capabilities for measuring and controlling the spectrum and mobile satellite contribution capabilities ;
- Setting up an internet streaming platform.

The trend for technological convergence, the importance of internet media, new platforms (mobile, tablet...) impose therefore an evolution of our company towards new markets and developing new non-linear and multiplatform services. This fact is taken into consideration in the new business strategy. It's worth noting that TDA has for ten years also been an internet service provider for corporate customers and owns therefore all the assets to address this technological convergence.

# Quality Control: more than keeping up appearances!

IN AN IDEAL WORLD THERE WOULD BE NO NEED FOR QUALITY CONTROL – THE AUDIO AND VIDEO WOULD APPEAR JUST AS THE PROGRAMME'S PRODUCERS INTENDED. BUT IN A FILE-BASED ENVIRONMENT IT'S NOT AS SIMPLE AS THAT. FORTUNATELY THE EBU'S STRATEGIC PROGRAMME ON QC IS HERE TO HELP, EXPLAINS ITS COORDINATOR **FRANS DE JONG**.

**D**elivery of programmes by tape gave us certain assurances. The broadcaster could specify the format and the QC process was simple: if the tape failed to play or was the wrong format, it simply got sent back. With modern file-based production, content is subjected to a wide variety of post production and format conversion steps, often passing through external companies. The path from the camera and microphone to the home is all but transparent.

Files certainly offer flexibility, and can be endlessly updated, copied, versioned, etc., with multiple audio and language tracks. As one producer proudly said: "Files can be edited and changed even while they're being transmitted. This is brilliant; I can use Twitter to change the end of my programme!"

But this virtually endless flexibility is also a problem. It translates into a much higher chance of things going radically wrong. One erroneous bit is enough to make play-out servers fail during tonight's beautiful documentary; a recent update to a video encoder could well be the reason why the high-value drama series suddenly looks awful on the catch-up platform, etc.

Aside from their different flavours, it is the sheer number of files used in current operations that makes manual verification impractical. The result is a growing desire for powerful QC products that can complement our human eyes, which are still unsurpassed for subjective QC operations such as spotting wrongly focused shots, but which have a hard time looking at the more abstract parts of files.

## QUALITY SHOPPING LIST

Two years ago the EBU set up the Strategic Programme (SP) on QC to allow Members to share their experiences of QC tools and how they integrate these devices into their own production processes. The work is chaired by industry veteran Andy Qusted (BBC), who has seen the need for and the use of QC from all angles, ranging



**Many vendors will demonstrate the integration of the EBU QC Checks in their products at IBC 2013. Visit the EBU stand (10.F20) to find out more.**

from his work as video editor (for 'Quality Comedy', such as "Keeping up Appearances"!) to head of technology for the BBC's HD services. Together with many experts from broadcasters and the leading QC tool manufacturers, SP-QC has defined a set of over 100 checks that help achieve consistency in the implementation of QC. It basically is a shopping list for users who can 'tick off' the checks they'd like to see applied. To assist vendors and broadcasters alike, the EBU also hosts a library of QC test files named "Bronze Files" by the group, as they demonstrate many of the issues and problems the QC tools are designed to identify.

## (INTER)NATIONAL APPEAL

The SP's deliverables have become a valuable reference for other groups, both at national and international level. In the UK, for example, the Digital Production Partnership (DPP) is aligning its work with the EBU's QC Checks list; the German broadcasters' Quality Management group is doing something similar. Internationally the QC Checks are being transformed into 'services' by the FIMS project under its Quality Assurance work item. So we are actually seeing the birth of a hierarchical approach to Quality Control, where national or even company-specific QC checks can be related to their base definition in the EBU's QC Checks list. This helps improve not only clarity of 'what is being checked', but also interoperability, as products can be built with the same target values and tolerances in mind.

## REPORTING REQUIREMENTS

Next on the roadmap for SP-QC is a recommendation on the reporting structure used for QC. The aim here is to allow easy integration of QC tools in complex production facilities by specifying a baseline common format, without constraining the creation of more 'filtered' versions for specific purposes. A play-out operator may for example want to see only very specific failure information, while a centralized logging tool may benefit from being passed the most detailed report available. The reporting approach is being defined in tight cooperation with the FIMS QA experts.

A key outcome of this work will be an exchangeable trusted QC report, where someone receiving a programme from a production company or a distributor or even just another programme area, will be able to trust the supplied QC report as if they carried out the QC themselves. Broadcasters in several European countries are already experimenting with this concept. The availability of the EBU QC Checks and related test material will help them to improve the efficiency of their QC processes.



CONSTANTLY EVOLVING TECHNOLOGY MAKES IT POSSIBLE TO DELIVER HIGHER AND BETTER QUALITY SOUND AND PICTURES. BUT THE INTRODUCTION OF A NEW DISTRIBUTION TECHNOLOGY NEEDS TO BE BUNDLED WITH A NEW OR IMPROVED SERVICE, SAYS SWEDISH TELEVISION'S HEAD OF DISTRIBUTION PER BJÖRKMAN.

*“Today’s modern LCD displays have the possibility of much higher intensity for small parts of the screen”*

# The Ultra HD equation

In recent history we can see how MPEG-2 compression combined with DVB-S/C/T transmission made it possible to introduce digital TV. The next phase brought H.264/MPEG-4 AVC with DVB-S2/T2, a combination that was used to introduce HDTV. And now the next compression standard, High Efficiency Video Coding (HEVC) or H.265, has been standardized. But if this new compression system is to be the core of future TV distribution, it will need to be launched along with a new service that would motivate viewers to upgrade their receiver and display equipment and provide demonstrable added value.

Clearly, 3DTV won't be that service. Instead many now believe that the next step forward in the production and distribution of TV is spelled “UHDTV”. Ultra HD, or UHD-1 and UHD-2, is the television version of the digital cinema systems “4k” and “8k”, referring to a horizontal resolution of about 4,000 and 8,000 pixels.

But only extending the resolution to 4k or 8k won't be enough. The fact is that the improvement for the average viewer would not be enough to motivate investing in a new display and receiver. The difference in picture quality compared with normal HDTV is just not significant enough. If all we do is increase the number of pixels in the picture, Ultra HD will be a failure.

## A NEW EQUATION

Instead the next level of TV experience would be a combination of several pieces of improved technology. A successful launch of Ultra HD could look like this:

$$\text{HR} + \text{HFR} + \text{HDR} = \text{UHDTV}$$

Here HR stands for High Resolution, HFR for High Frame Rate, and HDR for High Dynamic Range.

### High Resolution

This is basically anything with higher resolution than we use today for HDTV distribution, i.e. 720p or 1080i. It includes the new UHD-1 and UHD-2 formats, but also 1080p, which cannot today be delivered with a frame rate higher than 25 fps.

### High Frame Rate

If we increase the image resolution, the theory tells us that we also need to increase the frame

rate to cope with camera movement, e.g. fast pans. Therefore a new video format should extend the set of available frame rates to 100, 120 and maybe even 150 fps to provide better motion portrayal.

### High Dynamic Range

Historically the TV industry has worked with a target of full white being emitted with an intensity of 80 cd/m<sup>2</sup> (candela per square metre, also known as nits) from the display. But today's modern LCD displays have the possibility of much higher intensity for small parts of the screen. A new video format could use this to increase the dynamic range and use at least 10 or 12 bits for colour depth.

This equation might be extended by the capabilities of displays to present more colours than currently covered in HDTV.

## BRIDGE TO THE FUTURE

But the most important aspect of a new Ultra HD format is that, among all of the different flavours that will be standardized, there must be versions that will fit in the 3 Gbit/s HD-SDI production infrastructures (“3G”). Most TV stations and production facilities that have been converted to HDTV in recent years have made their cabling and core infrastructure in 3G – with a view to carrying the 1080p50/60 format. These investments won't be replaced for many years ahead.

Although it's possible to use dual or quad 3G links for UHDTV signals, in practise it's too tedious in a large volume operation. Instead, I believe we should use 1080p in 50 or 60 Hz with 10-bit resolution, to be an intermediate bridge to a fantastic new TV standard which then, when new infrastructures have been developed, can provide a stunning picture based on higher resolution, frame rate and higher dynamic range.

But before consumer products are launched we need to set the complete UHDTV eco-chain and standards and make sure we agree on a single common version to be known as Ultra HD. We cannot afford to have the complicated legacy situation that would come with the implementation of many different Ultra HD standards in consumer electronics products. And finally, we must not forget that this new format will almost certainly also be distributed through new software-based IP platforms, i.e. the internet.

# UHDTV: finding the facts

A JOINT EBU/DVB WORKSHOP HELD LAST MAY AT THE DOLBY THEATRE IN CENTRAL LONDON HAD ONE CLEAR OBJECTIVE: TO IDENTIFY A SET OF UHDTV PARAMETERS IN THE PRODUCTION, DISTRIBUTION AND CONSUMER DOMAINS. THE EBU'S **HANS HOFFMANN** PROVIDES THIS REPORT.

This fact-finding workshop was truly a milestone on the road to a UHDTV future – the lengthy waiting list wishing to attend the overbooked event was a testament to this. To meet its objective it was clear that an analysis of the complete end-to-end chain would be essential to provide direction for technology and standards-setting.

From the outset there was a shared understanding among participants that UHDTV must provide clear added value for consumers over HDTV. This requirement in particular led to debate, however, since early adopters that aim to deliver services in the next few years may be confronted with limited capabilities in chip sets (e.g. to support higher frame rates). Later adopters – broadcasters still in transition to HD, with a timescale beyond five years for UHD services – will benefit from advanced technologies, but may be confronted with legacy problems.

The workshop kicked off with a session on the end-to-end chain. It dealt with the question of content availability, infrastructure and bit-rate issues for real-time events, and the open question of HEVC licensing models. There were views on the use of high end UHD cameras for top quality HD production, which would serve to start filling archives with UHD content for future use. This opening session also looked at the impact of UHDTV on file-based production, with discussions around the need for extensions to studio compression and MXF/IMF.

## VIDEO PARAMETERS

Zooming in on specific details, video parameters were the topic of the next session. In principal a good UHD service should consist of an optimum mix of increased resolution, frame rate, colorimetry and dynamic range. Participants agreed that focusing only on a resolution increase to '4k' will not provide a sufficient improvement over HDTV. (This point was underlined by various demonstrations related to frame rates, dynamic range, HEVC

*“UHDTV must provide clear added value for consumers over HDTV”*

compression, etc.) The consensus was that a bit-depth of 10-bit is the minimum for UHD-1 and UHD-2, and that production must be done even in 12- or 16-bit.

Turning to frame rates, the debate led to an understanding that while higher frame rates are needed, further research is required into the benefits of using multiples of 50 Hz and into what the correct upper limit should be (120, 150, 240, 300, ... Hz). In the domain of colour, the support of extended colour range defined in ITU-R BT.2020 would require the availability of colourist metadata. And finally, for video parameters, it was agreed that increased Dynamic Range will play an important role in providing perceptibly better images to the viewer.

Overall it was agreed that the signalling of the video parameters and metadata throughout the chain, and the correct interpretation at the presentation device, will be crucial.

## COMPRESSION

A session focusing on compression centred around HEVC, with particular attention to the need to use the Main 10 profile with 10 instead of 8 bits per colour. The savings over MPEG-4 AVC will depend on the criticality of the content, but participants felt confident that up to 40% might be achieved. HEVC and higher frame rate support (and the residual bit-rate) is the topic of ongoing further work and will be a topic for November's follow-up workshop.

The message coming through loud and clear from the audio session was that “audio makes a difference”. The different approaches of channel-based systems (e.g. 22.2) versus the increasing interest in object-based audio systems was under debate. Again, more work is required in this area to ensure mass

market acceptance for what would be a next generation immersive audio system to accompany UHDTV.

Studio and transmission infrastructures were also on the agenda, with discussion of variants of real-time-capable SDI or network-based systems. It was reported that extensions to the current 3G SDI will appear soon, with SMPTE leading the standards work. In addition there was consensus that network-based and SDI-based technologies will coexist, each being used in their respective application spaces.

## DISTRIBUTION

Many questions related to next generation distribution technologies were discussed, encompassing DVB-T2 and S2 and their possible successors, plus IP-based delivery services to home, both real-time and non-real-time. Early UHD content might become available via internet download, but the lack of solutions for real-time HEVC decoding at the receiver side will ensure that this remains a niche application.

Experts were then broken into three groups, on production, distribution and presentation devices, each discussing possible barriers and ways forward. The overarching idea that emerged is that UHDTV may come to the market via profiles, with each building on the capabilities of another.

## POSSIBLE PROFILES

There has been, and will be, much discussion around such profiles, but it seems clear that a first UHD-1 phase could be 2160p50/60, but including the possibility of 1080p100/120. This profile would be limited to the Rec.709 colour space, but would have 10-bit bit-depth (with 12-bit optional) and some Higher Dynamic Range (HDR) capabilities.

A more advanced UHD-1 profile

would support 100 and 120 fps for the 2160p resolution as well as the ITU-R BT.2020 colour space, HDR and so forth. The most advanced profile, with a more distant time horizon, would be the 4320p100/120 system, to include all parameters defined in ITU-R BT.2020.

Audio in the profiles would expand from 5.1 support up to fully immersive and object-based methods as they become available over time.

### FIRM FOUNDATIONS

It should be stressed that these were initial ideas from the workshop, but the participants felt that they would provide a good foundation for future work.

In the consumer electronics domain, developments around HDMI (the widely used display interface) provided lots of scope for brainstorming. The current version of HDMI only supports UHD-1 up to 30 frames per second, which would exclude sport or any fast action content. It's no surprise then that the group expressed great concern about whether the next version of HDMI will appear soon enough and would support the parameters required for a really immersive UHDTV system.

All in all it was a really valuable event and an excellent basis on which to continue our joint journey towards this exciting new format. On behalf of all of the participants I wish to acknowledge Yvonne Thomas – from the EBU Technology & Innovation team – and David Wood, representing the DVB Project, who together coordinated the event. To obtain the full report from the event contact [thomas@ebu.ch](mailto:thomas@ebu.ch).

### MAKE YOUR VOICE HEARD

All of the bodies represented at the event – EBU, DVB, SMPTE and others – will continue to work together on the issues identified in this article.

There will be close collaboration to address the interdependencies between production, distribution and presentation. A follow-up workshop, titled **UHDTV: Voices & Choices** (EBU, 25-26 November), will provide an opportunity to take stock of the progress made.

Visit: <http://tech.ebu.ch/uhdtv13>



# Dancing with definition and dimensions

THE PATH TO A NEW TV FORMAT IS MARKED WITH MANY MILESTONES. THE 2013 EUROVISION YOUNG DANCERS CONTEST COULD PROVE TO BE ONE OF THE KEY MOMENTS IN THE JOURNEY BEYOND HDTV. THE EBU'S **YVONNE THOMAS** TELLS THE STORY.



THE COMPETING DANCERS WERE HAPPY TO HAVE THEIR REHEARSALS SHOT IN THIS REVOLUTIONARY NEW FORMAT.

An estimated one million viewers watched the Eurovision Young Dancers (EYD) contest live from Gdansk's Baltic Opera in June, showcasing the creativity and innovation of performers from around Europe. But the choreography wasn't the only innovative aspect of this year's event: it was also an occasion for an innovative 'first' at the crossroads of media technology and content.

In co-operation with Fraunhofer HHI, the EBU initiated a project to shoot the event in 3D 4kp50 – two cameras, side-by-side, each shooting the full 4k resolution of 4096x2160 pixels and a frame rate of progressive 50 frames per second per camera. This represented a true first: this format had not been produced anywhere before.

The EYD contest was chosen for the production due to the colourful stage and the smooth but dynamic movements of the dancers. The idea was to prove what is technically possible today in terms of potential future formats and to contribute to ongoing research and testing.

## SETTING THE SCENE

Baltic Opera, Gdansk, June 2013.  
"Camera ready. Playback. And action!"

The dancers began to glide over the stage while a crew filmed them with the two Sony F65 cameras installed on a mirror rig. The dancers were rehearsing their performances for the contest, getting final tips from well-known experts the Ballet Boyz. The production team from KUK Filmproduction had set up a dolly with the mirror rig and cameras in front of the stage. Backstage, in the warm-up and training rooms, the rig was mounted on a mobile tripod.

To prepare for the shoot KUK tested combinations of camera parameters, rebuilding the mirror rig specifically for the EYD production. Being the first such production in this format, it was also a valuable learning process. Their CEO Josef Kluger remarked on the futuristic nature of the project. For them it was about gaining experience with the new format and becoming familiar with the entire workflow. It was very much a project about future TV and cinema production and the whole team looked forward to seeing the 3D/4K image on large TV displays and in the final UHD-1 format.

For KUK, one of the challenging aspects of the production was the considerable weight and size of the

camera setup. This gave less flexibility compared to normal documentary equipment.

## THE TECHNOLOGY

The STAN (Stereo Analyzer) from Fraunhofer HHI was used to adjust and calibrate the stereo rig and to control the depth budget during the shoot.

A 2D HD signal from the camera was streamed on an iPad via WiFi with a six to seven frame delay. This allowed the director to monitor the recording and better communicate to the cameraman his requirements.

As it was produced in 3D, with the RAW files each at the full 4kp50 format, the data was doubled, resulting in about 10 TB per view at the end of the production. Compared to an ordinary 1080p50 image the data volume is eight times higher.

In post-production the images were cropped to UHD-1 resolution (3840x2160 pixels). They were processed, edited and colour corrected with DaVinci, Final Cut, Piranha and After Effects systems. Although the disparity had been calculated for a target screen size of about 65", the HIT (horizontal image translation) had to be slightly corrected to have smooth transitions between scenes.

There is currently no single play-out system or display/projector that can handle the content in its native format. Thus the 2D UHD-1 version of the EYD trailer (about 4.5 minutes) will be shown on the EBU booth – 10.F20 – at IBC 2013 in Amsterdam. And a week before that, Fraunhofer HHI will show the content in 3D on an autostereoscopic 4k panel at IFA 2013 in Berlin.

## THANKS TO...

This fantastic production was only possible with the collaboration and support of many partners. EBU Member TVP (Telewizja Polska) and the Baltic Opera Gdansk facilitated the production, integrating it into what was already a very tight schedule. The EBU and KUK were careful not to impact on TVP's live production. We appreciated the engagement of the Ballet Boyz and the competing dancers. They felt suitably honoured to be the subjects for this first production in the new format and were happy to adjust their own schedules to facilitate the test shoots. We also appreciated the cooperation with Band Pro GmbH and MXR.

See: [www.youngdancers.tv](http://www.youngdancers.tv)



DIFFERENT TYPES OF PROGRAMME CONTENT, AND DIFFERENT INTENTIONS BY CONTENT MAKERS, CAN LEAD TO DIFFERENT CONCLUSIONS ABOUT THE BEST IMAGE PARAMETER VALUES FOR TELEVISION AND MOVIES. HOW, **DAVID WOOD** ASKS, ARE WE TO KNOW WHICH ARE THE 'RIGHT' ONES?

*“...the more images per second a video system provides, the closer the experience of viewing will be to reality.”*

# The TV Frame Rate enigma

**W**hen we find a movie enjoyable, it's because we subconsciously put ourselves in the position of the characters: what would I do if it were me there? When we find watching sports or other televised events enjoyable we add another reason: we'd love to be there in the stadium while it's happening, to be part of the event. When it comes to news, we watch because we have the feeling that knowing what is happening in the world gives us a degree of control over it. Different types of media content have different psychological purposes.

## THE ROLE OF FRAME RATE

Image quality affects our sense of 'involvement' in the programme content. The elements influencing it are many, but one of them is the frame rate – the number of pictures per second.

Take a careful look at a studio-shot TV soap opera and compare it with a movie – notice there is a different 'feel' to them. Somehow you can tell that the soap opera was shot in a TV studio (if it was). Somehow the movie does not have this feeling, and gives you more of a sense of 'observing from safety' what is happening. It's often a nice feeling. You still believe it is happening – you have suspended disbelief – but you have the comfortable position of observer.

Movies have been shot at 24 frames per second for many years, and interlaced television at a 'twilight zone' rate, which is 50 or 60 half frames (called fields) per second – effectively higher than the movie rate. The 720p/50 or 60 progressive HDTV format has 50 or 60 full frames per second.

In real life, light reaches our eyes in a continuous stream. In effect, it's an infinitely high number of images per second, so the more images a video system provides, the closer the experience of viewing will be to reality.

## HOLLYWOOD AND HFR

For some years, the movie industry has been dipping its toes into increasing the image rate, to give movies more impact. Last year, the movie *The Hobbit: An Unexpected*

*Journey* was made at 48 frames per second (called HFR – high frame rate) rather than the usual 24. But guess what? Public reactions to the HFR version of *The Hobbit* were mixed. Some said it looked 'too real' – like the movie had been made on a set (which of course it had). The more real the technical parameters make it look, the more warts you will see. By making the image 'better', the higher frame rate had reduced the viewers' suspension of disbelief for the fantasy drama.

## TV AND HFR

In recent times, we have been considering higher frame rates for broadcasting, going beyond 50 and 60 for new TV systems, up to 100, 120, or 150 images per second. There should be a dramatic improvement in the sense of realness of the TV experience. In particular, when objects move in a scene – at a speed slow enough for our eyes to follow – they will be sharper and closer to the way things are in nature. This is surely going to be eye-popping for sports coverage as you'll have the best seats in the house. There are more advantages: images with higher frame rates do not call for the mental gymnastics needed when watching 3DTV (known as the accommodation/convergence conflict), yet bring more reality to the images.

## WHICH TO CHOOSE?

So, should we go for higher TV frame rates which will be marvellous for sports coverage, but may weaken our suspension of disbelief, at least with certain kinds of movie and TV drama on TV? Who knows what other kinds of content such as news or documentaries would benefit most from? What is more, TV and movie technology continue to converge, and will surely soon be one and the same.

What to do? You may say it is avoiding the problem, but how about a system that allows both higher and lower (in fact variable) frame rates, which the producer of the programme chooses, and which are signalled to the TV set or movie theatre? This would give us maximum flexibility. What do you think?

# ACCESS ALL AREAS

FILE-BASED FACILITIES, LEGISLATION AND INNOVATIONS IN STREAMING TECHNOLOGIES, SUCH AS MPEG-DASH, ARE DRIVING A RENEWED INTEREST IN SUBTITLING TECHNOLOGY AND OTHER ACCESS SERVICES. THE EBU AND ITS MEMBERS ARE ACTIVE ON VARIOUS DIFFERENT LEVELS WITH INNOVATIVE PROJECTS AND INITIATIVES.

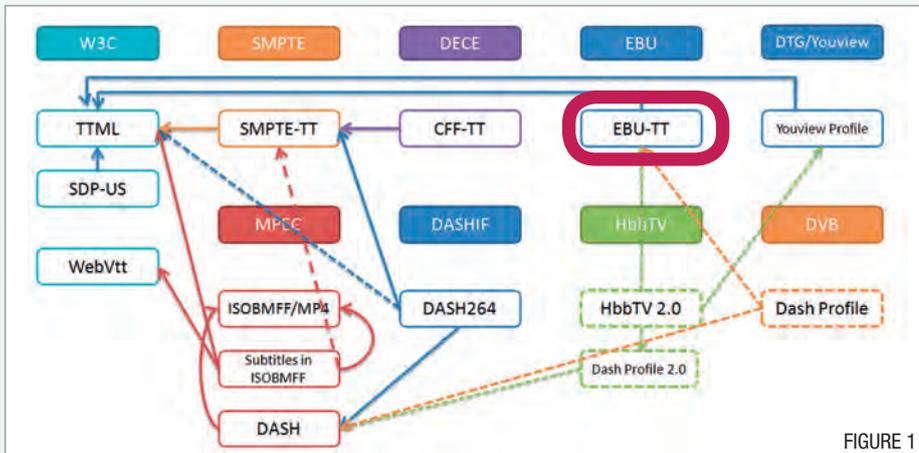


FIGURE 1

This summer, the EBU published a new subtitling specification (EBU Tech 3360), which explains how to map subtitles from EBU STL to EBU-TT, the new XML-based subtitling format introduced last year. The EBU-TT specification was not created due to STL being unpopular; on the contrary, many 100,000s of STL files exist in broadcasters' archives worldwide. And the format is still used today to provide programmes with their much desired lines of text. However, it is widely recognized that the future belongs to more text-based, less binary formats that remove certain constraints like the limitations on character sets. This counts especially for online

distribution.

By bridging the binary format STL and the text-based format EBU-TT, the EBU provides a convenient transition path for STL users. And this is without any loss of data, because the original STL file can be 'tunnelled' in the new EBU-TT files.

The EBU-TT work fits into a larger picture of subtitling format innovations, most of which are based on the W3C Timed Text Markup Language (TTML). In

although more led by broadcaster initiatives such as HbbTV.

The most important question currently being addressed is how to provide subtitling capabilities in MPEG-DASH and other online transport mechanisms. For this, key questions around timing, segmentation and content complexity need to be resolved. The EBU is providing an open discussion forum and intends to publish a practical solution, called "EBU-TT-D" (D for Distribution).

The aim of all the EBU's work in this domain is harmonization, by minimizing divergence between specifications and adopting existing solutions as much as possible. A first study into the overlap of the various available specifications (most of them shown in Figure 1), shows there is a good chance to define a common subset, helping interoperability and reducing costs.

A third aspect on which the EBU is actively working is live subtitling, especially as far as the production side is concerned. Current implementations do not provide standardized, future-proof solutions. In particular service handover, capture of data

for future re-alignment, and segmentation for various transport mechanisms require

attention here. The EBU's work in this domain is expected to result in EBU-TT part 3 – "Live Subtitling" next year. *Frans de Jong (EBU)*

## Transition to timed text

the USA this work is driven mainly by FCC regulations that demand online streamed programmes to be captioned; in Europe the biggest driver also is online deployment,

### Project Report

The German ARD broadcasters – BR, HR, MDR, NDR, RB, RBB, SR, SWR, WDR and Deutsche Welle – all share a common online archive, called ARD Mediathek. The XML format EBU-TT-D-Basic-DE will be used for this catch-up service. It is a profile based on EBU-TT part 1 (Tech 3350) and closely aligned with the upcoming EBU-TT-D specification.

The ARD profile was created by the IRT

relevance were three main requirements they had in mind. By using a basic subset of EBU-TT, the German broadcasters provide for an easy export from products implementing a wider EBU-TT profile like the upcoming EBU-TT-D, while guaranteeing minimal complexity for current product implementations.

Examples of where the complexity of the profile is minimized are the choice of text colours (only the eight "teletext colours" are allowed) and the restriction to two regions (with only the "top" and "bottom"

## ARD Mediathek uses EBU-TT

together with the ARD broadcasters. It had a review audience of around 70 representatives from broadcast operations, the subtitling editorial departments and the online divisions. Simplicity, speed of availability and practical

positions specified). The German EBU-TT profile is now being implemented by broadcasters and manufacturers of subtitling editing software and the feedback on it has been positive. *Andreas Tai (IRT)*

26.07.2013 | XML-Format for Distribution of Subtitles in the ARD Mediathek portals (EBU-TT-D-Basic-DE)

Initiated by Rundfunkbeiträge IRT

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SOME EXAMPLES OF THE DIFFICULTIES FACED BY OCR SOFTWARE IN TRYING ACCURATELY CAPTURE SUBTITLES.

Since March 2012, Dutch broadcasting organisation NPO has been using optical character recognition (OCR) technology on its three main TV services to convert in-vision translation subtitles to spoken subtitling audio. With spoken subtitling, a synthesizer reads the words of the titles aloud, making foreign-language programmes more accessible for people with serious sight problems. In the Netherlands the potential audience for this service, which has been running since 2001, is 430,000 people.

Dutch public broadcasters provide translation subtitling for virtually all of their foreign-language programming\*. The need for the OCR system arose due to the fact that separate Dutch subtitle files were available for only 70% of the programmes. And the percentage is actually decreasing, with a growing tendency for imprinting subtitles in the video signal

– so-called burned-in subtitles. With no off-the-shelf system available, NPO decided to create its own. Tough requirements for the project were set: a simple and efficient architecture should convert 99% of words correctly, ignoring foreign languages but capturing punctuation marks, and with the output available a maximum of 300ms after the first frame in which the subtitle appears.

The system was developed in conjunction with Dutch research organization TNO and Prime Vision, a company that originally provided character recognition technology for postal markets. NPO's playout provider Ericsson Broadcast Services integrated the system in NPO's

EBU Technical Review article, but the short message is that the project has been a great success. In fact, NPO has concluded that the data generated by the system is of such excellent quality that it is now the only source for spoken subtitles. Equipment previously used to derive the data from subtitle files has been dismantled, bringing the added benefit of increased reliability in the playout chain and decreased costs.

Perhaps the best measure of success comes from the people that actually use the service: the target audience is reported to be very satisfied with the improved services and complaints have fallen to a minimum. *Marco Slik (NPO)*

*\* Only broadcasts aimed at young children are dubbed. Additionally hard-of-hearing subtitles are provided for 95% of all programming, making the Dutch one of Europe's leaders in terms of broadcast accessibility.*

## OCR for spoken subs

broadcast chain.

A detailed overview of technical aspects of the system is presented in a forthcoming



At this year's EUROVISION Media Summit in May, Gion Linder (SWISS TXT – pictured) was elected as the new chairman of EUROVISION's Access Services Experts Group. The group has the objective, amongst others, to stimulate and support the exchange of technologies, products and services in the domain of accessibility. This means it also includes, for example, audio

description and signing. According to a survey carried out just prior to the Summit in Brussels, EBU Members value highly the definition of standards (72.7%) and the sharing of knowledge (88.6%). The EBU Technology & Innovation team keeps close contact with the EUROVISION group to align on relevant issues, including the use of EBU-TT and operational practices regarding live subtitling.

# Changes ahead in European media regulation?

THE BUZZ AROUND CONNECTED TVS, SECOND SCREEN VIEWING, SOCIAL TV APPLICATIONS – GENERALLY SPEAKING, MEDIA CONVERGENCE – HAS CAUGHT THE ATTENTION OF THE EUROPEAN COMMISSION OVER THE COURSE OF 2012 AND 2013. **WOUTER GEKIERE** AND **JACQUES LOVELL**, EUROPEAN AFFAIRS ADVISERS FOR THE EBU, OUTLINE THE MAIN DEVELOPMENTS.

Anticipating possible changes to EU media regulation brought about by media convergence, the European Commission issued a 16 page “Green Paper” on 24 April 2013, asking audiovisual stakeholders: “What’s in it for you?”

Alongside the EBU, electronics manufacturers, audiovisual producers, commercial broadcasters, online film services and other interested parties were asked to submit their views by 31 August 2013.

## WHAT’S IN A GREEN PAPER?

So-called Green Papers are in most cases a crucial first step in the EU law-making process and provide a basis for the European Commission to hear different views. As the institution in charge of proposing draft legislation to the European Parliament and EU Member States, the European Commission usually tests the climate by putting down some basic views on a given subject, and tables a number of questions to which all relevant players – “stakeholders” in EU-speak – are invited to respond.

When issuing a Green Paper, the European Commission gives a clear sign that it has identified a potential need to draft new laws. Though the paper in itself has no direct regulatory impact, the basic views put forward by the Commission and the responses gathered from stakeholders shape future policy discussions and indicate whether there is a genuine need to review existing laws or create new ones from scratch.

In this specific case, the fact that the Green Paper has been published one year ahead of the EU elections and the renewal of the European Commission in 2014 means that the results of the consultation will be passed on to the next administration as a basis to continue work. In parallel, in July 2013 the European Parliament finalized its own views in a report on Connected TV.

## MULTIPLE DIMENSIONS

When reading the European Commission’s “Preparing for a Fully Converged



Audiovisual World: Growth, Creation and Values” Green Paper, one might be struck by the number of issues covered in a mere 16 pages.

Anticipating that media convergence – “the progressive merger of traditional broadcast services and the internet” – may erode the “familiar twentieth-century consumption patterns of linear broadcasting” and provoke a “shift from ‘lean-back’ consumption to active participation”, the European Commission is fundamentally inquiring whether media convergence requires an overhaul of existing European rules for the audiovisual sector – or whether things could still work with some fine-tuning or the development of self-regulatory approaches from the industry.

Though the Audiovisual Media Services Directive is clearly earmarked as a potential target for revision, the

paper looks into the future audiovisual industry market structure and financing, the interoperability of connected devices, infrastructure and spectrum allocation, and the impacts on media freedom and pluralism, as well as advertising, the protection of minors, and accessibility for the disabled.

When it comes to technical issues, the paper asks in particular whether it is necessary to develop interoperable market standards, and whether radiofrequency spectrum allocation and sharing models can facilitate development opportunities for broadcasting, mobile broadband and other applications carried in the same frequency bands.

## KEY EBU TALKING POINTS

Involvement from an early stage in this process, which might lead to significant changes in how the audiovisual sector is regulated in Europe, is naturally an important issue for the EBU. In fact, the EBU’s response to the paper, which is under preparation as we draft this article, will be the result of an impressive concerted effort by the EBU, involving legal, regulatory, technical and political experts from across the EBU and its broad membership.

The EBU will seek to highlight the opportunities offered by media convergence but also indicate where risks may lie, drawing in particular on the fact that the strongly regulated world of European broadcasting meets the “Wild West” internet environment. The EBU will specifically stress the importance of meeting audience expectations and ensuring that high quality content with social, cultural and democratic value can still be easily accessed, warning that more content does not necessarily add up to better content.

The EBU will also underline the key role played by public service media in driving hybrid systems and digital technologies, standards and innovation, while emphasising the efficacy and relevance of the digital terrestrial platform as a means of reaching mass audiences on a free-to-air basis and completing offers delivered through the open internet.

# Broadcasting's next big thing?

BINAURAL SOUND HAS BEEN IN AND OUT OF FASHION OVER THE YEARS; WHILE INTEREST SEEMS CURRENTLY TO BE ON THE RISE, IT REMAINS A FRINGE TECHNOLOGY FOR BROADCASTERS. THE EBU'S **MATTHEW TRUSTRAM** FINDS EVIDENCE THAT THIS MAY BE CHANGING.

Perhaps it's because we live in an age where headphones have become fashion accessories, or because the idea of 'immersive media' has grown popular in recent years; one way or the other binaural sound seems to be everywhere at the moment (if you'll pardon the pun).

For all the talk though, the technique, which replicates location cues used by the human auditory system to deliver a full 360-degree immersive audio environment over headphones, remains on the fringes of broadcasting. The EBU's workshop on Immersive Audio over Headphones in May offered some interesting clues as to binaural sound's prospects as a mainstream platform for broadcasters.

## PRODUCING BINAURAL

On the face of it, it is perhaps surprising that binaural sound is not already in common use, for its simplicity if nothing else. At the consumer end, delivery requires nothing more specialized than a pair of ordinary headphones, and producing it from a live audio source is barely more complex, involving simply recording through a pair of finely balanced microphone capsules placed either in a real person's ears, or those of something manufactured to do the same job (such as the KEMAR dummy head). Despite this technical simplicity, binaural sound offers great improvements over '2D' stereo, allowing listeners to determine the height of sounds on the vertical plane, as well as to clearly position sounds originating behind them. The effect, particularly on first time listeners hearing a low-level airplane flyover or footsteps approaching from behind, is quite striking.

Interestingly, the advantages of binaural recording don't end with spatialization: the BBC's Paul Newis described its use in a documentary, where it was used to provide the background sound layer of a Chinook helicopter so accurately that service personnel could later name the call sign of the actual vehicle used. It's also reported that binaural recordings help listeners to distinguish multiple voices speaking simultaneously, as in, for example, round table panel show formats.

Production-side complexities do, however, creep in when binaural sound

THIS KEMAR DUMMY HEAD, ENGINEERED FOR ACCURATE BINAURAL RECORDING, WAS ONE OF THE WORKSHOP'S MORE UNUSUAL PANELLISTS.



is produced from anything other than a straightforward recording of a real-world, linear audio environment. While it is possible to synthesize binaural audio from multichannel sources such as 5.1, the problem of 'personalization' (since our auditory systems are as different from one another as our fingerprints) means that any one excerpt will have varying levels of perceived fidelity across the population. The workshop did, however, point to interesting research (e.g. the BiLi project, [www.bili-project.org](http://www.bili-project.org)) that could yield solutions in the near future.

Next are the problems thrown up for producers by the addition of an auditory 'viewpoint', which, as well as requiring a consistent use of the binaural technique (switching between binaural and non-immersive stereo is destabilising for the listener), gives producers added responsibilities to ensure the listener's position is clearly and consistently established. Furthermore, traditional editing operations such as cross-fading and layering tend to be to the detriment of the binaural effect, and can therefore not be relied upon. Here the solution may lie in the codification of an 'object-based' production methodology that would give producers control over each audio object's position. This would carry the additional advantage of being platform agnostic; an object-based audio file could be reproduced optimally for binaural, 5.1,

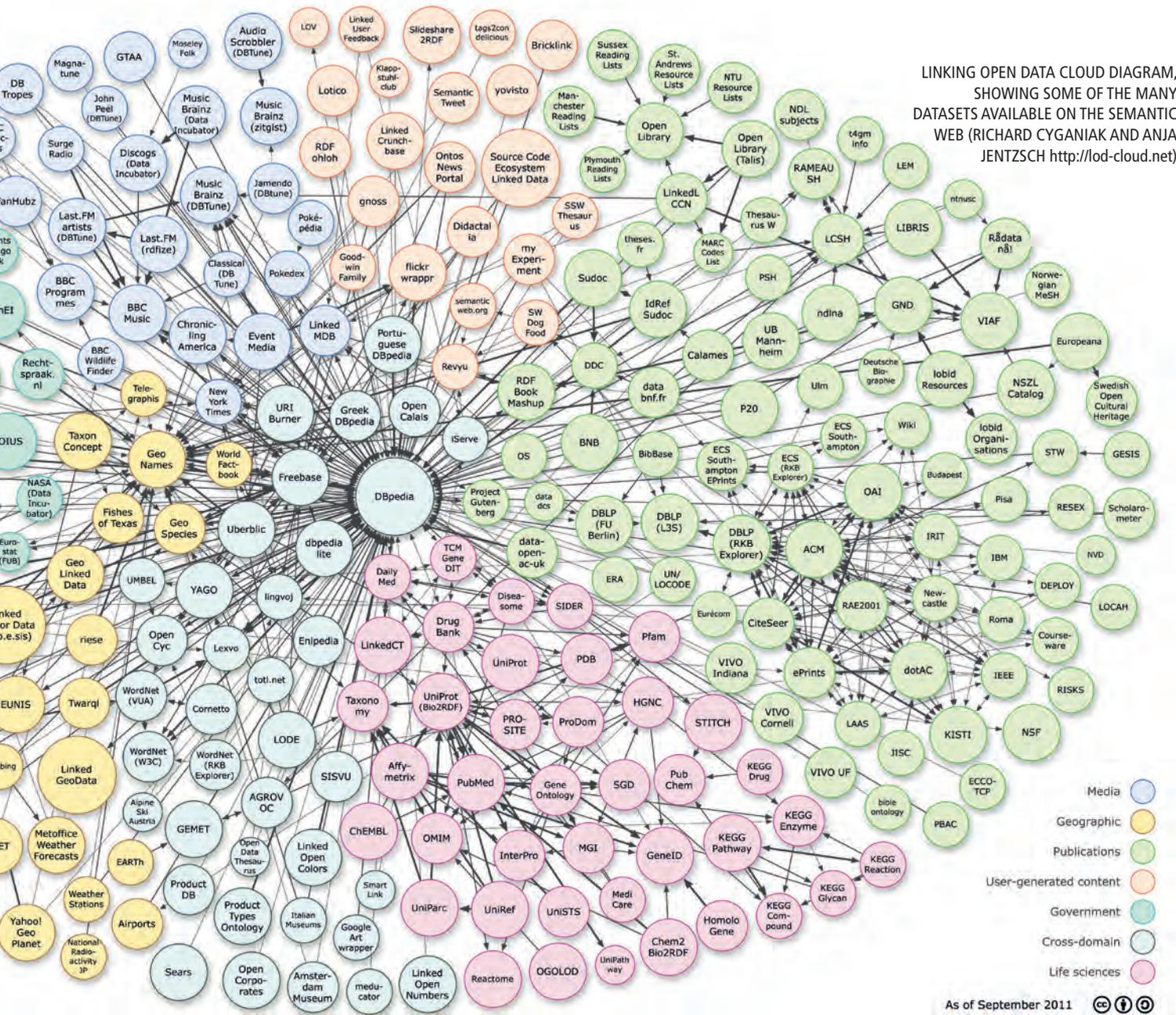
7.1, or, theoretically any multichannel array.

## LEAN-FORWARD LISTENING

A third, and perhaps more profound challenge for binaural sound was identified by the BBC's Chris Pike (chair of the EBU 3D Audio group). Subjective user testing in the UK evaluated the performance of different systems for producing binaural sound from multichannel sources, and, perhaps surprisingly, failed to identify a strong preference for binaural sound over stereo down-mixes for many audio content types. Extrapolating from this, one could reasonably draw the conclusion that listeners simply do not always want to hear binaural, and, by extension, do not always want to be 'immersed' in content, whether it be audio or visual.

To understand this result, it is perhaps helpful to distinguish between 'active' and 'passive' listening (or, indeed, viewing). Listening to binaural sound – like viewing 3D TV or interacting with programming via second screens – requires an active, or 'lean-forward' mode of consumption. With a technical solution to the personalization of binaural sound, and a robust production methodology, all that will remain will be for broadcasters to identify the best opportunities to wow their (active) listeners with the remarkable effect of binaural sound.





LINKING OPEN DATA CLOUD DIAGRAM, SHOWING SOME OF THE MANY DATASETS AVAILABLE ON THE SEMANTIC WEB (RICHARD CYGANIAK AND ANJA JENTZSCH <http://lod-cloud.net>)

to another. In all cases, validation will be required using one of the validators also available on the web, like from W3C.

You may also prefer tools proposing a more intuitive user interface for defining classes and properties (Protégé from Stanford University, TopBraid, Neon Toolkit, etc.) without directly writing code. These tools will eventually generate code, which you may use to learn and as the basis for more advanced developments, if desired. They also often integrate reasoners, validating/analyzing your ontology and inferring more relations between classes (making your model richer and ready for advanced queries).

These tools will help familiarizing yourself with basic ontological concepts. They will also help you optimizing your models, the ultimate goal of which should be to enrich your queries and let you or your users obtain what is relevant.

Many resources can be found on the web in different formats. As one example, the EBUCore ontology is available in RDF/XML for everyone to download and analyse or further implement from <http://www.ebu.ch/metadata/ontologies/ebucore/ebucore.rdf>

The corresponding html documentation is accessible from <http://www.ebu.ch/metadata/ontologies/ebucore>

More resources are available from <http://www.ebu.ch/metadata/ontologies/skos> with all EBU Classification Schemes (such as the genre and role lists) expressed in RDF/XML using the SKOS (Simple Knowledge Organization System) ontology.

## TO THE FUTURE

The market is sending early signals that semantic information will become an essential enabler for finding services and searching / retrieving content. Broadcast production solution providers have already proposed semantic based tools for asset management and archives. Of course, distribution is already in motion with schema.org (initiated by Google, Yahoo!, Microsoft, Yandex) for which BBC and the EBU have proposed extensions for radio and television programme description and publication event data to be inserted in HTML pages. Be part of it!

The EBU's **Metadata Models Project Group** brings together those interested in making the semantic web work for broadcasting. You can follow or contribute to the group's work. Visit <http://tech.ebu.ch/pmag> or contact Gunnar Dahl ([gunnar.dahl@nrk.no](mailto:gunnar.dahl@nrk.no)) or Jean-Pierre Evain ([evain@ebu.ch](mailto:evain@ebu.ch)).

# EBU

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PHOTO OF TALLINN TV TOWER BY MABRO LEPPIK VIA TOURISM.TALLINN.EE ON FLICKR. (CC BY-NC-SA)

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