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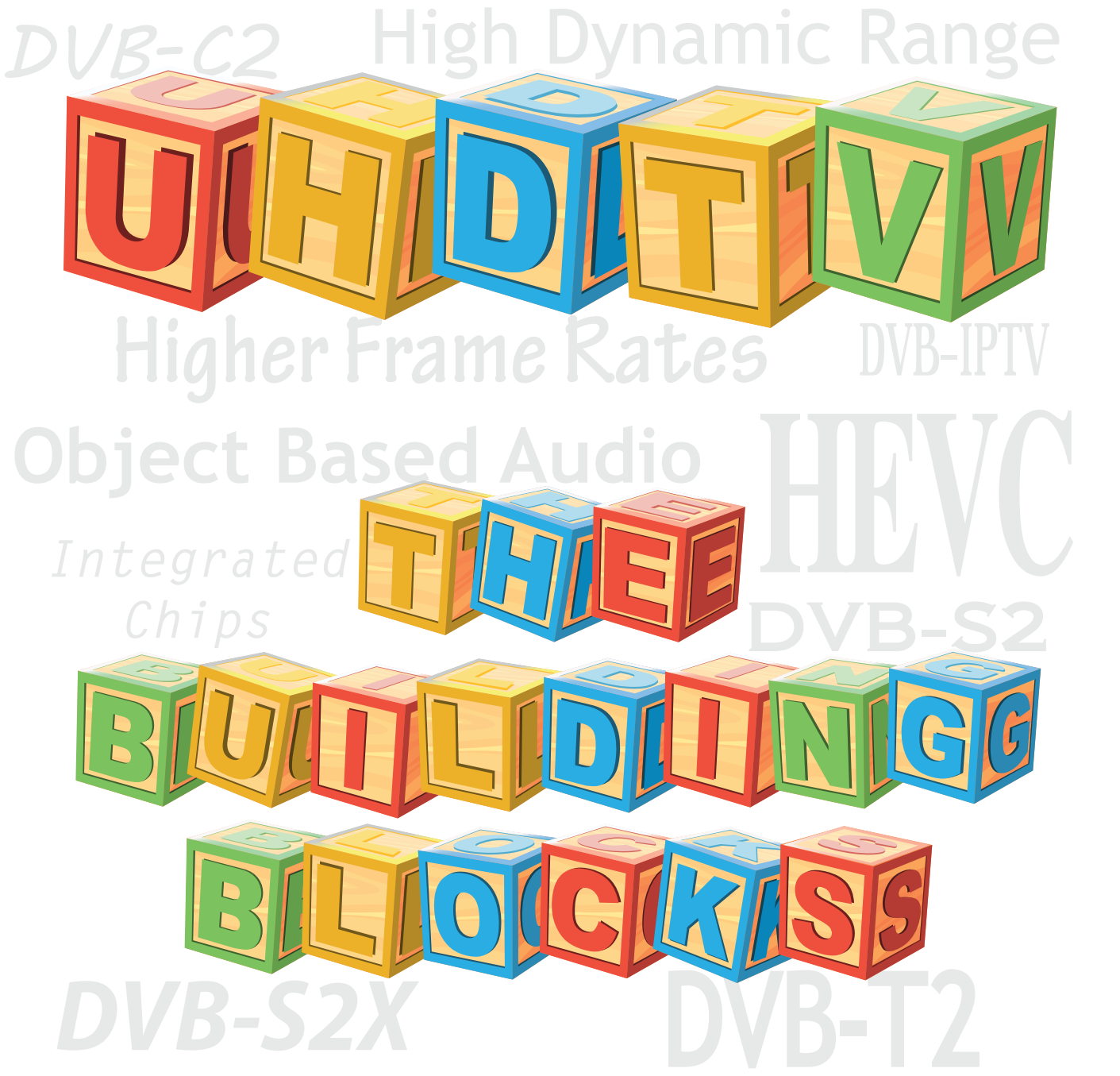

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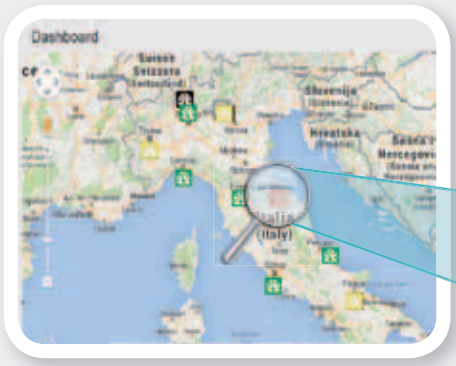

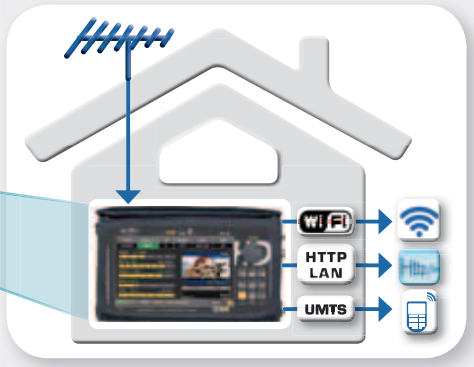

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Ongoing Innovation

A Word From DVB

Peter Siebert
Executive Director

As IBC rolls around once again DVB has some exciting new technologies to show and I hope you have the time to visit the DVB Stand in our usual place, 1.D81, in Hall 1. In recent months DVB has finalized work on several new specifications. One that is certainly a major milestone is the latest satellite specification - DVB-S2X. Targeted at the professional as well as the Direct-to-Home market, S2X offers a wider range of modulation and Forward Error Correction options, in addition to channel bonding of up to three satellite channels, which is relevant for statistical multiplexing of UHD services. The DVB Steering Board also approved the DVB Profile for MPEG-DASH and the first document (of three) for Companion Screen Services. Also approved were the necessary implementation guidelines for UHD services and HEVC encoding for DVB broadcast systems. These guidelines were eagerly awaited by the industry as they define the features from the HEVC/H.265 specification that will need to be implemented in broadcast receivers.

However, this is just Phase 1 of UHD in DVB. CM-UHDTV, the Commercial Module for UHD services, is already busy at work on Phase 2. While Phase 1 focused on the resolution, Phase 2 of UHD will bring Higher Frame Rates, High Dynamic Range, a wider color space as well as immersive audio. A large number of interested parties are participating in this process and in the middle of June over 90 people came together, in a combined EBU/DVB workshop, to discuss the relevant parameters for High Dynamic Range. The outcome of Phase 2 is extremely important for the industry as it will define how we will watch TV in the "beyond HD" future. As always, DVB is the organization where the stakeholders of the broadcast industry come together to define the next generation technology. As ever, DVB will continue to provide the building blocks for the broadcast industry.

New Standards

EN 300 743 Ver. 1.5.1: Subtitling systems (DVB-SUB v1.5.1)(Jan - 2014)
TS 101 162 Ver. 1.7.1: Allocation of identifiers and codes for DVB systems (DVB-SI Allocation) (Feb - 2014)
TS 103 205 Ver. 1.1.1: Extensions to the CI Plus™ Specification (CI Plus v1.4) (Mar - 2014)
TS 103 129 Ver. 1.1.2: Framing structure, channel coding and modulation of a carrier identification system (DVB-CID) for satellite transmission (Mar - 2014)
TS 100 289 Ver. 1.2.1: Support for use of the DVB Scrambling Algorithm version 3 within digital broadcasting systems (DVB-CSA3) (Mar - 2014)
TS 101 545-1 Ver. 1.2.1 : Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 1: Overview and System Level specification
EN 301 545-2 Ver. 1.2.1: Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 2: Lower Layers for Satellite standard (Apr - 2014)
TS 101 545-3 Ver. 1.2.1: Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 3: Higher Layers Satellite Specification (Apr - 2014
TR 101 545-4 Ver. 1.1.1: Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 4: Guidelines for Implementation and Use of EN 301 545-2 (Apr - 2014)
TR 101 545-5 Ver. 1.1.1: Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 5: Guidelines for the Implementation and Use of TS 101 545-3(Apr - 2014)
TS 102 034 Ver. 1.5.1: Transport of MPEG-2 TS Based DVB Services over IP Based Networks (DVB IPTV v5) (May - 2014)
EN 300 468 Ver. 1.14.1: Specification for Service Information (SI) in DVB systems (DVB-SI) (May - 2014)

New Members

Hunan Goke Microelectronics specializes in the design of integrated chips for the broadcast market**. www.gokemicro.com**

MBC (Munhwa Broadcasting Corp.) is a public service broadcaster and one of four major national South Korean television and radio networks. It is the oldest among all of the commercial broadcasting networks in South Korea. **www.imbc.com**

Triada TV, established in 1992 in Novosibirsk, is a manufacturer of professional TV and radio broadcasting equipment. **www.triadatv.com**

Wilhelm Sihn Jr. GmbH & Co. KG (WISI Group) develops and manufactures reception and distribution technologies. **www.wisi.de**

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Editors: William Daly, Harold Bergin
Editorial & Advertising enquiries to: WHD PR
Email: news@whdpr.com
Telephone: +44 (0)20 7799 3100

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Not If, But When

New Aspects for UHDTV

David Wood, Chair CM-UHDTV

David Wood, EBU Consultant

UHDTV conferences are in season. Recent events have looked at both 2160p UHDTV program production and delivery. Attendees ponder over the question of what UHDTV needs to be, to be successful. With the DVB 2160p Phase 1 specification available, the agenda of the hour is what elements DVB 2160p Phase 2 should contain.

The Phase 2 shopping list includes High Dynamic Range (HDR), Higher Bit Depth, Higher Frame Rate (HFR), Wide Color Gamut, and an Advanced Sound System (ASS). Like a pile progressively being increased in height with more coins, all of these would add to the final immersive viewing experience, adding to the higher static resolution of Phase 1.

For HFR - 100Hz or 120Hz there may be good news. For example, tests reported by Ericsson have shown that doubling the frame rate will only have a small effect on the compressed delivery bitrate. While doubling the frame rate using the 'old' AVC compression calls for an extra 30 percent bitrate, with the 'new' HEVC compression, the extra bitrate needed to double the frame rate is under 10 percent. So, the HFR will almost come free, as far as delivery bitrate is concerned. Going from the 8-bit/sample bit depth used today for broadcast to 10-bit/sample for UHDTV delivery may also almost come free for compressed delivery bitrate, because in fact certain steps of compression become more efficient when there are more bits/sample.

This paints a rosy picture for DVB Phase 2, if indeed there is little penalty to pay in delivery bitrate - usually 'bits are bucks'.

Cisco suggests that our shopping list of elements for a future UHDTV Phase 2 should go beyond the currently discussed features. Their thesis is that the future TV will be very thin, flexible, and large. It will become less a 'TV set' in the corner, and more 'TV wallpaper'. In this way, we will be able to fit much larger screens into our home. These large wall-filling screens will be able to display a whole range of services, including UHDTV. Cisco suggests that different kinds of program content suit different sizes and shapes of the segment of our wall TV where they are displayed. They argue that we should allow for a flexible aspect ratio for the TV image, say from 4:3 to CinemaScope. Would this be useful, or is it an idea before its time?

> ...the viewer most wants to be 'present' at the event – to be immersed in it. This is exactly what UHDTV offers.

UHDTV program making is also much discussed. Though UHDTV cameras are emerging there is still a lack of technical specifications for moving UHDTV signals around the studio, which should be based on IP. This will hold back the growth of UHDTV.

Program makers themselves also stress that making UHDTV programs is a 'new game'. The camera sensors are large, so much care needs to be taken with focusing and depth of field. The UHDTV director may be faced with the question, even excluding shooting Cyrano De Bergerac; "Which would you like in focus - the end of the nose or the mouth?"

For a recent Natural History program shot in 4k, every single shot in the program was 'story-boarded' beforehand, so every member of the crew knew exactly what the director was trying to achieve. This level of preparation does not come free. The bottom line may be that good UHD TV programs will need 'movie level' budgets.

But what kind of content will gain most from UHDTV? No surprises. The winner seems clear – it is sports programs. It is here that the viewer most wants to be 'present' at the event – to be immersed in it. This is exactly what UHDTV offers. There is also agreement that it is sports programs that will benefit most from the potential higher frame rates of Phase 2.

The second prize for UHDTV content goes to natural history programs, and here, in some cases, it may even be easier to shoot 'in the wilds of nature' in UHD than in HDTV.

The discussions also touch on the future 'senior' UHDTV quality level 4320p (aka 8k), but to many it still seems more over the horizon than on it. There is also some optimism that excellent 'auto-stereoscopic' UHDTV-based 3DTVs, that will re-ignite interest in 3DTV, are 'just a few months away'. The author of this article will believe this when he sees it.

Overall, the road to UHDTV will have barriers to overcome, but as we educate ourselves to higher quality, UHDTV is inevitable, and the issue for UHDTV is not 'if' but 'when'.

Applying HEVC

HEVC for broadcast HD & UHD

Ian Trow, Harmonic

Ian Trow is Senior Director Emerging Technology & Strategy at Harmonic with a worldwide responsibility for emerging technology and strategy. This currently includes HEVC, Ultra HD, targeted advertising, software and cloud-based solutions.

By now, most broadcasters have likely heard of HEVC (High Efficiency Video Coding), the next-generation video compression standard designed to optimize video distribution. HEVC reduces the data rate needed for high quality video coding by as much as 30 to 50 percent over MPEG-4 AVC (H.264), enabling broadcasters to deliver a better video quality using the same amount of bandwidth, or the same quality using significantly less bandwidth. This makes it a very exciting technology for the broadcast community and other key players in the video market, as they look to deliver advanced services like Ultra HD while lowering the cost of distributing their existing HD OTT offerings. This article looks at the current progress and key applications for HEVC in the broadcast environment, particularly with regards to HD and Ultra HD.

While most of the emphasis for HEVC today has been on streaming UHD and 4k content, HD OTT is likely to be the major application for HEVC in the short term, based on its ability to resolve the growing OTT and catch up TV costs that broadcasters are currently facing.

One of the biggest HEVC application areas will be multiscreen, where the adoption of HEVC is expected to be quicker than traditional linear TV. The speed of adoption for multiscreen is due to software based players that are at the heart of many HEVC multiscreen services based on MPEG-DASH and HbbTV. This allows operators to quickly realize the principal benefits of HEVC, namely increased bandwidth efficiency to reduce broadband congestion associated with video.

It's anticipated that HEVC will first be adopted for HD OTT delivery in areas of the world like France, which is an extremely advanced nation in terms of transitioning to an IP based infrastructure for direct-to-home broadcasting in order to improve the quality of existing HD services. East Asia is another region that is looking to reduce bandwidth or to slightly improve the quality of its broadband services. In countries like China, where consumers are adopting UHD TV sets early, there's a realistic prospect to upconvert HD content to UHD. HEVC would provide these countries with a cost-effective solution for reducing bandwidth and improving video quality.

In the long term, UHD will be a key application for the HEVC standard. Leveraging HEVC, broadcasters can successfully transition to UHD delivery in order to compete with streaming movie providers like Netflix; however, it would require a rather expensive forklift upgrade on broadcasters' existing infrastructures. In these uncertain times, broadcasters will need a compelling business case to transition their HD services to HEVC capability.

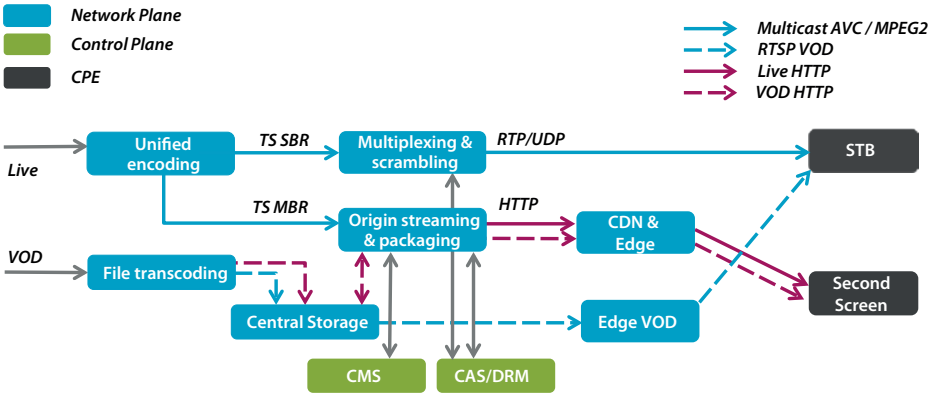
Currently, in Europe, a large amount of the terrestrial channel spectrum is being reallocated, creating significant re-engineering within public broadcasting facilities. Thus, the HEVC standard comes along at the perfect time as broadcasters are contemplating the replacement of terrestrial services, particularly those that are delivered via broadband.

When it comes to multiscreen, many of today's broadcast service offerings are based on H.264, but given the quick churn rate of tablets and mobile phones, it's worth contemplating whether consumer devices have sufficient processing or memory capability to support high quality video content. Thus, the biggest challenge that IP service providers face is network congestion due to the high bandwidth and bursty nature of video. HEVC directly addresses the high bandwidth issues and alleviates some of the network congestion problems. Although transitioning to HEVC implies an infrastructure upgrade, it's still a very valuable proposition for multiscreen services because it addresses an important issue that network operators are looking to resolve.

Given the increased throughput demands for high quality, real time video, broadcast infrastructures are predominantly becoming IT and file based. The HEVC standard is providing extra momentum to the transition to IP based broadcast infrastructures by promising additional bandwidth improvements.

The ever changing nature of broadcasting means that HEVC has the capability to enter the market uninhibited by previous standards and make traction in newer greenfield applications or wait for the right opportunity to make an impact on traditional areas of broadcasting. A number of European countries have delayed the introduction of DVB-T2 to coincide with the introduction of HEVC. While a lot of new services are immediately benefiting from HEVC, with the right alignment or modulation of encoding technologies, the standard can bring advantages to existing DVB-T services.

Live and OTT in Unified Broadcast Headend



Game Changer

Chips with HEVC

Jean-Philippe Perrin, STMicroelectronics

Throughout its history, the broadcast industry has undergone several major transformations. It started with analog and then the MPEG-2 standard enabled the emergence of digital broadcast. More recently MPEG-4 brought a 50 percent improvement in compression efficiency that enabled the industry to transition smoothly to HD. Recently a new standard has emerged: HEVC (High Efficiency Video Coding) brings a further 50 percent improvement in compression while powering even larger screens, especially those referred to as Ultra High Definition (UHD) screens.

The ecosystem for HEVC is now close to being ready for widespread broadcast deployments. Already, solutions for bandwidth efficient end-to-end delivery of innovative content based on this high quality, high resolution technology are on the starting blocks.

UHD quality content provides an opportunity to create premium media services for better monetization of content. Due to the current small installed base of UHD TVs, UHD will first appear in the growing over-the-top (OTT) services such as Netflix - committed for launch in 2014. Traditional satellite/cable/IP pay TV providers in advanced markets will most likely promote their video-on-demand offer first, to be followed later by dedicated UHD broadcasts.

Obviously the 'high efficiency' of HEVC can be used for HD content. If we look at the introduction of MPEG-4, HD content almost universally used H.264 while the SD content transition to H.264 was slower. Some greenfield operators, as in India, had the opportunity to start with SD/MPEG-4 decoders but for most of them the bandwidth gain of reframing SD content to MPEG-4 did not match the cost of replacing SD/MPEG-2 decoders.

Now the industry has evolved from a pure broadcast scheme where one program is broadcast to millions of decoders to more complex applications and we can expect that the adoption of HEVC for HD will be more popular for both broadcasters and consumers.

For example, IP based pay TV providers can operate in a more flexible mode than the pure broadcasters, but face high investments to deploy high speed networks in all geographical locations. In this context deploying HEVC/HD decoders can produce a fast return on investment. A typical example is shown in Figure 1. Using the H.264 format only a limited number of households are able to receive HD quality content, but by deploying HEVC/HD decoders, more households can receive HD quality content without improvements or modifications to the network.

The DTT industry is using the airwaves historically allocated to analog TV, but there is great pressure from governments to allocate more of these valuable airwaves to the mobile communications industry. With the analog to digital transition and the analog switch off complete, some bandwidth (typically 800MHz band) has been reallocated to mobile operators. With the greater efficiency provided by HEVC in combination with DVB-T2 freeing up more bandwidth there is an opportunity to not only to keep the same HD content on air but to greatly increase the number of channels.

Figure 1 – Full High Definition reach in High Efficiency Video Coding versus H.264

Jean-Philippe Perrin is Director of Marketing for Box & Gateway business line in STMicroelectronics.

For the satellite and cable industries, the broadcast model is not necessarily the only one and multiple new services can be deployed. They include push video-on-demand, dynamic advertisement insertion, and OTT, among others. All these new applications can leverage HEVC efficiency to save bandwidth and disk space and do not require waiting for the full installed base to be equipped with HEVC capable HD decoders and the switching off of the HD/H.264 live broadcast.

Given the strong momentum and high interest of the broadcast industry in both UHD and HD/HEVC, STMicroelectronics is offering two HEVC capable families of decoders. Both the Cannes/STiH312 and Liege2/STiH301 product families contribute to the innovation and transformation of the HEVC broadcast reception in both UHD and Full HD (FHD).

The Cannes and Liege2 family of decoders are powered by an ARM CPU and graphics processing unit (GPU) and field first-grade CAS/DRM security, high end peripherals and optionally a video encoder for transcode.

The Liege2 family of decoders are optimized on FHD HEVC decoding. As in the Cannes family, Liege2 integrates an ARM GPU while supporting the same depth of security as the Cannes devices. The ST family of products shares common hardware architecture as well as the same software structure, facilitating the implementation of middleware from various suppliers on both platforms.

On the Up

Higher Frame Rates

Richard Salmon, BBC Research & Development

Frame rates evolved in the first half of the 20th century into three groups. 24 frames per second (fps) was the standard adopted for cinema because it was an economical rate for the use of film stock which gave what was then considered adequate motion rendition, but more importantly was high enough to accommodate an optical sound track, and it was this which was the real driver for the standard. Double or triple bladed projection shutters prevented perception of brightness flicker.

In television, frame rates were conveniently synchronized to half the local mains electricity supply frequencies, either 25 or 30, according to region. This prevented problems with power supply ripple and lighting flicker, and gave a measure of compatibility with cinema film. Interlace was used to provide a double field to improve temporal reproduction and prevent flicker in the relatively small and dim displays whilst retaining the same analog signal bandwidth.

Motion Portrayal and the Human Visual System

Over the years there have been various proposals to improve the motion rendition of TV. 80fps was proposed by the BBC[1] for high definition TV, as a rate high enough to prevent visible flicker on a larger, brighter TV screen, a finding subsequently confirmed by NHK[2].

To prevent motion blur, and thus a loss of resolution in moving images, a higher frame rate, and shorter shutter opening is required. The present author proposed a frame rate of 300fps[3], which also gave compatibility with both 50 and 60fps systems, and research at NHK[2] suggested that a shutter opening of 1/320 second was required. Similar work at Sony[4] suggested that 250fps would be adequate, and proposed 240 for compatibility with 60fps. Figure 1 shows the effect, at HDTV image resolution, of reducing the shutter opening from 1/100 second to 1/300 second.

Standardization of Higher Frame Rates

The real breakthrough comes however when you consider the ability of the human eye to track motion, and work at NHK[2] indicated that at frame rates above 100fps, even with a short shutter, the brain interprets motion as being smooth if the eye can track it.

There are, however, two forms of un-trackable motion which the brain still does not interpret as smooth, resulting in either the perception of judder, or of multiple imaging. The eye is unable to track rotating motion, such as the juggling clubs seen in Figure 2, nor can it track multiple motions at the same time. Thus if in a football match the eye is following the ball, the background behind it may be seen to judder.

So in deciding the parameters for a TV system it's necessary to balance the ideal with the practical, which will satisfy the majority of situations, and thus 120fps was adopted for the ITU standard for Ultra High Definition TV[5]. Subsequently, work looking at lighting flicker and standards conversion issues has resulted in it becoming clear that a 50Hz based system would be necessary for Europe, and so 100fps is now being included in the international standards. There is also considerable debate over whether a fractional version of 120fps is necessary as an option in NTSC regions of the world.

Richard Salmon is a Lead Research Engineer at BBC R&D and Honorary Fellow of the BKSTS. He leads the BBC's research work on Higher Frame Rates.

References

1. Stone, M. A., 1986. A variable-standards camera and its use to investigate the parameters of an HDTV studio standard. BBC Research Department Report 1986/14.
2. Sugawara, M., 2011. Psychophisical Requirements for Higher Frame Rates in Future Television. DCS 2011, SMPTE Conference at NAB Show, Las Vegas, April 2011.
3. Salmon, R. A., Armstrong, M. G., and Jolly, S. J. E., 2009. Higher Frame Rates for More Immersive Video and Television. BBC Research & Development White Paper WHP 209, October 2009
4. Kuroki, Y., 2010. Development of the High Frame Rate 3D System. Proceedings of the 1st Brazil/Japan Symposium on advances in Digital Television, December 2010.
5. ITU-R BT.2020 (08/2012). Parameter values for ultra-high definition television systems for production and international programme exchange. International Telecommunication Union, 2012.

Figure 1 – Improved clarity with shorter shutter

Figure 2 – Rotating juggling clubs may be sharp, but cannot be tracked by the eye

Look on the Bright Side

High Dynamic Range for UHDTV

Andrew Cotton, BBC Research & Development

Andrew Cotton is a Principal Technologist at BBC R&D with over 25 years experience in broadcast engineering. His team is responsible for ensuring the end-to-end technical quality of the BBC's acquisition, production and distribution systems.

Those who have been lucky enough to see High Dynamic Range (HDR) TV pictures cannot help but be blown away by their impact. They are more realistic, more colorful, subjectively sharper and more engaging than standard dynamic range (SDR) images. That is not just marketing: the "Hunt effect" is a well known phenomenon whereby the colorfulness of an object increases with luminance; and video engineers have always known that increasing the contrast of an image makes it appear sharper as the gradient of edges increases. So it is no wonder that high brightness HDR images are so eye-catching.

The current suite of television standards were, however, developed with dim CRT displays and 8-bit distribution systems in mind. As a result of the limited dynamic range, detail in the highlights is crushed, bright images are desaturated and there is limited detail in the blacks. But with HDR flat panel displays entering the market, and the introduction of 10-bit compression in distribution, there is a great opportunity for us to revisit the standards and deliver a step-change improvement to the television experience.

HDR delivers a clear benefit to viewers on all screen sizes; you can see it from across the room. There is a great deal of interest in linking its introduction to that of Ultra High definition (UHD) services. By doing so the subjective quality difference between UHD and existing HD services is increased, broadening their appeal. So standards bodies responsible for each part of the television chain are working quickly to put in place the specifications that will enable HDR: ITU-R are working towards defining the signal format; SMPTE are studying the ecosystem; JCT-VC (MPEG/ITU-T) are studying the video compression and DVB are considering the implications of HDR for their UHD Phase 2 distribution specification.

With so much happening in parallel, special care is needed to ensure that the specified systems fully support the broadcast use cases. Whilst there has been a great deal of industry talk about the EOTF (electro-optical transfer function), the EOTF on its own does not deliver HDR; it only specifies how a display converts the electrical signal into light. Provided the EOTF is a reasonable match to the human visual system, and avoids introducing "banding" artefacts, any EOTF will be capable of reproducing a good HDR image. The real challenge is to devise an end-to-end HDR system that can work cost-effectively, be introduced incrementally and that does not impose significant restrictions on current operational practices.

Figure 1 shows a simplified diagram of an example UHD playout system. We learnt from 3D that it is costly and impractical for broadcasters to manage two versions of a program. So to avoid the need to duplicate the infrastructure to handle both HDR and SDR versions, the figure shows in green how the SDR simulcast service has to be derived from the master HDR service by means of dynamic range down-conversion, just prior to distribution encoding.

Broadcasters will also need to seamlessly manage a mixture of HDR and SDR content within a schedule. For many that will be a combination of recorded programs, commercials, and live programs from local studios and outside sources. We learnt from the introduction of surround sound that if we are to combine two sources (e.g., for cross-fades, DVE moves or graphics) all playout sources must be converted to a common HDR format. So SDR to HDR format converters appear in the figure (shown in blue). Furthermore, we learnt that the system cannot rely on metadata as it becomes invalid when two sources are combined. Hence the whole system, including the HDR to SDR down-converters, needs to operate without metadata.

It is clear that systems that could work for the simple workflows of cinema and on-demand may prove impractical for the more complex workflows of television.

Alongside proposals from Philips and the United States (based on Dolby tests), the BBC has made its own proposal to the ITU to support HDR production. The proposal is tailored to the needs of television broadcasters. Based on a log-gamma curve transfer function (see Figure 2), it is simple, requires no metadata and is compatible with legacy systems and displays.

It is too early to say which system will succeed. But the good news is that with the audience benefits of HDR so clear, there is a real desire from all involved to agree a good future proof and cost-effective solution, that will give a real "sparkle" to ultra high definition.

Figure 1 – Example UHD Television Playout System

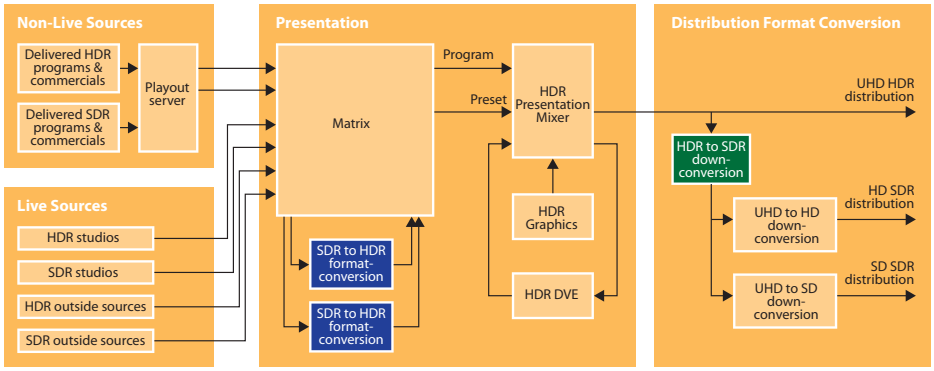
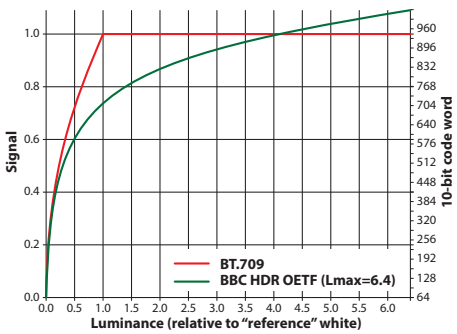


Figure 2 – Comparison of the BT.709 and BBC HDR OETFs (Optical-Electro Transfer Functions)



Freedom of Choice

UHD Multi-View - A new type of programming

Stephan Heimbecher, Sky Deutschland

Sky Deutschland began testing Ultra High Definition productions in live sports as early as December 2012. What began as a simple recording of a Bundesliga match shot with a single UHD camera, filling up memory cards roughly every 15 minutes, eventually culminated in a fully live multi-camera end-to-end 2160p50 production that was broadcast live over satellite in HEVC (H.265) on April 26, 2014.

In the course of the 17 months it took to put together the UHD live production chain step by step, the focus has always been on how to integrate the HD and the UHD production and how to migrate to a solely UHD production in the long run. Once services in the new format are launched, UHD will not supersede the HD format overnight. Hence it is inevitable to perfect the coexistence of HD and UHD in terms of production efficiency and cost. What is often overlooked is that with live sports a typical HD production will also benefit from UHD production elements in the same way HD feeds can add to a UHD production.

Taking this into account and with a view to the fact that the added value of UHD services for the consumer will be relatively small as long as UHD is technically limited to just the higher resolution (Phase 1), Sky Deutschland has experimented with some concepts that will further enhance the UHD viewing experience even in this early introduction phase.

This Multi-View approach, which was first showcased at IFA in Berlin in September 2013 (see photo), is not revolutionary as such, in that the combination of different feeds/viewing angles is also technically possible in HD. However, only in a UHD world – where the UHD screen can be regarded as an array of 2 x 2 Full HD displays – such a concept is shown to full advantage and provides the audience with a visual novelty that clearly differentiates from today's live sports production in HD.

Producing Multi-View for UHD (e.g., a football match) is relatively straightforward in that it only takes one (static) shot of the entire pitch coming from one highly positioned 4k camera. This feed – cropped to expose the playing area – will form the basis and fill the lower half of the UHD screen. The remaining two Full HD areas above can be filled with feeds from the regular HD production, providing the viewer with a simultaneous live view from three different angles. Of course, these HD windows at the top can also be used for slow motion, highlight loops or info graphics, etc..

An even more sophisticated approach is for the static pitch view to be derived from two 4k cameras, one shooting the left and the other one capturing the right half of the turf. Stitching these two pictures together and clearing the result from perspective distortion, with the help of some special software, will allow for an even better UHD view of the entire pitch. At the same time, this so called 8k stitching technology will offer additional tools to the HD production as well: the 7,680 x 2,160 pixels (eightfold Full HD) signal from the two stitched together 4k cameras can be used to generate virtual HD feeds as well as so called HD super-zooms. The latter was first tested live by Sky Deutschland during a Champions League match in October 2013.

When first shown to visitors at IFA in 2013, the feedback regarding the UHD Multi-View concept was almost entirely positive. Most people took a few minutes to fully grasp the new viewing experience, but once they had orientated themselves in looking at the three parallel feeds, they immediately realized the potential and benefit of the approach. UHD Multi-View delivers the best of two worlds: the freedom of looking at any corner of the pitch is in one's sole discretion as if being in the stadium, plus the added value of a modern TV coverage including slow motion, repeats, close-ups, different perspectives.

Stephan Heimbecher is Head of Innovations & Standards in Technology at Sky Deutschland. His post involves representing Sky on national and international committees, technical work with major Hollywood studios as well as technical innovation management tasks within Sky Deutschland.

The success of these first demonstrations has encouraged Sky Deutschland to take the concept further from its early mock-up phase. With a full end-to-end live production chain for UHD now in place, a real Multi-View production is feasible for the 2014/2015 football season.

The Multi-View Approach

Sounds Good

Where next for audio?

Ted Laverty, DTS

Ted Laverty is Senior Director of Corporate Strategy and Development for DTS. He has been representing DTS at the DVB since 2001.

The 'V' in DVB may stand for Video, but without decent audio you merely have great surveillance programming. Budgeting bits for audio in broadcasting is always a challenge, and often goes from "good" to "just good enough". Formats such as D-Cinema and Blu-ray already deliver extremely high quality audio to audiences today but what developments will present opportunities for broadcasters to improve the audio in their programming?

Object Based Audio (OBA) is the most important new technique for manipulating, delivering and rendering audio. It supports the industry's trend to greater personalization and interactivity. Combining audio and metadata to create objects that improves the audio experience in the following ways: accessibility; adaptability; personalization and immersion.

OBA is fundamentally different to existing systems. The flexibility of OBA allows for new ways to excite and engage an audience. Audio elements can be manipulated in a versatile manner allowing rendering devices to account for individual viewer needs. It allows their requirements to be matched to their playback equipment capabilities.

Content can become more accessible. Individualized experiences can be created to improve dialogue clarity or adding descriptive narrative. As dialogue clarity remains one of the main causes of audience complaints, technologies that assist will always be welcome.

The program audio can be adapted to the playback system. There are different requirements in playing audio on a smartphone as opposed to large home theatre systems. Sports fans could get 'home team' commentary mixes and external sources could be mixed into the sound field more elegantly than currently available.

Finally, audio, including height, could be delivered to the home. The number of consumers with height speakers in the home is small at present but is growing. OBA becomes powerful when you realize that a single format can be optimally rendered on a high-end multi speaker system. Advanced rendering could give virtualization of surround sound fields for headphones.

An important consideration is that these benefits can be enjoyed with stereo decoding and are not solely aimed at those with lavish home theatre systems. Consumers do not need to upgrade their playback systems but can add extra playback elements over time.

OBA has significant benefits to content creation. With channel based systems it is typical to create separate mixes for differing playback systems be they stereo, 5.1 or 7.1. An OBA based production chain allows mixers to capture all key elements and produce a single OBA mix for next generation audio capable devices in the home, or rendered in the headend to any needed legacy channel based format (e.g., 2.0, 5.1), or archived.

Work is underway in standards groups worldwide. The EBU FAME Audio Group has been considering the impact of OBA on production and delivery chains. The diagram below shows the key components in an OBA delivery chain.

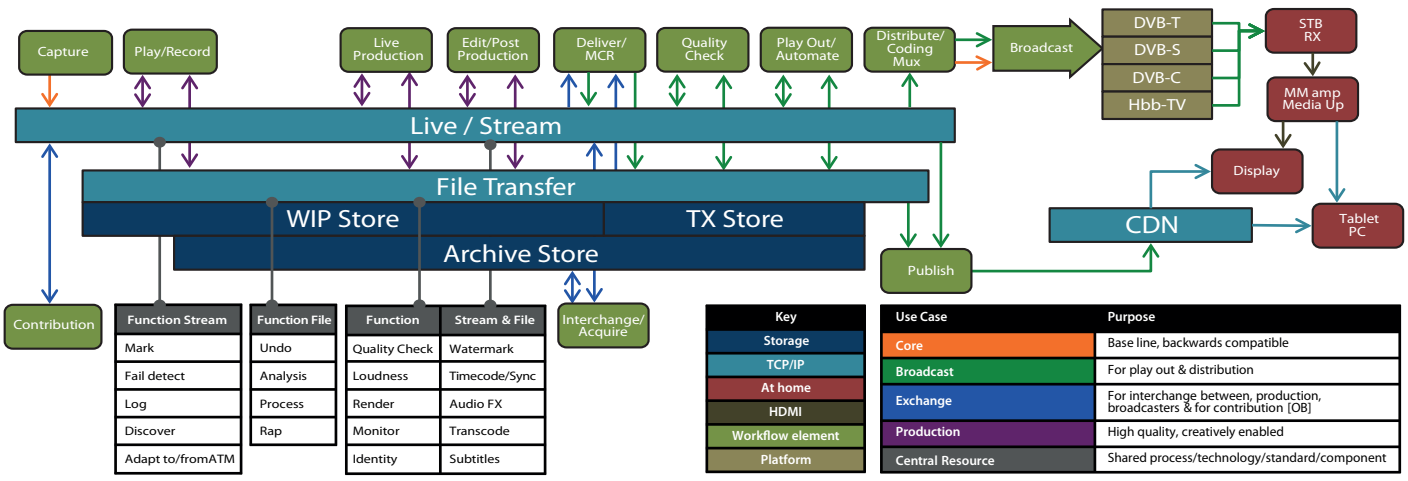
While implementing OBA may initially seem a daunting challenge, on closer inspection it becomes apparent that elements of workflow remain unchanged. Broadcasters are doing bits of this already. Also, there are opportunities for cost reduction as a single archived audio asset can be created and is more future proof than the channel based audio systems used currently.

Standardization is central in ensuring all the disparate elements of the broadcast chain interoperate. Successful ecosystems creation requires an open content creation standard. DTS has developed MDA (Multi Dimensional Audio) and this has industry wide support. It is also implemented in D-Cinema applications. MDA does not define mechanisms for home delivery. OBA is under discussion within DVB relating to UHD Phase 2 requirements. Standardization work for MDA is underway in SMPTE, ITU and ETSI. It is expected that the various codec proponents will have their own differing methodologies to deliver a seamless user experience.

We don't yet know exactly the must-have features consumers will expect but the toolbox approach found within DVB will be essential in making OBA ubiquitous and in creating compelling content.

The current state of OBA can be compared to that of text messaging as it was in the early 1990's. The technical elements required to implement OBA exist today. What is needed is the creative ingenuity to implement a system that consumers will love. We also will probably need a more consumer friendly name than OBA.

High Level Broadcast Components



Satellite Link

Ultra HD Via Satellite

Thomas Wrede, SES

Thomas Wrede is the Vice President, Reception Systems at SES. He is chairman of the DVB CM-S group and, on behalf of ZVEI, a member of the executive board of DIGITALEUROPE.

UHDTV (3840 x 2160 pixels) is a superb consumer proposition especially when you consider the consumers' desire for large screens in their living rooms. Analysts predict that by 2025 we will have around 1,000 UHD channels worldwide and 497 million homes will be able to watch UHD quality.

Satellite operators are embracing UHD as over time it will significantly enhance the attractiveness of the numerous direct-to-home bouquets and will help to positively differentiate them from terrestrial competitors, both in terms of picture quality and number of channels. With the introduction of the new HEVC encoding standard, the bandwidth required for good quality UHD satellite transmissions is in the order of 20-25 Mbit/s for sports content and in the range of 15-20 Mbit/s for movie content. Such bandwidth per program is considered to be commercially affordable when taking into account that the first commercial HD transmissions in MPEG-2 in the US occupied roughly the same bandwidth some 10 years ago.

With the introduction of the DVB-S2X standard, DVB has provided additional tools for enhancing the efficiency of UHD direct-to-home transmissions, where the transponder bonding feature of DVB-S2X will be an important asset. Furthermore, the plethora of additional MODCODs combined with a 5 percent roll-off gives an additional efficiency boost of up to 16 percent, depending on the transponder filter mask specified by the respective operator. However, broadcasters and operators will only consider DVB-S2X under two conditions: 1) DVB SoC (System on Chip) manufacturers must have implemented DVB-S2X on their silicon and 2) there must be a commercial scenario justifying the operation of a multiplex in DVB-S2X, e.g., operating three UHD programs in one transponder from the start. Given these conditions, the first commercial UHD transmissions will likely happen in a DVB-S2 multiplex.

So when and how will a commercial rollout of UHD over satellite happen and why hasn't it taken place already? To answer this question several factors need to be considered. An important one is technology evolution. With the pragmatic approach of standardizing and the introduction of UHDTV Phase 1 in 2014/2015, and Phase 2 in 2017/2018 and later moving towards Super High Definition, we have clearly indicated to operators that soon a better quality proposition might be possible ('better pixels' instead of only 'more pixels').

Operators need to be able to commercialize UHD and at this point some may have doubts that a Phase 1 proposition will be sufficiently attractive for their subscribers. So while operators look at Phase 2, and DVB and EBU working groups enthusiastically discuss HDR (High Dynamic Range) and frame rates beyond 120fps, Asian manufacturers of flat screen technology are, for the time being, focusing on selling Phase 1 compatible equipment.

Meanwhile, manufacturers associated with DIGITALEUROPE are discussing launching a Phase 1 interoperability logo, even specifying 8-bit as minimum color bit depth instead of 10-bit as proposed by broadcasters. All this, in addition to the lack of content for 24/7 channels, is clearly a tempting reason for the operators' commercial decision makers to postpone the launch of commercial UHD services until 2017/2018. Such a decision would certainly weaken the position of satellite operators and the broadcasting industry and leave the floor to OTT operators attempting to deliver UHD over limited bandwidth terrestrial infrastructures. This could result in a quality below Phase 1 and put off consumers.

So what is a realistic launch scenario for UHD over satellite? Firstly, satellite operators will continue to operate demo channels in HEVC HM10, 10-bit 50/60fps technology in DVB-S2 and for tests in DVB-S2X multiplexes. As a second step, and jointly with operators, a 24/7 demo channel with attractive material needs to be provided in the respective European markets to feed the soon available UHD set-top boxes and TVs with integrated satellite tuners and HEVC decoders. Most of all the UHD community needs a pioneer - as we had with Gabriel Fehervari of EURO1080 pioneering HD services about 10 years ago - that launches 2-3 commercial UHD channels in Phase 1 technology at best possible quality in 2015 at the latest. If we miss such a near-term launch scenario, UHD may move into an on-demand only proposition and hence may get – at least temporarily – lost for the broadcast industry.

World Cup First

T2 End-to-End Solution for UHDTV

Dr. Nik Dimitrakopoulos, Rohde & Schwarz

Dr. Nik Dimitrakopoulos is currently working on UHD and Super Hi-Vision deployments on terrestrial, cable and satellite networks for Rohde & Schwarz. He has long term experience on DVB-T2 field trials as well as TV and STB receiver testing. Nik is a member of the DTG RF Group, DVB-UHDTV group and FOBTV forum and participated in the first UHD trials over DVB-T2 in South Korea.

Many would agree that technological rivalry between South Korea and Japan sometimes works miracles. This time it was South Korea's turn to start the race in what has become a UHDTV marathon. Back in October 2012, KBS (Korean Broadcasting System) carried out the world's first terrestrial UHDTV experimental broadcast. The signal was broadcast using a 100W power transmitter from the Kwan-Ak mountain site with DVB-T2 (256QAM, FEC 3/4 and 1/128GI). The video content was a Korean drama show that was pre-encoded using HEVC (HM6.0) at 30fps with 3840x2160 resulting in approximately 30Mbps (YUV 4:2:0 subsampling and 8-bit color depth).

Within two years we saw some big changes in the UHDTV broadcasts in South Korea. The FIFA World Cup in June 2014 and the Asian Games in Incheon a few months later motivated all the major Korean network operators (KBS, SBS & MBC) to broadcast live UHD content over the Seoul metropolitan area. To implement such a solution was far from easy compared to the initial trials back in 2012. One of the key challenges was the available data rate. For example, in the UK a typical DVB-T2 configuration for rooftop reception allows for 40 Mbps using 256QAM and a very small GI (due to MFN). In Germany a more conservative DVB-T2 configuration with 64QAM and large guard interval allows for 24Mbps (see Figure1).

The story in South Korea is slightly different. The RF bandwidth is 6 MHz resulting in approximately a 25 percent less data rate compared to a similar setup at 8MHz. The GI configuration, due to SFN, as well as a lower constellation mode and the improved FEC required for indoor reception, will limit the available data rate even more. Taking into account these parameters the network operators could be restricted to a maximum data rate of 20Mbps.

Therefore it's all about the encoder quality and efficiency. The UHD content should be processed at 60fps and in real time which is necessary for sports where the motion is always a lot faster than in film dramas. In other words, a much higher temporal resolution is required for a smooth viewing experience.

This translates to an increased data rate compared to 30fps. It is worth mentioning that HEVC encoding algorithms have been much improved since the initial trials back in 2012. Nowadays, most of the real time HEVC encoders available in the market have demonstrated excellent results in UHD resolutions up to 60fps with data rates ranging from 24Mbps to 30Mbps. Typically, such encoders have a 5-8 second processing delay for UHD resolutions with HEVC. Based on Moore's law as well as continuous HEVC algorithm improvements, the real time encoder's delay is expected to be dramatically reduced in the coming years.

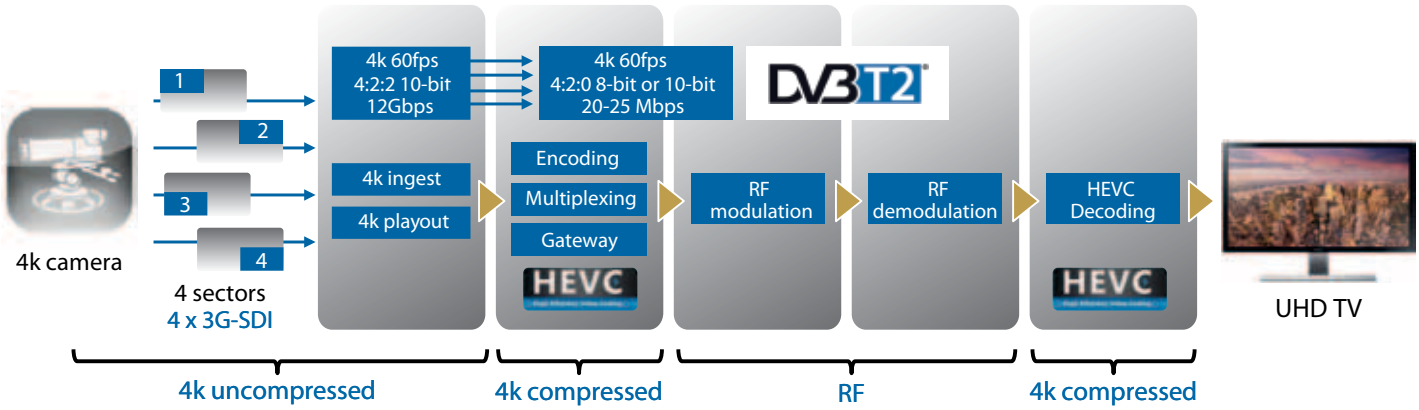
I was one of the lucky guys from Rohde & Schwarz who assisted SBS with an end-to-end solution in order to broadcast the FIFA World Cup games in UHD (see Figure 2). The service is still on air and will also broadcast the Incheon Games in September. A lot of measurements were conducted before the World Cup began. These measurements had to do with encoder performance (i.e., what is the minimum data rate for a picture perfect result) as well as fine tuning the DVB-T2 standard with field trials. The final parameters were: 707MHz (6MHz bw) - 256QAM non rotated - FEC 2/3 32KE - GI 1/16 - PP2 - available data rate 26Mbps (see Figure1). We ended up sacrificing a few dBs on the RF side to gain some Mbits on the baseband side and vice versa.

Following the evaluation of indoor antennas currently taking place, the constellation could be reduced to 64QAM. At the end of the day the conclusion was that not only a good encoder is necessary but also a DVB-T2 transmitter to broadcast with a strong and clean signal (high MER).

Figure 1 – DVB-T2 Modes

Country	Constellation	FEC	GI	FFT	Bandwidth	Data rate
U.K.	256QAM	2/3	1/128	32KE	8 MHz	40.2Mbps
Germany	64QAM	2/3	19/128	16KE	8 MHz	24.1 Mbps
South Korea	256QAM	2/3	1/16	32KE	6 MHz	26 Mbps

Figure 2 – End-to-end solution



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Another highlight is the ever-popular pre-conference Masterclass which focuses on particular new DVB technologies.

For further information on the program and the event please visit the website.

For sponsorship opportunities contact:
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DVB WORLD 2015

www.dvbworld.org

MARKET WATCH

www.verimatrix.com

Verimatrix is expanding the ViewRight cardless content security product line within its Video Content Authority System (VCAS). SMiT, a specialist in secure distribution of pay TV content, has achieved Verimatrix certification for the advanced cardless ViewRight CI+ CAM. SMiT is the first CAM manufacturer to pass the advanced security level set by the company. It complies with the CI+ 1.3 standard to support rich interactive features such as hybrid VOD, catch up TV, parent control, etc..

www.creonic.com

Creonic offers licenses for the new DVB-S2X Demodulation and LDPC/BCH Decoding IP cores that enable manufacturers of satellite equipment to reduce time-to-market for their DVB-S2X products. The IP cores are scalable solutions for latest FPGA and ASIC technologies and support symbol rates of up to 100 MSymb/s on state-of-the-art FPGAs. They have been built using the company's proven DVB-S2 IP cores as a starting point. The new codes of DVB-S2X allow for a more efficient use of existing satellite transmission channels.

www.nagra.com

Nagra's QuickStart encompasses all the major solution components that service providers need for a fast time-to-market delivery of live and on-demand content to a multiscreen environment. Designed to sustain service providers' growth and deliver customer satisfaction, the line up of pre-integrated digital TV products and services includes Gravity Edge HD UI, OpenTV 5 Client connectware, a choice of integrated SmarDTV and partner STBs, MediaLive Multiscreen headend, Nagra content protection, PRM and hosted CloudTV Services Platform.

www.teamcast.com

TeamCast has released a DVB-S2X software upgrade for Vyper, the company's satellite modulator described as a powerful and evolutionary platform which is widely used for DSNG, Contribution, Distribution and DTH applications. The new upgrade meets the requirements of the latest DVB-S2X standard and enables improved performance and features for core DVB-S2 applications. DVB-S2X, offers spectral efficiency gains for professional applications by up to 20 -30 percent and for some scenarios, gains of up to 50 percent can be achieved.

www.kathrein.de

KATHREIN has extended its product portfolio with a series of cost efficient UHF panel antennas for circular, elliptical or slant polarization. These antennas are particularly suitable for Digital TV broadcast transmitting antenna systems that provide a signal both for stationary as well as mobile TV receiption.

www.enensys.com

Part of the SafeGuard product range, ASIIPGuard is an evolution of Enensys' seamless ASI switch ASIGuard. The system can support up to six independent and hot pluggable ASI switches in 1RU. It now offers the capability to seamlessly switch between ASI and IP sources while guaranteeing service continuity with ASI and IP bypass. Crucially, the system can switch from three different feeds (ASI or ASI and IP) selecting the uncorrupted input for onward transmission.

www.dektec.com

DekTec has released a compact USB-3 modulator that supports many modulation standards including multi-PLP DVB-T2 and DVB-S2X. A single USB cable between PC and DTU-315 supplies power, data and control. Output frequency is 36 to 2150MHz, output level from -40 to -15dBm.

www.rohde-schwarz.com

The R&S BTC, a modular multi-standard T&M platform, now covers, besides DVB-S2, the new DVB-S2X signal generation for broadcast, interactive professional and DSNG services with annex M, ASI, IP or multiple input streams as input interfaces can be used to feed in external streams that can be modified with a remultiplexer. Transmission simulations for uplink and downlink with AWGN, phase noise, interference simulations for satellite and terrestrial signals plus IMUX/OMUX simulations are integrated.

www.imgtec.com

Imagination is rolling out a series of new Ensigma combo IP cores optimized for SoC integration. Ensigma programmable radio processing units address the challenge of proliferating communications and connectivity standards by supporting them all on a single architecture, and they support all major radio and TV broadcast standards including DVB-T2, DVB-T, DVB-S2 and DVB-S.

www.roverinstruments.com

HD TAB 9 is the new HD digital tablet analyzer from ROVER Instruments for DVB-S/S2, DVB-T/T2/Lite, DVB-C/C2 and MPEG-2/4. It has a high resolution 9"TFT 16:10 touch display for HD pictures and spectrum, remote control and BER, MER, PER, LDPC, quality, constellation, echoes and MER vs Carrier measurements. Weighing 2 Kg, including 5-hour Li-ion-polymer batteries, with its memory and PC interfacing capabilities, it provides a solution for fast and efficient installations.

www.ericsson.com

Ericsson's RX8200 Advanced Modular Receiver offers the ultimate in operational benefits by enabling decoding of all the main video formats of MPEG-2/4 standard and high definition in the highest quality, over both satellite (DVB-S2) and fiber networks. Early versions drove the adoption of MPEG-4 AVC High Definition and DVB-S2, and more recently 10-bit precision and 1080p50/59.94 profiles were supported. At this year's IBC Ericsson will show the new integrated DVB-S2X version of the RX8200.

www.syes.eu

The new Syes PCM-012 exciters manage Future Extension Frames as specified in the DVB-T2 standard. The company provides broadcasting equipment built to perform simultaneous handling of T2-Base and T2-Lite frames. A single transmitter is capable of broadcasting such composite T2 signals in SFN. The same hardware platform also supports regenerative repeater applications. Equipment can host a double tuner section and PLP recombination module that allows it to receive, regenerate and repeat composite T2-base and T2-lite signals.

www.newtec.eu

Newtec's professional 6000 series of broadcast satellite modulators, modems, OEM boards and hubs are now software upgradeable to the new DVB-S2X transmission standard. DVB-S2X reaches efficiency gains over DVB-S2 of up to 51 percent for high speed professional applications; up to 20 perecent for direct-to-home applications. This is much needed as the growing consumption of video & data and higher quality video (UHDTV) continues. Operators and broadcasters using Newtec's equipment cut costs, deliver more, higher quality content

www.neotion.com

Neotion strengthens its position in the market by enlarging its CAM range with Verimatrix, the specialist in securing and enhancing revenue for multi-network, multiscreen digital TV services. The company has introduced a portfolio of advanced security CAM products compatible with the Verimatrix VCAS for DVB pay TV solution for satellite, terrestrial and cable operators. The new CAMs offer robust cardless security for integrated TVs, STBs and professional IRD applications.

www.gatesair.com

GatesAir is now shipping its high efficiency Maxiva UHF and VHF transmitters, featuring broadband, modular designs that drive low total cost of ownership. Based on the company's PowerSmart 3D architecture, the space and energy efficient ULX-T liquid cooled UHF, UAX-T air-cooled UHF, and VAX 3D air cooled VHF transmitters are ideal for DVB-T2 networks of any size, covering all power requirements.

www.advantechwireless.com

The Advantech Wireless Ka-Band Outdoor VSAT Terminal is a fully integrated Ka-Band transceiver and DVB standard VSAT modem, able to receive the entire data capacity of a 500MHz Ka-Band satellite transponder, up to 2Gbps of traffic, and route appropriately. It supports the company's A-SAT dynamic DVB-S2/DVB-RCS switching technology. It requires only a single Ethernet cable to transport power and data. No need for any indoor element and it is easy to install.

www.harmonicinc.com

Leveraging the new Harmonic VOS virtualized video infrastructure platform, Electra XVM transforms broadcast and multiscreen workflows by integrating real time encoding, high quality branding graphics, and playout in a single, software-defined media processing system. The solution, with superior video quality, bandwidth efficiency, and workflow flexibility, reduces costs and drives new revenue generating services.

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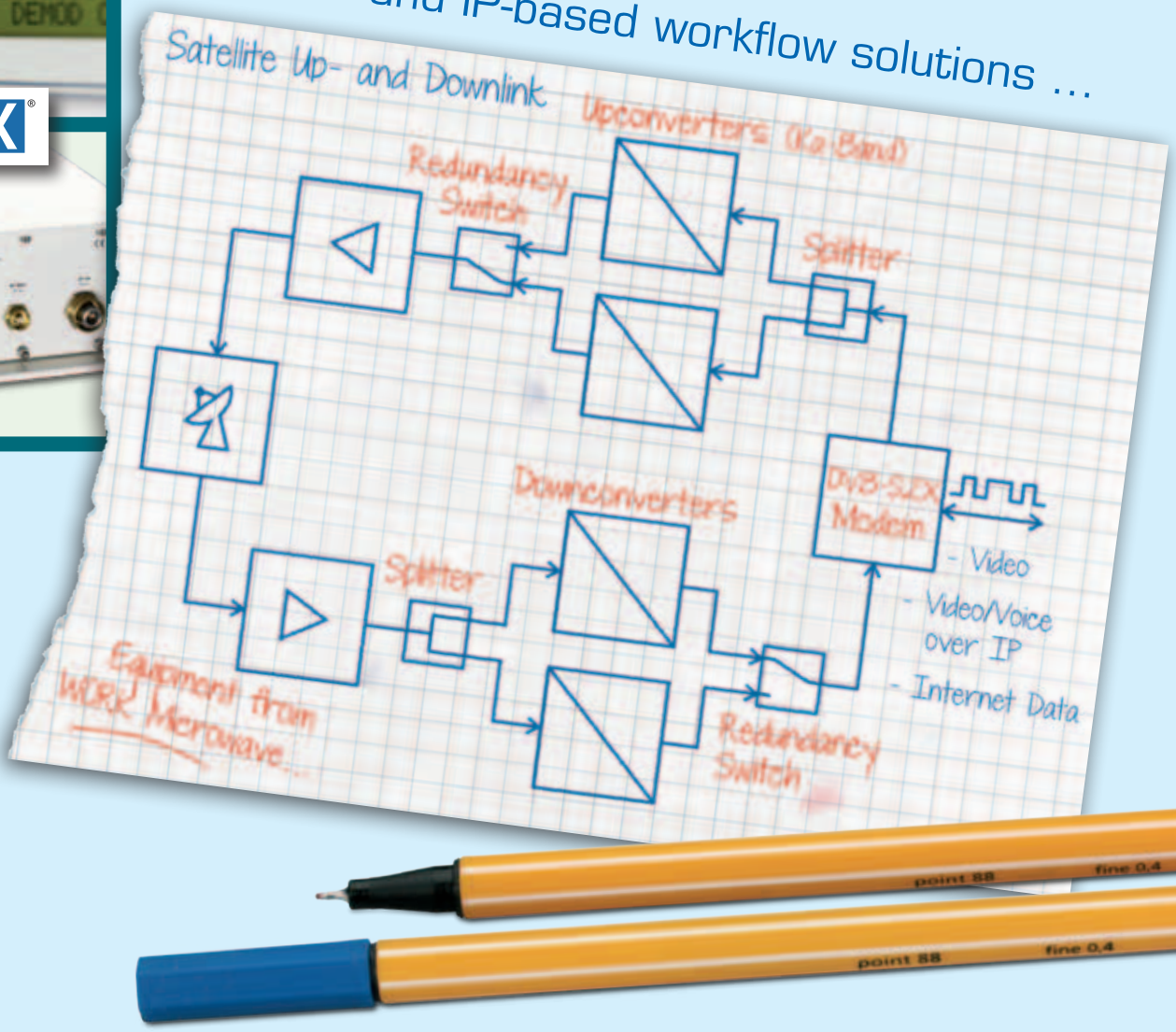

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www.work-microwave.de