tech-*i*

INSIGHT FROM EBU TECHNICAL

Contents

Issue 06 December 2010

Are we gambling on interference?

The new models and methods to protect broadcast services - PAGE 6

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3D TV – GO DEEPER

3D TV has generated an enormous amount of interest in the industry following the latest success in the screening of a number of prestigious sports events to cinemas. With many of the World Cup games screened in 3D, viewers were able to experience 3D TV in the comfort of their home sooner than expected. Further 3D TV channel launches have been announced and within a very short period viewers will have a bouquet of 3D TV services to choose from.

Ericsson has been active in the 3D TV arena for some time and recently announced that it is providing ESPN, the industry's first 3D sports television network, with a complete standards based 3D TV video solution featuring Encoders and Professional Receivers tuned for ESPN 3D broadcasts as well as for high quality HD. The complete end-to-end solution supports the highest picture quality from venue to viewer. ESPN has deployed a wide range of Ericsson 3D and HD products including the complete solution for direct-to-home and contribution and distribution of 3D content.

Ericsson's unique 3D contribution solution is based around the latest CExH42 encoder that offers advanced contribution features, such as 4:2:2, 10 bit precision and 1080p50/60 formats. When fully configured, the encoder can deliver full HD resolution for both left and right 3D channels with a single MPTS output for distribution direct to the studio. Once received in the studio the dual channels are decoded by the RX8200 Professional Receiver in preparation for studio processing. Left and right channels remain perfectly aligned through use of Ericsson's unique Simulsynch-3D technology, an option available on the RX8200 Receiver. When not in use for 3DTV applications, the equipment can be readily re-purposed for other high quality contribution applications.

To learn more about Ericsson's 3D TV contribution and distribution solutions please contact us :

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In a world of ever more devices, the traditional response of the media organisation is a multiplatform strategy. But what we can easily forget is that the consumer is not able to consume media in a similar way across different devices. What the consumer does is shaped, in part, by his or her media context.

In recent years, consumers and media organisations have been overwhelmed by new media consumer devices, and by new types of applications and services related to media. The original way to cope with this was to develop a multiplatform strategy. In essence, taking the same structured content (text, photo, and video) and publishing these to different platforms or devices, but with different styles or interfaces.

What we easily forget is that the consumer is not able to consume media in a similar way across different devices. The consumer's habits are shaped by his media context. This media context is the combination of the circumstances he finds himself in, the type of devices he has around him, and the network connectivity he has at that moment.

I have argued that there are three general media contexts: shared, personal and mobile. There is some interrelationship between their uses: especially around expected quality, interactivity, screen size, and attention span. Most of the devices and new services that have come into the market can be positioned under this framework.

The shared context is typically the situation where you consume media together with other people, typically in front of an enormous screen with the latest technologies like HDTV or maybe in the future UHDTV and 3DTV. The screen size is enormous, the expected quality (video + sound) high, the attention span is long, and the interactivity is rather limited. People want to be surprised, informed and entertained. Here people expect linear and on-demand TV in high quality. Hybrid platforms (open standards) are relevant here for minimal interactivity and basic applications and services, mostly for the catch up services.

The personal context is typically the situation where you consume media alone (physically alone) or in a personal way (your own experience). The screen size is typically smaller now, the expected quality moderately high, the attention span moderate, and the degree of interactivity higher. This context can happen in a separate place, or also in front of the shared medium.

In the first, the objective is to consume media in a personal way, in the second it can be an extension to what is happening on the primary (shared) screen. This is the 'second screen' concept. In the past many people used laptops sitting in front of their TV sets; but in the future this is likely to be replaced by tablet devices. We will use it for non media related activities like email, but for media organisation it can be the gateway for real interactivity and personal services. People will search for more in depth information around an item on the big screen, vote, give feedback, or inform their friends. This is the situation where real and personal interactivity will take place. Here are opportunities for more personal services and targeted advertising.

At the other extreme, there is the mobile context. In this situation you want to have the media at your fingertips, and experience it very personally. The screen size is small, the quality doesn't have to be perfect but the level of interactivity and clicking will be high. You control the device. The attention span is extremely short. You want to be briefed, fast and on the spot – 'Tell me now, show me now'.

Media planning is the art of understanding your 'target group' by putting the right programme on at the right moment on the right channel. In a world of more devices and more connectivity, the concept of media planning needs more dimensions. What was linear media planning, needs to become media matrix planning. The content and services you provide must be matched to different media contexts.

This will call for new creative talent, technical talents and inspiration, but it must be done.

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Is it my mother-in-law, or the 3D, that's giving me a headache?

In his ongoing series of articles on 3DTV, David Wood explores some of the factors that can affect the quality of perception.

The route to 'First Generation' 3D television (S3D) requires journeys down many roads. These include the development of broadcasting formats for different circumstances where different degrees of existing and new equipment are needed by the viewer. These are being considered in the DVB Project as 'Phase 1 3DTV' and 'Phase 2 3DTV'.

As well as this, there is much work to be done on production technology for 3DTV, including developing rules for production grammar that will provide programmes that are most comfortable to watch. We also need agreement on file formats and other aspects for production. The EBU 3DTV Group, led by Andy Quested, BBC, is studying these issues, and their progress will be reported in a future issue of Tech-i.

But at the same time as these tools for production and broadcasting are developed, everyone working in 3DTV needs a general understanding of the factors that affect the quality of perception of 3DTV. This article is a short introduction to them.

The science of the perception of images is termed 'psycho-physics', and our question is thus, for the psycho-physics of 3DTV, what is important – what matters?

In a 2D television environment, we have only to concern ourselves with picture quality evaluation itself – sharpness, resolution, colour fidelity, degree of artefacts, etc. The ITU has well defined methodologies for evaluating the 'subjective' quality of TV images.

In a 3D television environment, we have a lot more to concern ourselves with. New ways of evaluating 3DTV systems are needed, which may include, but also go beyond the classical subjective evaluation methodologies used for 2DTV. These have not yet been formalised, but ideas of how to do them are emerging. For example, the author proposed that quality evaluation of 3DTV should be made based on subjective evaluations using 50" screens at five times picture height. There are reasons why this is a good combination, because it removes some possible elements of bias in the testing.

There may be other (and better) ways of breaking the psycho-physical issues down to manageable portions, but one way is to consider the problem in three chunks, but which are all inter-related to an extent:

- The realism ('quality') of the image
- The eye discomfort associated with using the system, and
- The degree of eye fatigue that the system causes.

If we look further at these three individually, we find a number of sub-elements which influence them.

For our first area, we can find five factors which influence the quality of realism of the image (assuming the programme maker's intention is to achieve maximum realism).

These are as follows:

- The basic quality of the Left and Right eye images themselves. All of the elements that affect 2D images come into play. It matters whether the image (using the ITU acronyms) is 'LDTV, SDTV, EDTV, HDTV, or UHDTV'. The 3D quality will get better as we step up the '2D quality'. It is because we have HDTV today that 3DTV becomes more attractive than it was in the SDTV and EDTV days.
- The potential depth resolution of the 3D images. S3D systems fold depth information into the Left and Right eye pictures by virtue of the disparity between them, and thus the depth resolution is determined by the horizontal resolution of the Left and Right

Allowing a central object like the camera to project slightly forward of the screen plane makes a high impact 3DTV picture. [Anaglyph glasses are needed to view this photo correctly]

images. It matters whether there are 720, 960, 1280, 1440, or 1920 samples per line; and, all other things being equal, the potential depth resolution increases with each step.

- The geometrical congruency of the objects in the scene. This is the relation of the width/height/depth of objects. Quality is affected by the relationship of width to height to depth of objects in the 3D images compared to those in real life. Do they look the same as they do in natural vision? Do they look 'right'?. Or are they like cardboard cut-outs, or people with 'octopus arms'. How 'right' they look is determined by factors such as camera lens angles.
- The apparent size of objects in the scene. This is the extent to which their size matches normally perceived sizes. Do they appear as 'very small men and women' – the 'puppet theatre effect', or the opposite – the 'baby's eye view of the world'. This is mostly related to the spacing used between camera lenses, and how far it is from the normal human eye spacing, which is about 6.5 cm.
- The construction of the scene. This has an influence on the 'impact' of the scene, and thus on the perceived quality. An 'ideal' 3DTV picture (at least some argue) may have some central object which has elements that project just forward of the screen plane, but which do not 'violate' (cut) the TV screen window.

For our second area, we find three sub-issues that define the level of eye discomfort. These are as follows. As explained earlier, complete separation of the issues is not possible and there is mutual influence of factors.

- Ease of fusing the Left and Right eye images in the mind – ease of accomplishing the process technically known as 'stereopsis'. Our brain takes in the two images, and lays them on top of each other in the mind. It creates a single image with depth or volume – or at least it will do so provided the two images are adequately related to each other. This is affected by the amount of disparity or parallax between the Left and Right eye pictures. It is also affected by where the objects in the scene lie with respect to the 'screen plane' and the depth range. More generally, this fusing ability is affected by the goodness of the matching of the Left and Right eye pictures. One of the most critical issues can be vertical misregistration of the L and R images. Possibly the precision of time coincidence of the Left and Right images may also be a factor.
- Comfort level associated with glasses. The weight, elegance, level of light attenuation of the glasses affects the 3D experience.
- The production grammar used in making the programme can affect eye discomfort. One need is for the depth plane of the principle object in the scene not to change dramatically on shot/scene cuts, and the extent to which the principle objects are placed in the 3D 'favourite' location or 'sweet spot', which is at, just forward, or just behind the screen plane.

There is good 3D, and bad 3D. BBC's Andy Quested takes IBC delegates through 3D.

For our third area, we come to that for which there may be least knowledge available today. This is the sensation beyond eye discomfort, which might be called eye fatigue. Eye discomfort can turn to eye fatigue, which is something experienced after viewing for a time. There can be mild nausea, or a kind of seasickness, or irritated eyes. They can be due to many of the factors which are described earlier in the article. They may lead to conflicting balance cues. The old enemy of accommodation-convergence conflict, where we try to focus on the 'apparent' position of the object, can be a contributory factor. One of the important questions that we need to answer is whether there may be residual effects of watching 3DTV.

So why do these all occur? At heart it is because S3D in NOT natural vision – it is a limited 'subset' of it. The S3D camera (like all cameras) does not record the phase of the light, just its amplitude. The 'phase' of the light wave we see in 3DTV is the phase of the TV screen, not the original objects. No focus depth cues are available, and only one pair of views are available, wherever your head is. We can never 'lie down on the settee' and watch 3DTV, even wearing the glasses. It only works when the viewer is sitting or standing vertical.

There is much research to be done on the psycho-physics of 3DTV, and until we know more it may be sensible for broadcasters to urge viewers to take off the glasses if they feel the slightest eye discomfort, and possibly not to watch for long periods without having a pause without glasses. 3DTV can be a very exciting experience, but let's take care.

> "The science of the perception of images is termed 'psycho-physics', and our question is thus, for the psycho-physics of 3DTV, what is important – what matters?"

New Approaches

Terry O'Leary sets out the new models and methods being developed by the EBU Technical for calculating and limiting interference to broadcast services.

Introduction

The Stockholm'61 Plan for analogue television has been superseded by the more efficient digital DTT GE'06 Plan, in particular in the 470-862 MHz frequency band. The increased efficiency of modern digital technology, as expressed in the GE'06 Plan, has given rise to what has been termed the 'digital dividend'.

In order to exploit the digital dividend in the most diverse ways possible, spectrum in the range 790-862 MHz was allocated, on a co-primary basis, to mobile services at WRC(07). As a result of this new allocation, broadcasters are faced with the threat of interference arising from dense networks of IMT base stations with which they will be sharing frequencies.

In addition, as part of its digital dividend strategy in the band 470-790 MHz, the CEPT intends to allow cognitive radio devices (sometimes called 'white space devices', WSDs) to use spectrum 'interleaved' between operational DTT frequencies (i.e., the 'white spaces') on a non-allocated basis. This means that WSDs would be allowed to operate in that band subject to the restriction that they will not cause harmful interference to primary DTT services to which the band is allocated, and will not be protected by the primary DTT services.

In both cases, new interference scenarios have been introduced that require new approaches for ensuring protection to existing and future broadcast services. We detail below what new approaches EBU Technical has been developing.

Co-Channel IMT Base Stations

In the past, the main sources of interference to television broadcasters were the signals of other television transmitters operating on the same or adjacent channels. High power co-channel television transmitters, hitherto the main source of interference, are usually arranged in 'sparse' networks in which the closest interfering transmitters are situated with distances of 10's of kilometres separation. This means that, in any given DTT 'small' reception area, it can be expected that only a very limited number of interferers will be of significance. In this case, additional effects of 'cumulative' interference are small and can be treated using known (analytical) methods developed in the past.

In contrast, a dense IMT base station network may use hundreds (or even thousands) of base stations, operating on a single frequency, in an area covered by a single DTT transmitter. Thus, with the entry of smaller power, dense IMT networks, although the individual contribution of each IMT base station is smaller, the cumulative interference effects of hundreds of base stations can be very significant. In fact, EBU studies have shown that interference levels may be increased by 20 dB or more, as compared to a single IMT base station. This means that a broadcaster might accept the introduction of a multitude of IMT base stations on the basis of the individual interference due to each single IMT base station, but when the cumulative effects of the entire IMT network are taken into account, it would turn out that the resulting interference level would completely destroy the DTT reception.

In Figure 1, the differences between a DTT network and a dense IMT network are shown. In the area depicted by the blue star within the lower DTT coverage area (large circle), reception would be degraded primarily by the 2 co-channel DTT transmitters in the upper DTT coverage areas. Due to the high density of the IMT base station network (depicted by the small red circles), the interference within the blue star would be the result of the contributions of a far larger number of interferers in close proximity.

WSDs & Mobile IMT Handsets

WSDs and mobile IMT handsets with low power may be able to operate inside a DTT coverage area using a channel adjacent to that used by the DTT transmission. However, this can (and will!) give rise to little 'pockets' of interference centred at the WSD. This is due to the fact that the interfering field is extremely high near the WSD and becomes smaller as the distance from the WSD increases. See Figure 2a for a pictorial representation of adjacent channel WSD interference effects.

The WSD and IMT powers must be constrained to appropriate low levels so that the 'pockets' are very small, of the order of 1 m radius. (Note that, although in principle WSDs are not supposed to interfere at all with DTT services, for the sake of 'efficient spectrum usage' some minimal interference has been deemed to be acceptable.) Because of the nature of WSDs (handheld, mobile), many WSDs, operating on various adjacent channels, may be employed anywhere within any DTT coverage area. Figure 2b gives an indication of the randomness of the WSD positions. Note that these positions may be 'appearing'

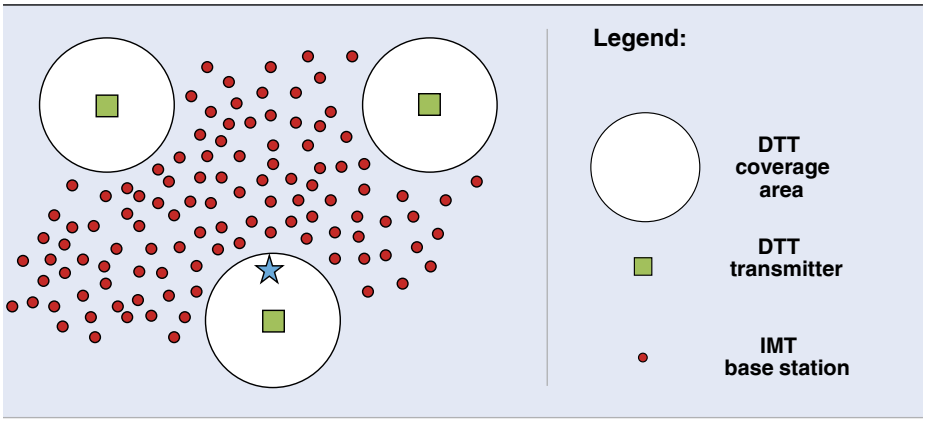


Figure 1:
Co-channel broadcast (BC) network and co-channel IMT base station network. Whereas the interference contribution to BC from a co-channel BC network may be about 3 dB higher than from a single BC transmitter, the interference contribution to BC from a co-channel dense IMT network may be about 20 dB higher than from a single IMT transmitter.

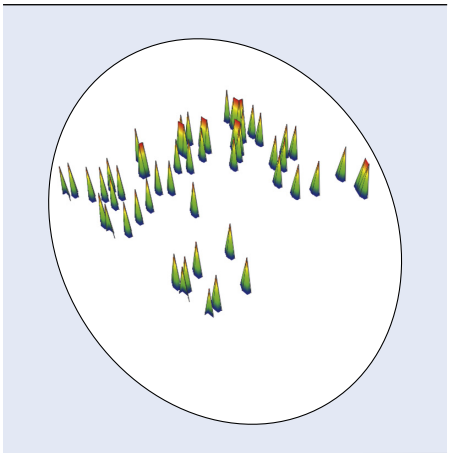


Figure 2a:
'Pockets' of local WSD interference.
The interference contribution to BC coverage (inclined circle, appearing as an ellipse) from an adjacent channel WSD forms a 'pocket' of interference surrounding the individual WSD. Here the little upwards-pointing 'cones' represent the interference levels within the interference 'pockets' surrounding the WSDs. The red vertices represent the highest interfering fields, and the blue bases the lower interfering fields, beyond which the **interference would be considered 'acceptable'.**

and 'disappearing' as the WSDs are turned on or off and also may be moving as the WSDs are transmitting.

Adjacent Channel IMT Base Stations

An additional interference problem may arise if adjacent channel IMT base station networks are working inside of DTT coverage areas. This situation is similar to that described in the previous section (see Figures 2a and 2b), the only difference being the fixed positioning of the base stations and their generally higher transmit power.

It should be noted that this potential adjacent channel problem is so severe that many CEPT administrations are considering leaving DTT channel 60 empty (and removing any existing DTT networks in that channel) in order to avoid adjacent channel interference from an IMT base station using channel 61.

DTT Protection

As was the case during the preparation of the GE'06 Plan, the protection criterion used to protect DTT transmissions is based on the concept of location probability. In general, broadcasters consider a small area of about 100 m by 100 m (a 'pixel') as being 'covered', if 'acceptable reception' is ensured for 95% of the sites within that 'pixel'. Reception is 'acceptable' at any given site if the ratio of the wanted signal strength to that of the total combined interference (including noise) is greater than a reference value called the 'protection ratio'.

In dealing with the new sources of interference (i.e., IMT base stations and WSDs) broadcasters would still like to define coverage in terms of pixels and location probability.

New Calculation Methods

For one or two interfering sources (e.g., interference for DTT vs. DTT), simple analytic approximations are available for estimating location probabilities.

However, for calculating interference in the new situations (i.e., DTT vs. dense IMT networks and mobile IMT handsets and WSDs), new difficulties have arisen when trying to estimate/limit interference, due to the large numbers of interferers which must be taken into account (e.g., for IMT base stations) and/or the mobility of the interference sources (e.g., for WSDs).

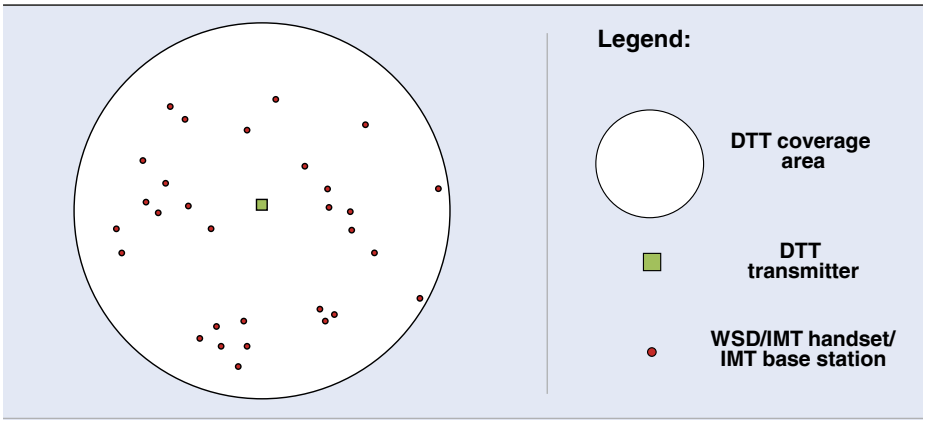


Figure 2b:
Broadcast (BC) coverage area and adjacent WSD/IMT (mobile) handsets and IMT base stations.
The interference contribution to BC from a (random) set of adjacent channel WSDs located randomly, and moving randomly, within the BC coverage area must be calculated using statistical methods (e.g., Monte Carlo techniques).

> There are many excellent solutions now available in the internet media distribution market and there is a good prospect of more solutions to come in the near future.

New models and methods for performing the required calculations have been under development within the EBU for the last few years. These methods are based on what is called a 'Monte Carlo' approach. This approach (as the name might suggest) employs 'random numbers' in a way reminiscent of gambling, perhaps as carried out in Monte Carlo (or anywhere else for that matter). In particular, it is an approach which allows a very precise evaluation of probabilities in cases where there are a large number of 'random' variables (e.g., IMT base stations and powers, WSD locations, etc.) for which accurate analytical calculation methods are not available. In general, a Monte Carlo approach involves huge numbers of calculations, for which computer power is needed.

In the last few years, the CEPT has established several working groups to study the compatibility between DTT and IMT services and between DTT and WSDs. In addition, the ITU established a Joint Task Group to study the compatibility between DTT and IMT services. EBU Technical has been contributing heavily to the work of these groups in terms of defining new concepts relevant for the new compatibility situations, new models for calculation, as well as new methods for calculation.

In addition to the development of the new models and methods, EBU Technical has also been developing the required computer software for performing the calculations. Furthermore, EBU Technical has developed a proposal for a Monte Carlo methodology to be considered by the ITU-R as the basis of a new Recommendation for the treatment of this new type of interference situation.

Next Generation Handheld

As the work progresses on NGH, DVB's second generation mobile TV system, Alberto Morello and Vittoria Mignone report on the two pronged approach that could maximise synergies for DVB-T2 or telco networks.

DVB-NGH (Next Generation Handheld) is the next (and maybe last) piece of the jigsaw of second generation DVB broadcasting standards. They all target achieving a performance, in terms of channel capacity, that is close to the theoretical limit for such a transmission channel.

DVB's work on NGH started with a commercial analysis of the possible scenarios for the introduction of a successor to DVB-H, developed early in the last decade. It needed to take into account the experience obtained from DVB-H, and other mobile TV systems, and also the significant changes that have taken place in the last few years, both in the delivery and consumption of multimedia content.

When developed, DVB-H was intended to provide linear broadcast services (e.g., television and radio) for handheld devices. This was the relatively simple perceived need at that time. Nowadays, user demand for multimedia content is going through a profound change from traditional linear content consumption to a range of rich media content consumption. This consideration was a fundamental requirement for DVB-NGH.

Taking into account this evolutionary trend, DVB has launched a technical group to define an efficient, flexible and robust system to deliver rich media content to the mobile vehicular or pedestrian user. It will mainly be a terrestrial system, to be used in UHF broadcast bands, but may contain a satellite component, to benefit from its capacity to cover large geographical areas at low cost.

The design process was kicked off in the first quarter of 2010. A large number of worldwide companies cooperated in the TM-H group, under the chairmanship of Frank Herrmann of Panasonic. Given the good progress, the first commercial NGH devices may become available in 2013, which will facilitate success in the marketplace.

Despite the large number of technical solutions available today (e.g., DVB-H, MediaFLO, DMB just to mention some of them), mobile TV or handheld television has so far rarely been a success.

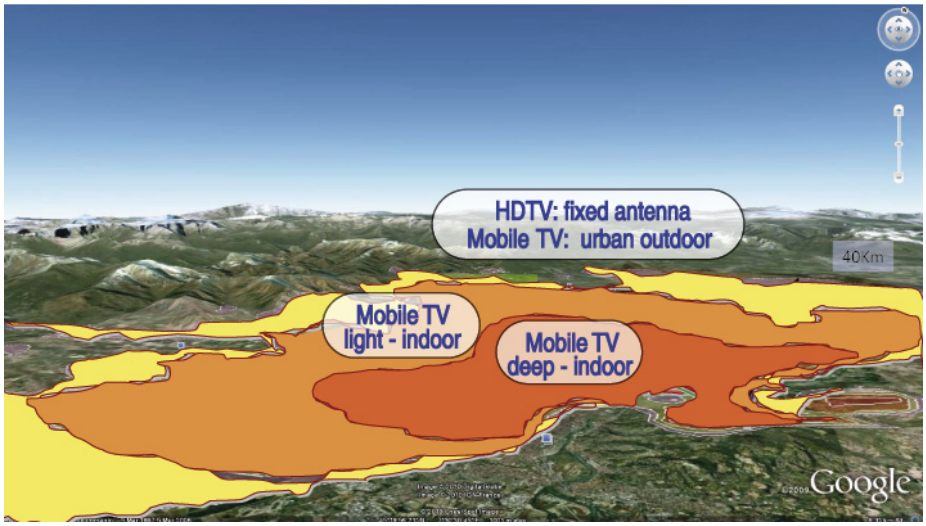
The main reason for this is generally considered to be the lack of an adequate 'business model'. Serious income is needed to sustain large investments for building transmitters, and for maintaining a specific 'cellular' network, if we are to provide deep-indoor coverage. There will also be the high costs for premium 'mobile-specific' content.

The experience indicates that, although consumers are interested in mobile TV and rich multimedia on-the-move, they are not interested enough to be willing to pay a subscription for conventional free TV content, and the demand for premium pay-per-view content is not sufficient to make the business profitable. Of course, the number of active users is a key factor for a broadcast business model, since revenues are proportional to the number of users, while the capital costs are fixed.

On the other hand, mobile broadcast systems which are integral parts of a terrestrial TV broadcast network may have more potential for success

This approach has two main advantages. Firstly, broadcast TV networks, with their large coverage and reduced number of

> User demand for multimedia content is going through a profound change from traditional linear content consumption to a range of rich media content consumption.



Using DVB-T2 and DVB-NGH combined may allow both HDTV and services to mobiles.

transmitters (coverage areas from hundreds to several thousand square kilometres), are significantly cheaper than ad-hoc mobile TV cellular networks (coverage areas of around one square kilometre in cities). Secondly, the introduction of a mobile TV service 'piggybacking' a fixed TV network can be made gradually, reducing investments in initial phases when revenues are low due to the limited number of users.

With first generation systems (DVB-H, DMB,...), a major difficulty was the weak error protection of the mobile signals, which was unable to exploit the low signal power penetrating deep-indoor in houses using a conventional TV network. Thus, a specific cellular network was necessary to increase the indoor signal level.

Two general approaches have been considered in the DVB-NGH discussion. The first could be called 'DVB-T2 centric' and the second 'Mobile Communication centric'. Each has advantages.

For the first approach, with a second generation system based on DVB-T2, there is a concrete opportunity to improve the mobile TV ruggedness by 7-10 dB, thus offering 'light-indoor' coverage (90% locations) 20-30 km away from a broadcast transmitter site. In fact, DVB-T2 has been designed to already take into consideration the possibility to operate in a mobile environment, including OFDM to mitigate multipath propagation and differentiated error protection and time-interleaving at service level.

Thus, with such a system, a gradual strategy of investments may be implemented, progressively moving from a low cost broadcast network to a denser network while revenues are growing. Therefore, it can be foreseen that in the initial phase, T2 and NGH services will coexist in the same signal, thanks to the flexible Future Extension Frames of DVB-T2, which are capable of allocating different transmission time slots to different types of services (e.g., HDTV for fixed reception and mobile TV).

Of course, in order to seamlessly integrate broadcast and two-way on-demand services, DVB technologies will smoothly interface with telco wireless broadband services on the user terminal.

This T2-based approach has been supported by the EBU Technical Committee with a specific strategic paper to DVB, since this approach seems the most suitable for synergies with broadcast infrastructures.

On the other hand, with the second approach, which is Mobile Communication centric, there may also be very important synergies between rich multimedia broadcast and the development of 'new generation' mobile telco networks and user terminals (i.e., based on UMTS, HSDPA, MBMS, and LTE technologies). A telco-oriented DVB-NGH solution would share network investments with telco services (mobile telephony, mobile broadband access), benefit from a flexible use of resources between the broadcast and the interactive services, reduce networks and terminals costs and, last but not least, exploit the huge economic resources of telco operators for subsidising terminals.

Both directions, broadcast or telco oriented, have been discussed in a colourful debate in DVB.

Recently a twofold approach has been proposed. The first one is DVB-T2 aligned, the second one would be aligned to an evolution version of LTE-E-MBMS (to be developed in a second phase, in cooperation with 3GPP).

The T2 aligned branch would offer two functionality layers. Layer A is a subset of DVB-T2, while layer B adds non T2 technologies (the most important being individual service component robustness and graceful degradation based on H.264-SVC).

The improvements considered contain proposed technologies that are believed to be highly promising. The most important is probably MIMO, which consists of double cross-polar transmitting and receiving antennas, although its benefit in the NGH mobile environment is still under evaluation. This technology is also being investigated in Japan for a possible next generation version of their ISDB-T system, which could increase the bitrate available per channel significantly. The ISDB-T trial, for example, provides 60 Mbit/s in a 6 MHz static broadcast channel, for HDTV applications and for future generation services (e.g., SHV, 3DTV). However, the broadcast frequency band used may influence the degree to which MIMO can be used. They are under evaluation in the DVB-NGH group for possible inclusion in the layer B of the T2 aligned branch.

The authors' personal opinion is that DVB-NGH will give new impulse to a family of services that are highly promising, and for which there will be public demand. We can hope that they will be successful in spite of the current recession, and be part of the process of economic recovery. As always, their success depends not just on the availability of technology. There must be content that the public wants and needs. Broadcasters will need just as much creativity in the area of programmes and content for serving these mobile devices, as they have shown for the technology itself.

Killer HBB applications?

The campaign for Content over Technology

Peter MacAvock takes a further look at hybrid services and what will be its driving force.

What are the killer applications for HBB? Hands up anyone who knows what they are. The fact that the engineers are still centre stage talking about the technology suggests that we have yet to identify what's going to turn the huge potential of hybrid into a set of services that will become as popular as teletext was in the analogue age.

Let me start out by saying that I don't have the answer: yet, anyway. But there are a number of principles broadcasters could consider adopting in this complex space. I'd like to go through some of the background to this topic, before proposing some ideas.

Watching TV has become quite complicated. The viewer now has to contend with three worlds rather than just one in the past. A TV set used to receive broadcast TV with perhaps some teletext. That 'broadcast world' remains, but it is to be augmented by internet connected services typical of those offered on manufacturers' portals. In today's market, there is little if any linkage between the services broadcast and the connected TV offerings. Thus one world (broadcast) is moving to two (broadcast + connected TV). Enter hybrid, which seeks to link the broadcast TV services with a set of applications drawn from the more flexible internet. Thus, the hybrid world makes up the third world or 'application environments'. Result? Potential confusion for the consumer.

A typical domestic installation in Europe will have a TV set, a set-top box for cable or satellite reception, a DVD player and perhaps a home cinema system. That is three or four separate devices each with its own remote control and each of these probably have 50-60 buttons on it. Watching TV used to be so simple: on/off, channel up/down, volume up/down. Whilst it is unreasonable to go back to the simple (and perhaps boring) analogue days, broadcasters should concentrate on the simplicity of that consumer proposition. Now add in the complexity of the internet to the broadcast and packaged media sources the viewer uses and you have a recipe for chaos. Is it any wonder that I have regularly caught my father trying to change channels on his cable set-top box using a DECT telephone?

Generation Y is supposed to be more tolerant of complex consumer propositions having been brought up in the era of the internet 'pop-ups', but this tolerance shouldn't be an excuse for sloppy offerings from broadcasters and CE vendors. Our offerings have always been based on simplicity – may it remain so in the future.

The age old management speak for this approach is 'KISS' (Keep it simple stupid).

On the basis that we are trying to keep the hybrid world simple for our consumers, what applications do we think will drive the up-take of our services? On the face of it, it would seem appropriate to exploit the simplicity of the linear broadcast offering, and attach attractive content to this. Today's connected TV solutions typically have well known brands associated with them, but do not appeal in terms of the content they propose. So what could help the broadcaster exploit his unique selling point and empower the viewer?

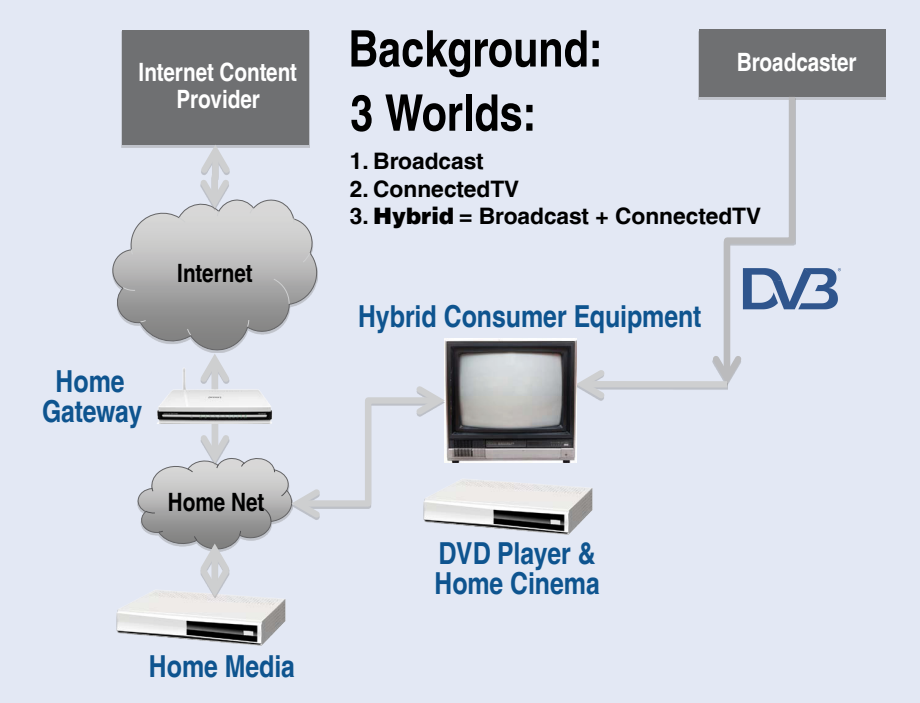
Well, catch-up TV seems to be one. EBU members will testify to the popularity of their web-based catch-up services, and porting these to a CE device seems sensible. One could imagine an intelligent catch-up service which is driven from the live broadcast, and points users to 'episodes you might have missed…'. But is that it?

I suppose there is always teletext. Well HTML-based SuperText, or something similar. Analogue teletext is exceptionally popular, and one could argue that the push for hybrid is, at least in part, based on broadcasters wish to offer richer teletext services in all-digital transmissions.

A third driver – and not one of my favourites – is the weather application. Everyone needs one apparently, and any interactive or hybrid TV demonstration appears to have one. I wonder why.

There is the whole question of the role social media could play in hybrid television. Combined with linear broadcasting, social media offers significant opportunities to enhance viewer involvement, thereby reducing 'churn'. Amongst many others, a question arises as to how advertising on social media could be mixed with a linear programme.

In future editions of Tech-i, we will explore additional applications that could drive the up-take for hybrid.



Broadcaster requirements for broadband - Part 1

Dr.ir. E.M. Verharen, Manager R&D, Nederlandse Publieke Omroep examines the challenges surrounding broadcasting to mass online audiences in Part 1 of this 2 Part series.

Internet, as it is today, is not a 'broadcast' medium. There are many challenges for the organisation, rights, delivery technology, and regulatory issues that must be overcome, to allow us to be able to grow to broadcast-size online audiences for our broadband internet services.

The broadcaster has to make strategic choices about what services to provide over the internet. There may be many involved in the choice - connectivity and/or streaming service providers, and/or syndication partners. They also need to determine under which conditions, both for partners and end users, the services are provided (e.g., cost-recovery or for profit).

The rights have to be cleared. The rights holders (e.g., outside producers) and collective rights organisations view the internet and mobile internet as additional distribution channels, where additional groups of users access and consume broadcast services. In my experience, what we see is rather more of a shift in the (distribution) medium used than an increase in the net number of users. Furthermore, rights holders sometimes withhold rights because they foresee a 'golden future' for pay-per-view and subscription services, separate from broadcasters' services. To prevent misuse of content, and fulfil rights agreements, the broadcaster may have to use geo-filtering and Digital Rights Management techniques.

On the delivery technology side, choices have to be made about what devices to support, formats, and quality of the services. The internet today is not a 'broadcast' medium. The networks used by network providers today, between broadcasters and end users, are not suitable for carrying radio and TV services to large audiences. The internet excels in one-to-one connections. It is great for personalised channels and on-demand services - but not regular broadcast sized audiences. Too often congestion occurs, introducing delay and jitter in packet delivery, which reduces the received quality and overall user experience.

A number of techniques (or a combination of them) can be used to circumvent congestion:

- **Multicast** for supporting linear services. Although an 'old' technology, rolled out in closed managed IPTV networks, it is still not widely used in interconnected IP networks, including ISPs internet backbones and local access networks, up to and including the home internet access routers. Alternative techniques such as multicast-unicast gateways, application level multicast and stream splitting in the local loop can be helpful.
- **Content Delivery Network** (CDN) technology, positioned as close to the end users as possible for supporting both linear and on-demand services. The use of commercial CDN providers today can only reduce problems in the exchange path (for extra cost) as they are often not present within the ISP's networks.
- **Peer-to-peer technology**. Where appropriate, depending on the way ISPs' networks are built, and upload capacity at the end user side.
- **Adaptive streaming technology** is an answer to overcome temporary and local congestion problems. It (temporarily) reduces the quality of the streaming service. However, when real congestion occurs, caused by millions of viewers accessing broadcasters' streams, falling back to a suboptimal quality, as low as 64 or 128 Kbps, is not an option.

When providing services themselves, broadcasters need a good local infrastructure and network connectivity to internet exchanges, where national, regional and local ISPs are connected. Proper peering agreements with ISPs, and detailed and constant attention to network planning and monitoring are essential.

I believe that European and national regulatory frameworks and regulations should guarantee 'net neutrality', so that no network provider can prevent an end user from accessing or using broadcasters' services on unjustifiable grounds. Regulations can also make it possible to gain access to broadband infrastructures where (commercial) deals are not possible with the providers, such as placement of CDN technology within an ISP network, or they can oblige the use of efficient network technologies within broadband access networks (e.g., MBMS in LTE).

The EBU and its community are currently working on many of these issues. They are vitally important for the future of public service media.

Part 2 will be published in Tech-i Issue No. 7 in March.

The IMDA & internet radio

The Pursuit of Standards

Jan Nordmann outlines how the work of the IMDA has brought standards to internet radio and is now poised to help enable a new raft of devices and services.

This new area of the broadcast world requires standardisation if it is to continue to flourish and, equally importantly, if the quality of its offering is to be upheld. To this end, a new organisation, the IMDA, is bringing an industry-wide approach to the development of internet radio guidelines and marketing support that aims to ensure and accelerate the continued growth of this exciting new market.

Although it is still early days for the organisation, it already has introduced a baseline certification standard for standalone internet radio players. Requiring devices to decode both WMA and MP3 codecs, employ HTTP streaming, accept various playlist formats (M3U, ASX, PLS) and render stereo streams faithfully, even on mono speakers, IMDA Profile 1 is turning out to be a huge hit with manufacturers.

For proof, consult the list of companies with Profile 1 Certified Devices, which includes Audiovox, Awox, C. Crane, Freecom, Frontier Silicon, Lenco, M3 Electronic GmbH, Ministry of Sound, Pure, Revo, Roberts Radio, Rotel RDG, Sangean, Sonoro, Tangent and Terratec. It's a great start, and one that will bring benefits all round. For manufacturers, the standard will speed up the process of bringing a new product to market and reduce the risk of competitive clashes. Online broadcasters adhering to IMDA Profile 1, meanwhile, will be able to reach target audiences using fewer audio codecs, thereby cutting associated costs. With this scheme up and running, the imminent focus of attention shifts to metadata and its coordination and control by manufacturers or aggregators.

For the first time, the IMDA Service Identification XML specification defines streamed radio station data to identify the station and stream information. It is already proving to be an invaluable resource for device design companies and aggregators, as well as for broadcasters, who can express their preferences about representation with greater clarity and simplicity. Moreover, the specification is set to be expanded in the future with guidelines for services including electronic programme information and on-demand content. IMDA is opening up version 1.0.0 (Beta) of the Service Identification specification on its website (http://bit.ly/imdasib) for the industry to review. This is an initial publication, which broadcasters, aggregators and device makers alike will use and provide feedback. Details on how to do this most efficiently are available at http://bit.ly/imdasibetacontact. It is with an eye on the expanding nature of internet media devices and services that the IMDA is working on its next device profile. Anyone involved with the internet radio world, directly or tangentially, is advised to follow these developments. The IMDA has made great strides in pursuing internet radio standards that everyone can depend upon, but now the organisation is positioned to help bring about a whole new generation of devices and services that will add a further dimension to the market. Yes, these are exciting and occasionally daunting times, but thanks to the IMDA's efforts, internet radio seems to be destined for a bold and dynamic future.

Contact the author at jan.nordmann@dmt.fraunhofer.org.
More information on the IMDA is at www.imdalliance.org.

EBU R 128
A Success Story

Florian Camerer and Frans De Jong of the EBU Technical PLOUD Group provide an update on the success of the Loudness initiative.

What happens when you publish a new specification two weeks in advance of Europe's biggest broadcast convention, the IBC? You would guess people wouldn't even have time to read it. WRONG!

At the end of August the EBU published its eagerly awaited Loudness Recommendation, EBU R 128 and corresponding metering spec for 'EBU Mode' Loudness meters. Two weeks later nineteen manufacturers were at the EBU booth, demonstrating their implementations.

It was an extremely encouraging start to the implementation phase of EBU's loudness work. Two years earlier, at IBC 2008, the EBU had launched its initiative to change the way audio is measured and normalised, labelled the PLOUD project. In just 24 months an excellent mix of over 240 audio engineers, meter manufacturers, academics and other professionals managed to create a recommendation, a metering spec and an algorithm to measure loudness range (provided by TC Electronic).

Starting the tour

The meters displayed at IBC ranged from file-based 'measure and correct' to live production meters. Analyser style devices and extensive logging software to keep watch over multiple channels were also shown.

Having the kit available is one thing, but installing it in the broadcast workflow is something else. Much of the interest from the many broadcasters visiting the EBU booth was focussed on practicalities; "Where do we start?" "How do we train our staff?" "What should we specify in our delivery specs?"

The most convincing answers to these types of questions come from colleagues who have already started. Such as NDR's Askan Siegfried, who faced similar questions in his organisation. Askan decided to jump into a van and visit his colleagues to show them 'hands on' what Loudness is about. Firstly, after an introductory presentation, he would first put gaffer tape over the studio's QPPM meters. Then he would ask his fellow audio engineers to mix with their ears and to measure the result with a loudness meter. To the relief of the engineers the meter and their ears would be in agreement. This actually means audio mixers can go back to what they should be doing: listening instead of trying to interpret a dancing peak meter.

Frontrunners

The first broadcasters to implement EBU R 128 in their facilities are those in Germany, Austria and Switzerland. At a recent AES event, Yannick Dumartineix showed how Swiss public broadcaster RTS has designed its new (file-based) workflow to include R 128 metering and normalisation. The equipment, that two weeks previously had been on show at IBC, was already in place in the QC suites of RTS' new television facilities.

These are just two examples of broadcasters moving to loudness normalisation. With the move to HDTV and file-based workflows, many more are expected to find a natural 'change-over' point to introduce loudness metering, for the benefit of their audiences.

PLOUD: over and out?

So where does that leave PLOUD? Has the Group finished its work? Not quite. At the EBU Audio Experts meeting during IBC, it was decided PLOUD should now focus on helping broadcasters implement EBU R 128. Being such a large forum and with so much expertise from all sides of the industry, the Group is in a unique position to share experiences and best practices. According to PLOUD chairman Florian Camerer (ORF), that fits perfectly with the longer term vision the Group started out with: "Introducing a new metering paradigm is not a trivial thing, it requires more than merely good technology. The strength is in our combined experience, that gives confidence to newcomers to the topic. We continuously get requests from all over the world for help with education on this audio revolution. The EBU provides an excellent platform for this, but of course it is the individuals who make it work. You could certainly say I am very proud of PLOUD".

http://tech.ebu.ch/loudness

01. **EBU R 128 supporting meters shown at IBC 2010**
02. **Askan Siegfried (NDR) packing for his Loudness tour**
03. **German audio engineers in a Loudness training session**

In the Spotlight

Thomas Saner,
Swiss Broadcasting Corporation

What lies behind the thoughtful eyes of the EBU Technical Committee's newest Member, Thomas Saner of the Swiss Broadcasting Corporation elected in June 2010? The EBU Technical Committee consists of 13 elected members, who represent the interests of the EBU membership as a whole. They are asked to consider themselves elected as individuals rather than organisation representatives, and thus to speak for other members in similar circumstances.

Can you tell us something of your current responsibilities at the SRG?
I am responsible with my team for the elaboration and the realisation of the distribution strategy for the products of SRG SSR. This includes radio and TV as well as online.

It's always interesting to hear about 'outside interests' - what are yours?
I like listening to music but I also play it. Although I play brass music with my cornet I like nearly every style of interesting music from classical to rock. Also, I like cycling and hiking in the mountains.

What do you consider as your finest achievement so far in your career?
It is not one special event, but rather the fact that in the last twenty years I have succeeded in working in interesting positions all along the media production chain with ever growing responsibilities.

Why did you step forward as a candidate for the EBU Technical Committee?
SRG SSR by nature is not a big player in the European landscape of public broadcasters. We have no technical development department. Therefore the EBU is important for us as an organisation to support the development of standards and to promote these standards throughout Europe or even worldwide. I am convinced that as a member of the Technical Committee, with my long media experience, I can strongly contribute to EBU strategy.

What are for you the most important challenges facing EBU Members, particularly those with circumstances similar to SRG, today?
The media business is changing fast and fundamentally. This doesn't mean that public broadcasters have to follow every trend immediately. The products of public broadcasters are still very strong. But now is the time for creating universal and flexible production facilities and processes to enable us to be ready to follow future trends.

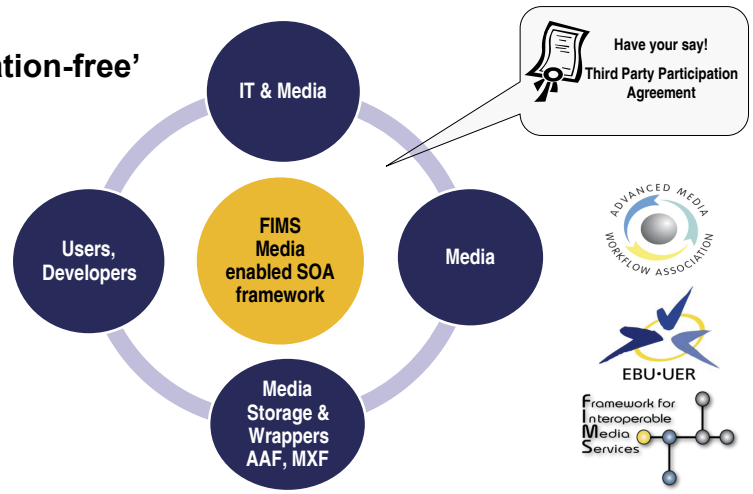
Service Oriented Architecture

Less than a year ago, EBU and AMWA established the Framework for Interoperable Media Services (FIMS) project to develop solutions for more efficient workflows in file-based SOA (Service Oriented Architecture) production environments for the creation and delivery of content across a wide range of media.

The first task has now been completed in the form of a Request for Technology (RfT) to which several companies, namely Amberfin, BBC, Cinegy, IBM and Sony, have responded.

Phase 1 consists of specifying a common service definition format based on the project framework defined in the RfT. Work has already started to build the framework based on the IBM and Sony proposals with the valued experience of service developers and users from Amberfin, BBC and Cinegy.

The plan...
'compensation-free'



AmberFin
BBC
Cinegy
IBM
SONY

ADVANCED MEDIA WORKFLOW ASSOCIATION
EBU·UER
Framework for Interoperable Media Services

The project will also address container issues seeking maximum compatibility with AAF and MXF.

Companies who have not responded to the RfT can contribute after signing the participation agreement that protects the compensation-free licensing policy under which the project operates. Other members of the project include: Avid, Digimetrics, IRT, Limecraft, Metaglue, NTC, Omneon, Portability, RedBee Media, Tixel, Vidispine, VRT.

Phase 2 will investigate the possibility of defining common services using the framework developed in Phase 1. All respondents have already suggested key services. Specific user requirements will also be duly considered.

The plan is a first specification for service definition in December 2010 to allow the project to work on a demonstrator for NAB 2011. Though challenging, the quality and commitment of the vendors and users involved in the project offer a very positive perspective.

The project is co-chaired by Giorgio Dimino, RAI and John Footen, Chime Media. It is jointly coordinated by Brad Gilmer, AMWA and Jean-Pierre Evain, EBU.

More information can be found on the FIMS wiki (http://wiki.amwa.tv/ebu).

Jean-Pierre Evain

3D, 3D, & (guess what) more 3D

At IBC 2010, held in September in Amsterdam, there was optimism in the air. The year-on-year attendance had started to rise again, with numbers nudging 50,000 exhibition registrations once more, and 1300 conference delegates. Has the 'recession' past – or must we fear a 'double dip'? Time will tell.

3DTV, though a fascinating subject, was probably a touch overdone. Virtually every conference session seemed to elevate it to the level of the invention of the wheel. It is an engineer's half magic toy box - though there are many questions still to be answered (see page 4).

The other (rightly) hot issue was the joining of television or radio and the internet. This clearly has enormous potential, and could change the face of broadcasting. The emphasis is on the word 'could' here, because a serious worldwide fragmentation of systems became obvious. If ever there was a casebook study of the broadcasting business not being able to agree a common standard, this is sadly it.

EBU Technical arranged an 'EBU Village' once more, showcasing key frontiers in broadcast technology. Our star for 2010 was arguably the airing of the progress made in 'Loudness'. The EBU Technical Committee has completed a suite of documents which give broadcasters all they need to make sure the public is not irritated by variations in loudness when there are programme breaks, or even (if everyone uses the tools) when you change channels. Loudness is also reported on (see page 13).

The EBU Village also showed a major collection of tools associated with helping people with disabilities. This is a very worthy subject, and our responsibilities in all sectors of society are highlighted in a recent United Nations Resolution. This demo was a cooperative effort, made by the BBC, IRT, NHK, and the DTV4ALL Project of the European Commission.

We had (of course) our own 3DTV demonstration, principally looking at issues of 3D production, such as the need for ultra careful registration of the stereo pair and lens matching. Hybrid broadcasting was there too, courtesy of IRT and RAI.

One of the crowd pullers on the Village proved to be a 'software radio' system developed by the EBU Technical and CRC (The Communications Research Laboratory in Canada). This was designed to show that a flexible platform can be made onto which systems can be run in software. A complete digital encoder and decoder radio chain was shown, running in software. Such systems could also pull in internet radio, and this demonstration may point the way to a low cost and flexible future for digital radio.

[Anaglyph glasses are needed to view this photo correctly]

The EBU Village also featured the DigiTAG alliance, demonstrating inter alia terrestrially broadcast 3DTV (what else?).

Finally, EBU Technical was invited by IBC to organise a morning session on the day after the IBC Conference usually closes *(See picture above)*. The aim was to look at the 'hottest' subjects in broadcasting today, and identify barriers to success. The session was well attended (considering most delegates usually return home the day before) and thought provoking. But yes, we did examine 3DTV – what were we supposed to do?

David Wood

diary 2010 - 2011

MXF Masterclass 2010

30 Nov - 1 Dec 2010 / Geneva (CH) / Fee. This 2 day Masterclass in MXF will enable you to gain expert knowledge in MXF in order to better evaluate the operational challenges related to migration.

Emerging Production Technologies in Focus

1 - 3 Feb 2011 / Geneva (CH) / Fee. Obtain insight into top technology innovations required for production engineers (topical tutorials). Shared user experiences on current radio, HD and tapeless production are some of the highlights at this seminar.

Digital Radio Summit 2011

16 Feb 2011 / Geneva (CH) / Fee. The third edition of the Digital Radio Summit will take place at the EBU Headquarters in Geneva. This event will gather broadcasters, industry representatives and operators during "The Radio Week". Registration will be opened at a later date.

EBU BroadThinking Seminar

29 - 30 Mar 2011 / Geneva (CH) / Fee. This seminar will highlight the EBU's and outside experiences on online, internet and hybrid broadcast broadband technologies and related services and applications experienced over the last two years.

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

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