DVBSCENE

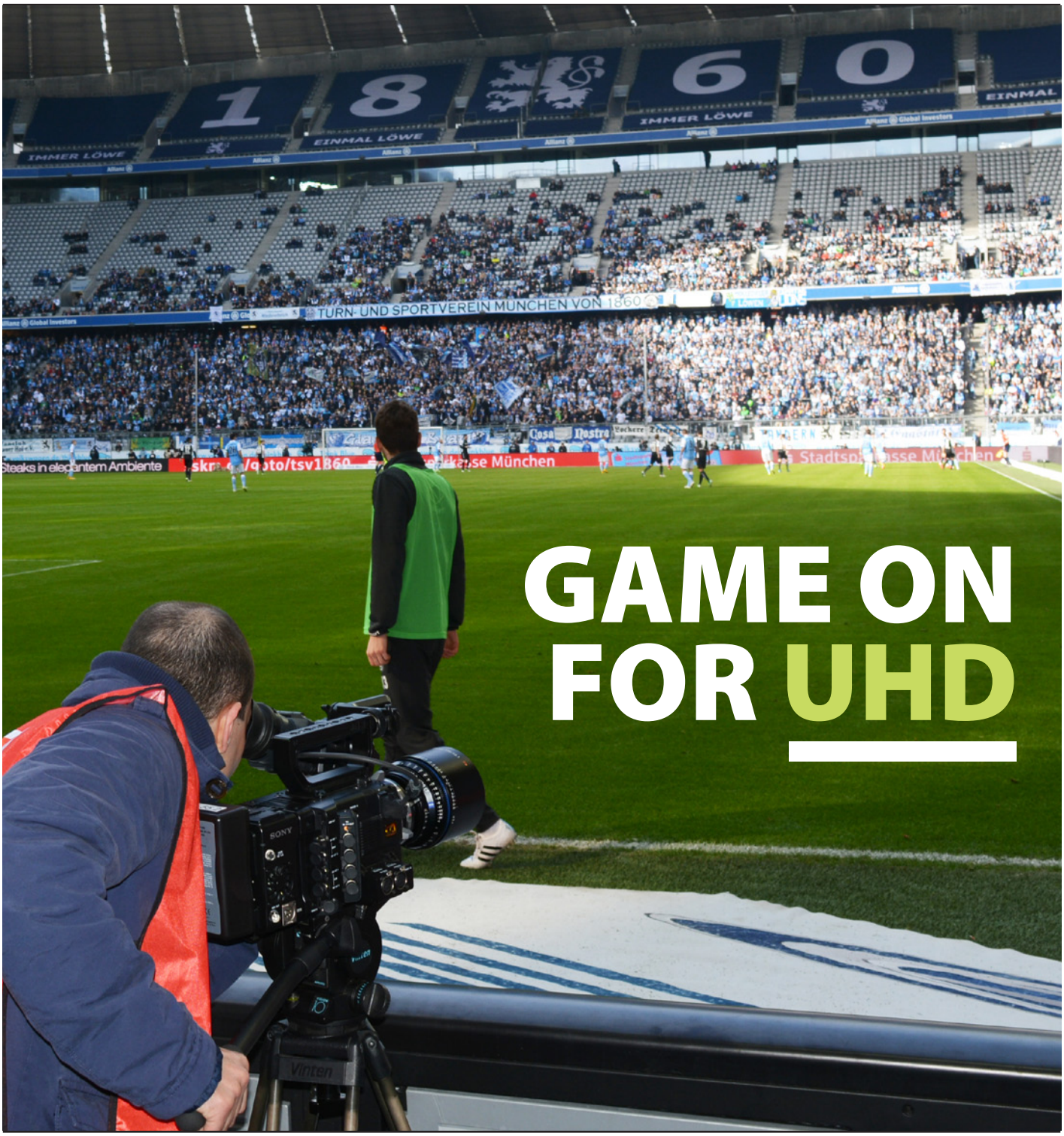
DVB Digital Video Broadcasting

Issue No. 49

March 2017

Delivering the Digital Standard

www.dvb.org



SECURING THE CONNECTED FUTURE

The world of video is becoming more connected. And next-generation video service providers are delivering new connected services based on software and IP technologies.

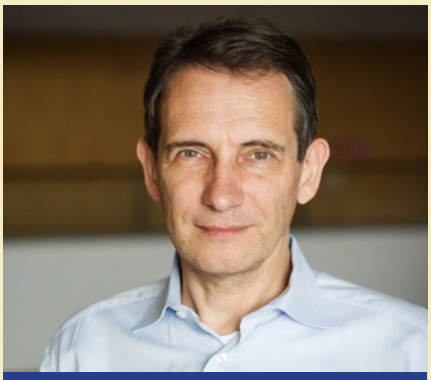
Now imagine a globally interconnected revenue security platform. A cloud-based engine that can optimize system performance, proactively detect threats and decrease operational costs.

Discover how Verimatrix is defining the future of pay-TV revenue security.

Download our
VCAS™ FOR BROADCAST HYBRID SOLUTION BRIEF
www.verimatrix.com/hybrid

verimatrix®

The End of Innovation?
A Word From DVB



Peter Siebert
Executive Director

A small step for mankind, but a big step for the broadcast industry might seem like an overstatement, however that's exactly what happened on 17 November when the DVB Steering Board approved the newly updated audio – video specification, TS 101 154, thereby enabling the rollout of UHD services. The newly revised specification is the result of enormous effort from the DVB Members' engineers, and is further evidence of DVB's leadership in the broadcast industry. The specification defines the support for the use of High Dynamic Range (HDR), Higher Frame Rates (HFR) and Next Generation Audio (NGA) in the DVB broadcast environment. In particular, the HDR part had been eagerly awaited by an industry keen to provide a new level of video quality to the end-user. Also, in combination with the UHD Phase 1 features, 4K UHD resolution and wider color space, there has been a quantum leap in video and audio performance. Perhaps unlike 3D, UHD is not a fad. As long as we continue to use flat panel displays, I do not expect to see any further advancements as the video quality exceeds the capabilities of the human eye and any further improvement would not be noticeable.

TS 101 154 allows the industry to offer true UHD, which is more than just an increase in resolution. Some claim that the new features are even more important than an increase in spatial resolution as appreciation is not dependent on how far the viewer sits from the screen. While the display industry is going full speed ahead and already offers a wide range of UHD/HDR TVs, progress in the production domain is slower. The broadcast industry still needs to fully understand its potential, so it may take some time before we can experience true UHD. Furthermore, professional equipment manufacturers have yet to provide a complete range of production equipment.

Does all this mean that we have reached the end of innovation? Certainly not. When it comes to displays there are still technologies to be explored such as Virtual Reality (VR) and holographic displays. VR, in particular, is a hot topic and could prove to be relevant for broadcast. To examine this further, DVB has set up a Study Mission Group on VR. The group has provided an initial report and discussions are underway on the next steps for VR in broadcast.

In addition to VR, DVB is addressing a wide range of new topics. For terrestrial broadcast, DVB is looking at the feasibility of frequency reuse factor 1 (also known as WiB). This could lead to a completely new network architecture and later down the line may result in a new terrestrial broadcast system. DVB is also exploring the long term vision of satellite broadband and broadcast as new High Throughput Satellites (HTS) and LEO / MEO satellite constellations are on the horizon. Following requests from the Asia region, DVB will provide a second generation Emergency Warning System, which amongst other features will also support receiver wake-up from standby mode. And just to mention one more item, DVB has started the technical work on ABR Multicast which will bring multicast scalability to OTT delivery of live content.

Over the 22 years of my involvement with DVB there has always been something new and exciting to look forward to and today is no different.

New Standards

TS 102 606-2 Ver. 1.2.1: Generic Stream Encapsulation (GSE); Part 2: Logical Link Control (LLC) (Dec - '16)
TS 101 162 Ver. 1.8.1: Allocation of identifiers and codes for Digital Video Broadcasting systems (Jan - '17)

Cover photo: Courtesy of Sky Deutschland.

Published by the DVB Project Office,
c/o European Broadcasting Union,
17a Ancienne Route,
CH-1218 Grand Saconnex, Switzerland.

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

Printed by New Goff n.v.

www.dvb.org · www.dvbworld.org · www.dvbservices.com

To subscribe to DVB SCENE and DVB SCENE eNews free of charge visit: **www.dvb.org/subscribe**

Consuming Media

Changing Viewing Habits?

Dr. Roberto Suárez Candel , EBU

Dr. Roberto Suárez Candel is Head of the Media Intelligence Service, the research unit at the European Broadcasting Union. He leads an international team of analysts responsible for data collection processes, the implementation of research projects and the publication of market reports. His team's main goal is supporting Public Service Media across Europe in their daily operations, advocacy activities and strategic planning.

Despite the rapid growth of internet usage, the overall time people spend watching TV and listening to the radio has changed little over recent years. In fact people are spending an increasing amount of time on media, with total viewing and listening time on the rise. Below are some of the main findings of the Media Intelligence Service's annual Media Consumption Trends report, which draws on the available research from a wide variety of sources to give EBU Members a snapshot of the latest developments.

People are spending more and more time on media. Although research assessing how much time people dedicate to media greatly varies in scope and methodology, studies usually point in one common direction: a steady increase in media consumption time. ZenithOptimedia predicts a 10% growth in media time in Western Europe between 2010 and 2018.

Watching video is the main media activity and total viewing time continues to increase. In Finland, total viewing time, which covers all types of watching including 'traditional' TV and online video, increased by 8% between autumn 2013 and autumn 2015. In the UK, the average daily viewing time increased by 42 minutes between 2010 and 2016.

Linear viewing tends to decline but live TV remains by far the dominant type of viewing. In many countries, live TV represents roughly 9 out of 10 minutes watched. It is in Northern European countries where the proportion of live TV viewing is often smaller. For instance, live TV represents 78% of total viewing in The Netherlands, 76% in Finland and 63% in the UK.

The growth of online TV and video is happening slowly in general, but faster among younger age groups. In the UK, online viewing (broadcaster catch-up, video-on-demand and short video clips) represented 15% of all viewing time in 2016, up from 10% in 2014. Over the same period, the proportion of online viewing more than doubled among youths aged 16-24, from 21% in 2014 to 47% in 2016. Paid on-demand services, such as Netflix and Amazon Prime, now account for 20% of viewing time for this age group, which is significant but still much less than live TV (36%).

Online viewers are still 'TV hungry'. Online TV and video may partly eat into traditional viewing, but at the same time they drive the growth of total audiovisual consumption. In Denmark, one third of the population regularly watches both traditional and online TV. This group spends around 25% more time watching than viewers who only watch traditional TV. Only 5% of Danes watch exclusively online.

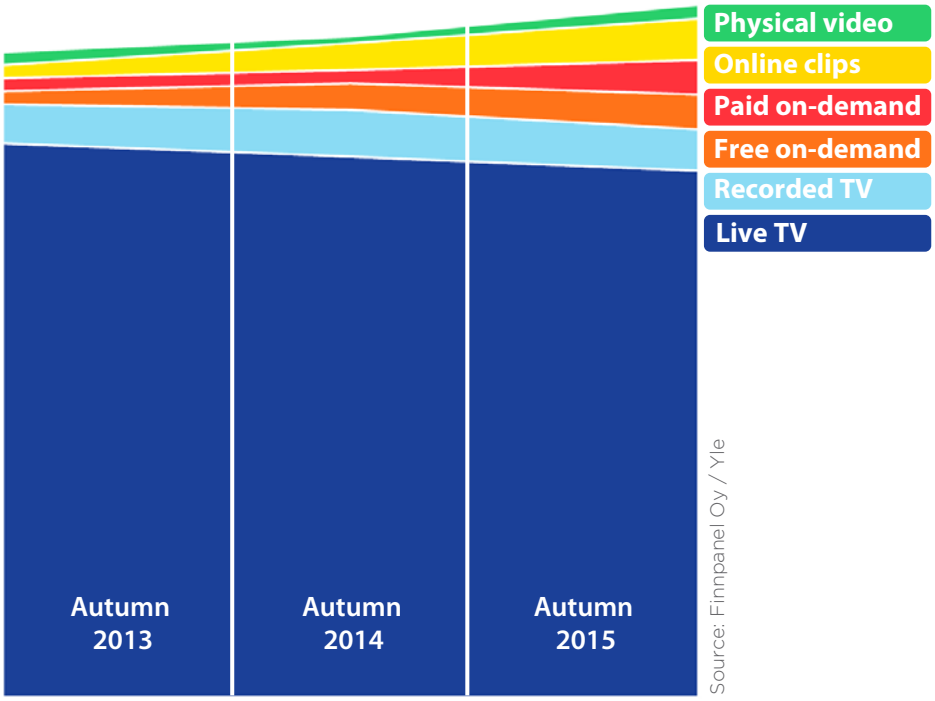
The TV set remains by far the most prominent device for viewing activities. In the UK, 93% of total viewing was done on a TV set in 2014. Two years later, this proportion remained the same. In the Netherlands results are similar, with 91% of viewing happening on TV sets in 2015. While younger age groups tend to embrace viewing on other devices, the TV set remains dominant also for them. Among Dutch teens aged 13-19, the TV screen accounted for 70% of all viewing in 2015, followed by computer (20%), tablet (4%) and smartphone (3%).

Watching on smartphones is still very modest. In the UK, 70% of adults aged 16+ own a smartphone which they use for 2 hours and 13 minutes per day. Only a fraction of this time, 5 minutes per day, is used to watch TV/video content. Among youth aged 16-24 this increases to 14 minutes per day, with most minutes dedicated to short video clips.

EBU Members can download the complete Media Consumption Trends report from www.ebu.ch/mis

Sources: United Kingdom: Ofcom Digital Day / Finland: Finnpanel Oy - Yle Media / Netherlands: Media:Tijd / Denmark: DR

Evolution of total viewing in Finland - time spent by viewers aged 9+



A FULL RANGE OF MONITORING, RECEIVERS, PORTABLE ANALYZERS & OPTICAL EQUIPMENT TO

Receive Analyze Transmit

SAT-TV-CATV SIGNALS

EXAMINER

PROFESSIONAL SAT-TV-CATV PROBE

Multi reception Probe for the analysis of DVB-S2, DVB-T2, DVB-C/C2 and DAB+ signals with integrated video decoding in HD SDI, HDMI, TS over IP.

MRX-200

TV & SAT PROFESSIONAL
MULTI-RECEIVER & MONITORING

Professional Receiver for TV, SAT and Radio signals for monitoring and Broadcast contribution.

TAB-9

PROFESSIONAL
TOUCH SCREEN
ANALYZER

Analyzers for Professional Installers. All the RF measures of TV, SAT, CATV, RADIO and HD pictures in a Touch screen display.

RLT-D10 ROVER LASER TRANSMITTER

REA-C20

COMPACT EDFA OPTICAL AMPLIFIER

COR-STC

CONDOMINIUM OPTICAL
HIGH LEVEL RECEIVER
WITH AGC

A full product range for your optical SAT-TV-CATV broadcast network: Transmitters, EDFA amplifiers, redundancy switch, Optical link, Receivers.

ROVER
OPTICAL CATV & SAT

Explore our products at
www.roverinstruments.com

Product made in Italy by Rover Broadcast.com

DVB T2/C2/S2

RO.VE.R. Laboratories S.p.A | Via Parini 2, Sirmione (BS), 25019 ITALY | +39.030.91981 | info@roverinstruments.com

In My Opinion

Never Mind the Quality, Feel the Width?

Paul Gray, IHS Marketing Technology

Paul Gray is a Principal Analyst/Researcher within the IHS Markit Technology group. He has more than 20 years of experience in market intelligence, marketing and product management. He joined IHS Markit in November 2014, when IHS acquired DisplaySearch, a leader in primary research and forecasting on the global display market. At DisplaySearch, he served as director of European research. In addition to TVs, he also covered wearable devices, digital broadcast and semiconductor technology. He conducted in-depth analysis and forecasting of wearable devices, connected TV and 4K Ultra HD.

Paul's work includes forecasting, product strategy, investment and R&D decisions. He has also been involved in consulting and conferences, and he has been cited as an expert in Nikkei, Los Angeles Times, Le Monde, Financial Times, The Korea Herald and other publications.

The growth of the installed base of 4K televisions is important to UHD broadcast's success. Clearly, having a set large enough to make UHD content noticeably better is essential. Screen size growth has been a steady long-term trend: average size sold has grown by one inch (2.5cm) per year for the past decade. This trend has been running and still shows little sign of slowing in Europe – or indeed most other regions. 55" is already the most popular size category for 4K sets in Europe, which suggests that things are on the right track.

I have one overriding concern though. Over the years, TV brands have largely failed to preserve value in their products. A TV in any size is a third of the ticket price of a decade ago. Features intended to revalue the category such as extreme thinness, 3D, internet connections and curved screens have unsurprisingly not saved brands from their urge to cut prices. Average pricing has been supported almost entirely by selling larger screens. Sooner or later we will reach a finite limit on size.

The rush into 4K TV production came largely from a supply-side push: panel makers were under margin pressure so introduced 4K resolutions. Elsewhere, brands felt that the pipeline of hot new features in TV was quiet. This 4K craze started in China (despite a total absence of content) and then spread outwards as the big global brands moved rapidly to defend themselves. The rest of the video industry has been struggling to keep up ever since.

The TV business is hyper competitive: this resulted in a rush to launch 4K products even in the absence of agreed standards. A recent broadcaster's 'plugfest' revealed that only half of 2015 models correctly interoperated with their new UHD set-top box. Launching a new product today was seen as more important than whether it was useful in future.

> ...many consumers will not care sufficiently to pay for the difference of real UHD, however what matters is keeping the attention of those who do care and to offer them an amazing experience.

This pressure to launch new products reveals a deeper truth. The consumer electronics industry has failed to adapt. Most CE devices are hard to differentiate, as they use technologies accessible to all: off the shelf semiconductors, platforms and displays. Features and benefits are confused – consumers buy benefits not features. Competitive advantage is no longer through devices but in offering differentiated experiences (veterans could argue that it always was). UHD should offer a heightened sense of reality compared to HD. Dynamic range, pixels and frame rates are simply tools to enable a UHD experience, not ends in themselves. People watch programs, not televisions.

3D failed because nobody cared enough about the experience – which generally got worse, not better, with each generation of TVs as costs were reduced. The seeds are already being sown for a similar sad path for 4K televisions: many are marketed as HDR-compatible. They have entirely standard panels and offer nothing in extra performance: all they can do is accept an HDR10 signal.

We are approaching a critical point in the development of UHD. Broadcasters have successfully resisted the urge to launch half-finished services, instead waiting until the quality of experience was good enough. The real question is whether the TV set-making industry is determined to have the patience to make products that truly exploit the potential of UHD signals, or whether it will simply turn into a race to the bottom on price. While many consumers will not care sufficiently to pay for the difference of real UHD (or be unwilling to buy a big enough screen), what matters is keeping the attention of those who do care and to offer them an amazing experience. It will keep value in the television business and provide fertile ground for the entire broadcasting industry to thrive.

Renewed Purpose

Tightening boot laces - and bootstrapping the DVB Project

Peter MacAvock, Chairman, DVB

With DVB now 24 years old, today's TV world that it helped shape is very different. Analog switch-off is done – or more or less done – around Europe, and well underway further afield. Although DVB is often termed a SDO (Standards Development Organization), it was set up as a pre-standardization industry forum – and that's how I continue to refer to it. DVB sends its specifications for standardization to ETSI and CENELEC via the EBU/ETSI/CENELEC Joint Technical Committee Broadcast – a real handful for a technical body that is small but continues to produce some of the most popular ETSI standards[1].

What made DVB unique back in the dawn of digital TV remains relevant today. All the DVB technologies are developed according to Commercial Requirements, agreed painstakingly in the Commercial Module with input from all stakeholders in the industry. Agreed by consensus, these Commercial Requirements drive the technical process, which yields technical specifications of the highest quality that underpin a multi-billion dollar industry today. But it doesn't stop there, DVB has pioneered a forum for exchange of views on intellectual property rights, the IPR Module, that has – in many respects – written the rule book for how to approach IPR in the context of technical specification development. And IPR patent licensing is much in the news these days with high profile debates on patent licensing programs for HEVC and MPEG-DASH much to the fore.

If the logic still works, how might we apply a commercial requirement driven technical development process to today's broadcast industry problems? Well what are those problems? In short, the same set of words appear when trying to formalize the industry issues: broadband, OTT, online services. One might consider that the 'B' in DVB still refers to the technique of broadcasting alone, but in practice the whole broadcast industry is embracing the online delivery of its services. This is in response to an explosion in the number of devices that can consume media, and the access networks to which they are connected. The challenges of facilitating this transition in such a way as the whole industry can profit is at the heart of DVB's work. Let us not forget though, that broadcast services remain highly profitable and the backbone of how the consuming public is entertained, educated and informed today. DVB's role is therefore to continue to address the needs of the broadcasting industry today, and provide for the needs of the industry as it transitions to a future where broadband networks will be increasingly important, and hopefully profitable.

With this in mind, there are a number of elements we have put in place to 'tighten the bootlaces' of the DVB Project. Up until now, DVB's output has been technical specifications alone. We're proposing henceforth to embrace aids to interoperability as part of our output. Looking at the way in which modern web standards are developed, we see that testing and testability is integrated from the outset. DVB Commercial Requirements can refer to output that might go beyond a technical specification where such additional elements are seen by the industry as helping the interoperability of the resulting products in the marketplace.

> ...provide for the needs of the industry as it transitions to a future where broadband networks will be increasingly important, and hopefully profitable.

A criticism that has sometimes been levied against DVB in the past was its tardiness in producing specifications. We looked closely at this, and felt that it was rather a lack of transparency that might have been the root cause. From now on, the Commercial Module will own a set of timelines for the development of DVB specifications. These will cover the requirements capture phase, through to the development of the specifications that meet those requirements, leading to the deployment of products based on those specifications in the marketplace. Because this is a complex and ambitious task, we are emphasizing the importance of ensuring that these timelines are constantly reviewed and updated so that it's clear to all observers where the DVB Project is in its process.

In addition to these elements, we have proposed a number of other measures to improve the way DVB works, like an extended analysis of the commercial drivers that motivate the technical specification process to ensure that they accurately reflect the market requirements, and ensuring that all DVB Members are aware of their obligations under the IPR rules that we have worked hard to develop. But probably the most important other item is to reach out to the industry to better capture the problems it has.

We're mindful of the fact that DVB is an organization well understood by those inside the Project, but the DVB's Module Chairmen felt that there was a new breed of broadcasting industry strategist who is perhaps less aware of how DVB could help them. With this in mind, we are reaching out to various sectors of the industry to identify areas where DVB could help. And of course, there's the need for a continued close relationship with the HbbTV Association – the organization specifying the interactive platform of choice in connected TV.

Peter MacAvock is Chairman of DVB. He was DVB Executive Director for 14 years before taking his current position of Head of Delivery, Platforms and Services at EBU Technology & Innovation. One of his first tasks as Chairman was to undertake a review to determine how DVB will adapt to meet the new challenges the TV industry is currently facing.

[1] http://www.etsi.org/standards-search#Pre-defined%20Collections

OpApps

Expanding the Scope of HbbTV

Matthew Huntington, Freesat

Matthew Huntington is CTO for Freesat. He is a steering board member of HbbTV and Chair of its Marketing and Education Group. He is a council member of DTG and on the management committee of the FreeTV Alliance.

Over the last year the HbbTV Association's requirements working group and specifications working group have been working on a new area, known as operator applications or OpApps for short. This work will expand the scope of HbbTV standards from broadcaster and content provider applications to network operator applications.

What is an Operator Application?

In the context of this work, an 'Operator' is an organization that aggregates channels and offers them to consumers. This might be a traditional pay-TV operator such as Kabel Deutschland, an IPTV operator such as Swisscom or a free-to-view operator such as Freesat.

An operator application is a TV guide that enables consumers to access the channels and services within the operator's look, feel and brand. Operator branded TV guides have existed since the launch of digital TV, but these have been the preserve of vertically integrated pay-TV operators running on set-top boxes. The intent of the HbbTV OpApp work is to enable operator applications to be deployed in a standardized way across horizontal/retail markets, as well as traditional vertically integrated markets. When an OpApp integrated digital television is bought through a normal retail channel, and connected to an operator's network (DTT, cable, satellite, IPTV), customers will be able to access the operator channels within a controlled user experience.

Operator applications have been deployed using existing HbbTV specifications, the most notable examples being Freeview Australia and Freeview New Zealand. These solutions, while effective, will only work in very specific circumstances and have significant limitations. The HbbTV OpApp specification will overcome these.

What is the value of an Operator Application?

An Operator Application can deliver a compelling look and feel, which is easy and effective to use, and integrates an operator's full range of broadcast and broadband services. The experience can be tailored to local requirements in a way a global UI cannot. Deployed products can also receive updates over time as new features are developed, making operators more competitive and overcoming the issue whereby manufacturers have limited incentives to deliver updates to products beyond the initial warranty period.

An Operator Application delivers consistent branding for the operator, this ensures that viewers develop an affiliation with the operator and will value the service more.

Manufacturers are able to do less customization for local markets and can benefit from the operator's marketing and promotions.

Consumers benefit from a better integrated experience making it easier for them to find the television they love, that will be enhanced as the market evolves.

Key Features

The HbbTV OpApps work is built on a couple of key assumptions. The first is that OpApps will coexist with standard HbbTV broadcast applications and that OpApps will not interfere with their operation.

The other key assumption is that there will be a bilateral agreement in place between the device manufacturer and the operator. Applications are only expected to work when there is an agreement in place, which is different from the universal support expected for standard HbbTV applications.

OpApps will also coexist with the manufacturers own user experience, as well as other OpApps on multi-tuner devices. Typically, consumers will be able to switch to an OpApp by selecting a 'Source' on their device. When a different source is selected (e.g., HDMI), the OpApp will not continue to have control of the user experience.

Operator Application and Free-To-View TV

Operator applications present an opportunity for free-to-view television operators. By providing a consistent branded user experience to consumers through horizontal market devices, free-to-view television operators can better compete with vertically integrated pay-TV providers enabling such operators to transform their business.

Television has gone through a major evolution over the last few decades from a handful of channels available to a typical service offering tens to hundreds of channels, all supported by a range of on-demand services. Pay-TV operators have driven much of the TV evolution and grown with it. Without a strategy to compete with pay-TV, free-to-view television risks declining both in content variety and households to a point of unsustainability.

Free-to-view platform operators need to transform their offering and themselves in order to compete with pay-TV. Traditionally they have been organizations that manage infrastructure, but they need to transforms themselves to manage viewers, with multiple steps along the way. OpApps is a key technology that operators can use as part of that transformation.

Freesat has started its own transformation and is encouraging other free-to-view television operators to follow its example to strengthen free-to-view television in other markets. Freesat has launched operator applications across horizontal set-top boxes and televisions, using our own approach. Freesat is now contributing our experience and knowledge to the HbbTV OpApps work.

Freesat's Operator Application launched in 2012

Discovering HDR

Experiences in live production

Stephan Heimbecher, Sky Deutschland

DVB kicked off its UHDTV related activities back in September 2012 by envisioning a phased approach to suit early adopters as well as long-term improvements to both audio and video. Phase 1 basically focused on the higher resolution of 3840 x 2160 pixels, while Phase 2 added further 'goodies' to make the audio-visual experience more realistic for the viewer. However, due to its complexity, it would take more than four years for DVB to complete a new version of TS 101 154, which adds support for High Dynamic Range (HDR), Higher Frame Rates (HFR) and Next Generation Audio (NGA).

Sky Deutschland's journey 'beyond HD' began almost at the same time with the first Ultra HD tests in the Allianz Arena in Munich being conducted at the end of 2012. There was almost instant enthusiasm about the new technology despite the awareness that it would take quite some effort and time to update the entire end-to-end workflow, especially for live productions. But just a few months into the UHD trials it became clear that just the higher resolution (Phase 1) wouldn't propel UHDTV to long-lasting stardom. Nevertheless, the next two years would be dedicated to preparing the live production chain for Ultra HD, gathering the necessary production experience and setting up the integration with the existing HD production workflow.

When the first HDR UHDTVs were suddenly being introduced at CES in January 2015, Sky Deutschland began to trial this new feature in live sports production as well. The typical use case was to demonstrate the benefits of HDR is what many of us had just recently experienced during the FIFA World Cup in Brazil during the summer of 2014: sunny and shady patches of the field are difficult to handle in a TV production without the additional dynamic range. But even in parts of the world where the sunshine does not pose a problem or during nighttime matches, HDR will do its magic in rendering a much more realistic picture.

However, making HDR happen in an Ultra HD live production would turn out to be even more challenging than the step from HD to UHD. While a first live end-to-end test in August 2015 confirmed that the impact on production equipment and tools would be relatively moderate, it also became clear that composing a compelling HDR picture will require more testing and training. Before that could be addressed, Sky Deutschland was seeking more clarity in what would be the appropriate HDR format to run these tests.

Following the approval of the Commercial Requirements for Phase 2 in late 2015, DVB was initially overwhelmed by no less than nine respective proposals for HDR technology, far too many for any operator to test under real live production conditions, let alone compare the results. Instead, Sky Deutschland focused its HDR activities on two systems, which had already been standardized at the time: Perceptual Quantizer (PQ, SMPTE ST-2084) and Hybrid Log-Gamma (HLG, ARIB STB-B67). By mid-2015, PQ was on the verge of commercial deployment as the mandatory format for Ultra HD Blu-ray, while HLG was backed by the BBC and Ultra HD pioneer NHK.

Typical use case for HDR production

Stephan Heimbecher is Director, Innovations & Standards in Technology at Sky Deutschland. He is a board member of the German TV Platform and chairs a UHD working group of that body. He is Co-Chair of FAME (Forum for Advanced Media in Europe). Stephan is also a member of the DVB Steering Board as well as of the Steering Committees of the Innovation Center for Immersive Imaging Technologies (3IT). He actively participates in the Ultra HD Forum and leads the Broadcast Group of the UHD Alliance.

It became clear in the early tests that both PQ and HLG would deliver almost indistinguishable and equally stunning HDR results, and the perceived benefits of HLG from a live production perspective were the lack of metadata requirement and the partial backwards compatibility with SDR TVs. The latter was quite important due to the large number of non-HDR UHDTVs being deployed in the market by 2015. When the ITU-R confirmed with the publication of BT.2100 in July 2016 that PQ and HLG would be the right choices for use in production and international program exchange, it was time for Sky Deutschland to conduct another major HDR trial to obtain further experience.

For that, a three-day beach volleyball tournament in St. Peter-Ording was chosen. This provided the ideal opportunity to test HDR in a live production environment under changing weather and light conditions. But the main objective of these tests was to optimize the workflow so that a single OB van utilizing one set of HDR cameras would deliver an optimal HD SDR and UHD HDR signal at the same time. The results of this outdoor trial were confirmed by an indoor test during a concert production in Berlin at the end of October 2016, which was equally suitable to demonstrate the benefits of HDR.

Shortly thereafter, DVB endorsed its UHD-1 Phase 2 specification, which for HDR also supports PQ and HLG. And, with HDMI announcing support for HLG signalization in HMDI 2.0b just a few weeks later, the course was set for HDR in broadcast. However, HDR live production and the addressing of non-HDR legacy consumer equipment still remaining challenging, time will tell as to how fast operators will be able to introduce the new technology.

To Immersive and Beyond

Introducing Next Generation Audio

The latest version of the DVB's TS101 154 heralds a new landmark in audio, a revolution in sound which perfectly complements UHDTV's improvements in the picture. Known by the term NGA, Next Generation Audio marks a real and profound change in the way audio is produced, delivered, and experienced in the home.

Immersive and Personalized

Next generation audio systems will not only be vastly more bandwidth efficient, but provide a truly immersive experience which will bring consumers new levels of control and personalization. It adds the height dimension and creates a more realistic sound scene, immersing the consumers in a hemisphere of sound. When coupled with the latest advances in UHD video, Next Generation Audio has the power to transform the consumer experience.

A new Paradigm for Audio

NGA systems treat audio differently and break it down into its logical elements. This simple change eliminates the current need for a broadcast mix to be 'one size fits all', instead NGA allows the audio to adapt to listening environments and to listener preferences. It also gives consumers the power to personalize the audio, and to choose between different audio experiences, such as alternative languages, team-biased sports commentary, or director's commentary.

Objects, Elements and Presentations

Instead of delivering complete stereo or 5.1 channel-based mixes, content creators can deliver discrete audio elements that are grouped into one or more presentations, each of which represents a complete audio mix and a different user experience. The benefit of this style of creation and delivery is that audio elements can be swapped out, changed in level, or even omitted from the final mix. These multiple elements and presentations can then be delivered very efficiently in a single elementary audio stream.

A Revolution in Audio Accessibility

Accessibility features such as Audio Description tracks can also be sent as audio elements, to be mixed in during playback. Delivery of discrete audio elements also provides dialog enhancement control, empowering consumers to change the relative balance between dialog and ambience to improve intelligibility.

Adapts To the Listening Environment

The Next Generation Audio systems are adaptable, with one stream being capable of producing the best audio experience for any playback devices including home theatre systems, TV sets, mobile devices, and headphones by rendering the audio in an optimal way to whichever device is used.

The benefits offered by the next generation audio systems are clear, and the DVB has included two solutions in the latest version of its Audio Video Coding specification TS 101 154: MPEG-H 3D Audio and Dolby AC-4. Both solutions are described below by Stefan Melzer of Fraunhofer IIS and Elfed Howells of Dolby.

MPEG-H 3D Audio

Stefan Meltzer, Fraunhofer IIS

Stefan Meltzer supports the Fraunhofer IIS business development team as a technology consultant. His focus is on the adaptation of MPEG audio technologies in TV broadcast systems worldwide.

The MPEG-H TV Audio system is based on the latest development of the MPEG audio group, the team that has already contributed a number of audio solutions to the broadcast community and enabled the success of digital TV worldwide. The addition of MPEG-H to the DVB family of standards marks the start of a new era in TV audio. The MPEG-H TV Audio system supports all the elements described above such as immersive sound, interactivity and audio reproduction adapted to the end device, but it is much more. It is a complete system from the microphone to the speaker, opening up new opportunities and challenges for creatives as well as a new dimension in user experience.

MPEG-H provides three different methods for the transmission of audio: Channels, Objects, and Scene-based audio. Objects and Scene-based audio are new concepts in TV audio, while Channel-based audio is a well understood concept and ensures that all current content can be used with MPEG-H.

Dolby AC-4

Elfed Howells, Dolby

Elfed Howells is a Business Group Director at Dolby, based at their European Headquarters in London. He is currently responsible for Dolby's multiscreen audio strategy across worldwide broadcast and OTT markets. He is a member of the DVB Steering Board and a DVB sub-group chair.

AC-4 (ETSI TS 103 190) is a well-established open standard, first introduced to the DVB's codec specification (TS 101 154) in 2014. It was introduced as a revolutionary new audio format, to match the 50% efficiency saving offered by HEVC in video. It is four times more efficient than AC-3, offering 5.1 audio at only 96 kbps.

ATSC 3.0 has also included AC-4 in its proposed standard, and NABA has recommended it to be the only NGA codec for ATSC 3.0 broadcast services in North America (USA, Canada, Mexico).

The latest DVB specifications now include the capabilities of AC-4, a well featured and efficient codec for both traditional and NGA. AC-4 not only brings immersive audio, vastly enhanced accessibility, and interactive personalized audio, it also brings features that go beyond the DVB requirements, such as advanced Dialog Enhancement and Audio-Video

The Channel-based representation of audio now includes height speakers, introducing a third dimension in the sound field. The MPEG-H TV Audio system as defined in DVB limits the number of available speaker channels to 12 allowing popular formats such as 5.1+4 and 7.1+4 ('+4' = four height speakers).

By comparison, audio objects are not bound to any loudspeaker setup. They are transmitted as sound elements with associated metadata describing their position in space and their properties. For final reproduction, they are mapped on the actual reproduction setup and thus can be easily adapted to the properties of the target device. Another main advantage of objects is that they can be manipulated by the user within the limits defined by the content creators, for example, to switch between different languages or to offer different commentary versions such as home and away team commentary in a football match. The adaptation of the volume can be used to enhance a dialog object in a noisy listening environment or to improve the dialog intelligibility for the hearing impaired.

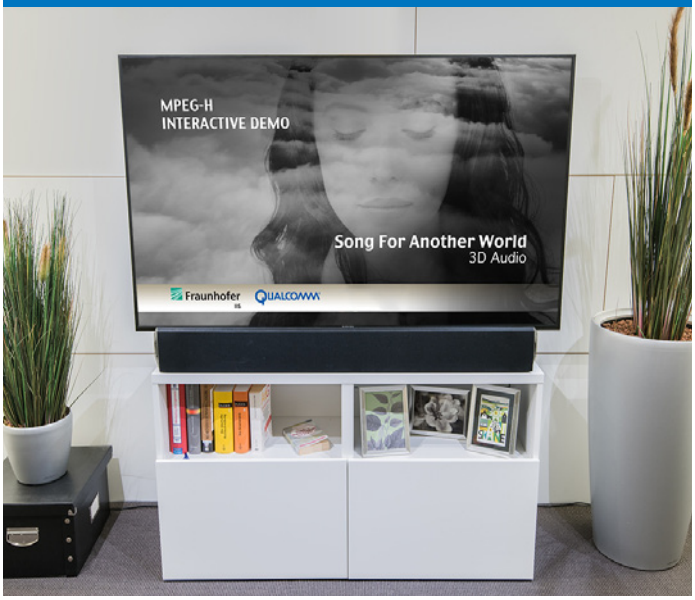
Scene-based audio is also known as Ambisonics. Ambisonics is a representation of the pressure of a sound field with mathematical equations. Since an Ambisonic representation is also independent from the final reproduction speaker setup, it can be easily manipulated before the final playback. This feature makes it very attractive for use in Virtual Reality applications.

All these new interactive possibilities for audio produce new opportunities, and need to be delivered in a way that satisfies the engaged user who wants to explore all options, as well as the laid back one who simply wants to switch on the TV and be entertained. For this purpose, the MPEG-H TV Audio system offers the concept of presets. Presets can be defined by the content creators and define a combination of different elements of a mix and their relation in terms of position, volume, etc., to each other. Presets can be, for example, different language versions, a TV commentator versus a live atmosphere mix of a live event, or a preset with increased dialog levels for the hearing impaired.

To complete the system, new tools for producing audio content for the MPEG-H TV Audio system have been developed, enabling content creators to utilize all the new options. For the living room of the future, Fraunhofer has developed a 3D soundbar creating the immersive user experience.

The MPEG-H TV Audio system is ready for deployment and in 2017 the first terrestrial UHD TV service will start its regular operation using a Next Generation Audio Codec. The ATSC 3.0 based South Korean UHD TV service will be the first to use the MPEG-H TV Audio system as its only audio system.

The reference design of a 3D soundbar of Fraunhofer IIS allows the convenient delivery of immersive sound into consumers' homes



synchronization, to eliminate lip-sync problems and enabling seamless ad splicing.

For many years, almost all DVB receivers have included Dolby's Multi-Stream decoder engine (MS10, MS11, MS12). It supports native formats such as AC-3 and E-AC-3 and the AAC family of codecs (AAC and HE-AAC) making it the universal turnkey solution for decoding broadcast and streamed audio.

AC-4 is now available as standard in the current version of MS12 and is included at no extra cost to manufacturers. It is also free to use for broadcasters, OTT providers and content providers.

These factors make it easy to integrate and test, which is why many manufacturers will include AC-4 in new TVs coming to market this year.

Samsung, LG, Sony, TP Vision, Sagemcom and VIZIO have made press releases or public demonstrations of TVs and set-top boxes with AC-4, and DVB televisions with AC-4 support, from major manufacturers, will be in the market in 2017. It is also already available for mobile devices.

Encoders from Harmonic, Ericsson and many others also include support for AC-4, with new features and new professional products available this year.

Immersive audio is synonymous with the Dolby Atmos, a multi-award winning format used by over 500 movies since 2012. It is already broadcast by DVB operators such as BT (UK) and Orange (France), for live sports and recorded programming, and is the definitive format for immersive OTT, including a recent launch by ProSiebenSat.1's Maxdome service.

AC-4 was built for Dolby Atmos, and is the only DVB NGA codec to deliver this immersive, moving audio experience to any playback device. Over 75 models of home theater systems, 40 speaker models, 11 soundbars, and 60+ mobile device models support this immersive format today.

Since 2015, operators in many countries have been trialing AC-4 both in their labs and on-air. National broadcasters in Spain (RTVE), France (TDF, France Television, Arté) and the USA (PBS/KQED) have broadcast AC-4 streams over terrestrial networks. Three major DVB-based vertical operators have specified AC-4 into their platform with two others expected soon.

The live AC-4 trial in Spain from National Broadcaster RTVE has been on-air for over six months with considerable success. Manufacturers are now using these live streams to validate their AC-4 solutions as they come to market. The trial is configured with AC-4 as the only audio format available for the service.

AC-4 is not only ideally suited for advanced use cases such as VR, but can also revolutionize today's broadcast, OTT, mobile or hybrid use cases. Whether for immersive, personalized, or a more efficient way to deliver existing audio, it has the strong industry support and the end-to-end ecosystem to deliver.

Today, the AC-4 team, together with many industry partners, are ready to support the smooth, cost effective addition of AC-4 to any device and any service.

With AC-4, many different experiences can be created from a single stream by combining elements into presentations

Emerging Trends

Influences in the UHD market

Myra Moore, DTC Reports

The interdependency between highest quality A/V and the latest display technologies has reached a new high with Ultra High Definition (UHD) content and advances in Light Emitting Diode (LED) TV displays.

When UHD was only equated with 4K, industry insiders questioned whether consumers could detect enough of a quality improvement (without any other processing enhancements) to entice them to upgrade their TV sets and content consumption. An array of technical ingredients such as High Dynamic Range (HDR) and Wide Color Gamut (WCG) coupled with high resolutions morphed into the 'new' UHD. Simultaneously, significant advances in display technology were being realized.

Arguably, the processing enhancements, such as greater ranges of displayed whites and blacks, a wider range of colors rendered, and 3D/enhanced audio coupled with higher resolution and faster refresh rates, are the most important ingredients for the premium viewing experience. But when coupled with the latest Organic Light Emitting Diode (OLED) or Quantum Dot (QD) displays the perceptible improvement in quality is undisputed.

Apart from the perennial hype surrounding technology that has yet to find a market (or exist as a commercial offering), the stars of this year's Consumer Electronics Show (CES) held in January in the US, were these high-end TV displays playing content that had been made and processed with all the UHD enhancements.

LG, which has succeeded in making significant manufacturing efficiency improvements through the acquisition of both manufacturing expertise and Kodak's OLED patents, has commercialized the display technology and is the industry's supplier of TV panels. It showed at CES what it calls 'wallpaper' OLED TV (2.85mm thick) that can be attached to a wall with magnets and a slim bracket. Entering the market at $8,000 (available in 65-inch and 77-inch screen sizes), it clearly is not ready for the mass market. But lower priced and thicker flat panels (but still quite thin) come with the same quality display and are seeding the burgeoning premium consumer market category. According to LG, the new OLED models will be 25% brighter than previous sets.

Other TV suppliers are showing up to the OLED party with Panasonic and Sony renewing their support of OLED TVs that support HDR, WCG and next-generation audio technology. They both are sourcing their displays from LG and both displayed impressive OLED TV offerings at CES.

TV market leader Samsung, however, is producing QD TVs for its premium offerings. QD TVs are basically LCD TVs improved by a process that enhances the LED backlighting resulting in the display of a wider palette of color values. QD TVs are the main competitors to OLED TVs in the premium display market.

At CES, Samsung unveiled what it dubs quantum Dot Light Emitting Diode (QLED) technology, which the company says will deliver brighter colors and wider viewing angles. And, as with OLED displays, other TV makers are also expected to offer QD TVs, setting up an obvious matchup between the two display technologies, and more pointedly, between LG and Samsung.

Neither OLED or QD TVs have reached price points that create a mass market category. Creating manufacturing scale and improved production techniques is the current course of action and industry insiders appear confident that manufacturing economies of scale and improved production efficiencies will be realized.

To that end, a handful of companies are working on improving the manufacturing process for OLED panels with new tools such as inkjet printing systems and new materials used for that process. This process, which uses nozzles to spray organic compounds onto glass or plastic substrates, is believed to make the manufacturing process more efficient by increasing yields.

Most of the companies working on these solutions are startups with backing from heavy hitters like DuPont and venture capital arms of big consumer electronics companies. One of the most prominent is California-based Kateeva, which many observers believe is closest to commercializing an inkjet printing system for large scale production of OLED TVs. The company's reported goal is to deliver large-screen OLED TV panels for $1,000.

Today, these displays aid the industry in demonstrating that true UHD (4K and the additional improvements) is, in fact, a significant improvement in the viewing experience. Even when displayed on today's ubiquitous LCD TVs, the quality enhancements are apparent to the average eye. This isn't trivial as many consumers felt stung when promised a transformative TV watching experience with 3D TV. They'll be looking a bit closer this time.

Myra Moore is president of DTC, a boutique market intelligence firm that analyzes the worldwide consumer digital TV market and aids TV providers in transitioning to next-generation technologies.

At CES 2017, LG showed what it calls 'wallpaper' OLED TV (2.85mm thick)

VR Scorecard

Success Factors

David Wood, Chair, DVB Study Mission Group - VR

How can we know, in advance, if a new media system or technology will be successful? If we could predict this with accuracy, we would all be millionaires. But we are, at least, not without tools for establishing likelihoods of success. In the DVB Study Mission Report on VR, though far from a treatise on the subject, we looked at this issue for VR.

First things first. There are many variants, but the major distinction in VR systems is usually taken to be between systems that allow different 'degrees of freedom' for the user in his or her head-mounted display (aka HMD) virtual world.

The two groups of systems can be called: 'panoramic/3 degrees of freedom' and 'panoramic/6 degrees of freedom'. The first is the simpler system. The user can move his head around with a corresponding change of view. The second group is the more complex. The user can move bodily in the virtual world and what he sees and hears matches this. The HMD for the first group is usually a container into which fits a smart phone. For the second group, it is a specially designed headset which is connected to a computer or games machine. There are also usually differences in the quality of experience in the audio. It is more immersive in the second group. For the sake of a name, in the DVB report we call the first, Type A, and the second (you guessed), Type B.

It's obvious that the overall sense or illusion (or immersion) with Type B will be greater than Type A, but this comes at the cost of greater complexity and cost. Which is the best bet for commercial success?

One of the simplest tools to establish likelihood of success is the combination of degree of disruption and benefit. History suggests that the combination needed for rapid success is low disruption and high benefit. This might be, say, an app which uses your existing tablet or smartphone and provides some really valuable service. On the other hand, the combination of high disruption and high benefit can eventually succeed but takes a long time to do so. This might be, say, UHDTV. High disruption and low benefit products traditionally have not done well.

So where do our Type A and Type B VR systems lie in our matrix of disruption and benefit? Type A might be called moderate benefit and low disruption. Type B might be called high benefit and higher disruption. We might conclude that both may succeed to a degree, but Type B will take longer.

There are more detailed tools which may help to sharpen the picture. We can analyze a series of success factors, and score them. The total score can be taken as a measure of the likelihood of success.

The main success factors are arguably: availability of equipment, cost of equipment, ease and convenience of use, desirability of content, availability of content, cost of content, equipment externality (the extent to which the equipment be used for other things as well), and network externality (the extent to which the more people that have one, the more useful it is).

David Wood is Consultant, Technology and Innovation, for the European Broadcasting Union, and has previously chaired the ITU-R groups that prepared the Recommendation for UHDTV, ITU-R BT 2020. David leads the DVB's Study Mission Group on Virtual Reality.

History suggests that the combination needed for rapid success is low disruption and high benefit.

In reality each of these 'success factors' will have different weightings, but as a starting point we could assume that they all have the same weighting, and assess what score each would have on a given scale. In the DVB report we use a scale of 1(bad) to 5(excellent) - like they used to mark your maths at school?

We assessed that both Type A and Type B would have relatively high scores when the combination of all the factors are taken into account, but Type A does have the significantly higher overall score, at least in the near term.

There are many issues in the road ahead for virtual reality: can common standards be agreed; can the content that the public will want to buy be developed; can sensory sickness be adequately minimized? But given these issues can be solved, the (probably phased) future of VR looks virtually certain.

Enhancing the On Board Experience

Next Gen In-Flight Connectivity

Kevin McCarthy & Koen Willems, Newtec

Kevin McCarthy,
VP of Market Development, Newtec

Koen Willems,
Market Director, Government and Defense, Newtec

For many years, aviation has been the last frontier of the satellite industry. While demand for In-Flight Connectivity (IFC) on commercial and government aircraft has never been higher, the numerous technical, regulatory and commercial hurdles remain daunting.

First generation IFC systems were largely based on legacy technologies, adapted to the airborne environment. While these early solutions proved that IFC was technically possible, their low efficiency and poor performance often resulted in an unsatisfactory service.

Fortunately, there is hope on the horizon. With the advent of High Throughput Satellites (HTS) and next generation waveforms, industry leaders such as Panasonic Avionics Corporation and the Canadian Department of National Defense (DND) are looking to change the game.

Next-Generation Waveforms

A waveform is essentially a sophisticated algorithm used to convert data into radio waves. The relative yield of this conversion process is known as spectral efficiency. The resulting ratio of Mbps per MHz is the single most important factor in most satellite business models because it directly impacts the cost and quality of the service.

Next generation aero modems will support the most efficient waveforms available on the market today.

DVB-S2X

For example, in Panasonic's case, the forward channel (towards the plane) will use the latest Satcom transmission standard, DVB-S2X, which is optimized for HTS wideband transponders. The Canadian DND aircraft will use DVB-S2X both in the forward and return channels.

DVB-S2X addresses several limitations of the previous standard, DVB-S2. It includes a wider, more granular range of Modulation and Coding combinations (MODCODs) that dramatically improve Mbps/MHz efficiency. It also supports much wider HTS transponders, from 140-500 MHz. In addition, the new standard includes Very Low Signal to Noise (VL-SNR) MODCODs, which are ideal for aviation and other very small antenna applications.

Government Applications: Reliable High Throughput ISR Links

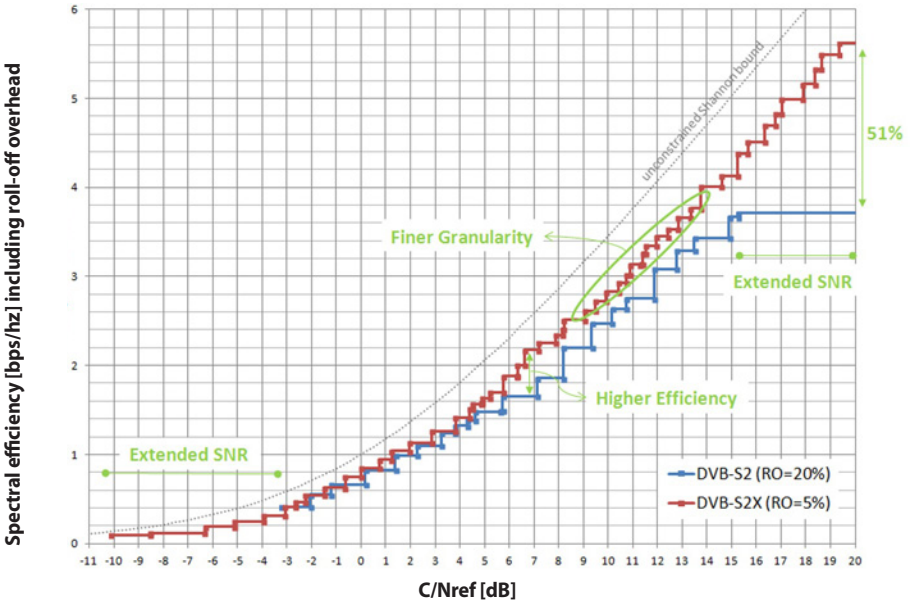
These new waveforms are not only being deployed on commercial aircraft, but increasingly on government and defense airborne platforms for Intelligence, Surveillance and Reconnaissance (ISR) applications. These ISR aircraft are typically stacked with sensors and cameras on board to assess situations such as conflicts, disasters or illegal activity on the ground. Recently, the Canadian DND selected the DVB-S2X equipped Newtec MDM9000 Satellite Modem for use on its Aurora fleet for ISR and Search and Rescue (SAR) missions. Leveraging DVB-S2X and other efficient technologies, the modem provides double the throughput at maximum service availability compared to legacy systems. The relay of high definition video and sensor data coming from bandwidth-hungry sensors on board the ISR platforms increases operational efficiency and enhances the decision making process.

So, What Does It All Mean?

At the end of the day, commercial airline passengers just want reliable broadband connectivity at an affordable price. On the other hand, government and defense end-users seek reliable and high throughput links at maximum efficiency to support their ISR and SAR operations. Every little sensor detail can change the course of an operation and impact human lives.

Until now, satisfying all these requirements has been nearly impossible. However, with the recent advances in waveform technology, we are quickly approaching a tipping point. Soon airplanes will simply be another place where people expect to be connected, without a second thought.

Efficiency versus C/Nref



Next Gen Video Codec

Will Standardization Do it Again?

Benjamin Bross, Fraunhofer HHI

Benjamin Bross is a Project Manager at the Video Coding & Analytics Department of the Fraunhofer Institute for Telecommunications - Heinrich Hertz Institute, Berlin and a part-time lecturer at the HTW University of Applied Sciences, Berlin.

Since the early 90s, the ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Pictures Experts Group (MPEG) together have provided a new video standard about every 10 years. Starting in 1995, the joint video coding standard H.262/MPEG-2 kicked off digital television by enabling digital video broadcast with DVB-T/S/C and home entertainment with DVD video. In 2003, the next big joint standard was finalized: H.264/AVC. Reducing the bitrate by about 50% for the same video quality compared to H.262/MPEG-2, H.264/AVC started a true digital media revolution including HDTV, IPTV and a massive spread of mobile and web video. Currently over 3 billion devices support H.264/AVC and 50% of all bits on the internet are coded according to this standard. However, the increased coding efficiency leads to an ever-increasing amount of digital video or, as the Jevons Paradox puts it, "The efficiency with which a resource is used tends to increase (rather than decrease) the rate of consumption of that resource.". That is why VCEG and MPEG teamed up again to develop the High Efficiency Video Coding Standard (HEVC) as successor to H.264/AVC. By providing another 50% bitrate reduction when finalized in 2013, HEVC, aka H.265, enables new immersive services including UHD video with High Dynamic Range (HDR), Wide Color Gamut (WCG), panoramic video and low bandwidth HDTV. HEVC is expected to continue supplanting H.264/AVC with more than 313 million mobile handsets and 20 million TVs shipped with HEVC support in 2015 and expected growth trajectory to continue well into the future.[1]

Following Jevons Paradox, the work on video coding techniques beyond HEVC already started with VCEG and MPEG joining their forces in a Joint Video Exploration Team (JVET) in October 2015. The future video coding standard should consider new video formats from the beginning, including new test sequences for resolutions up to 4096 x 2160 (4K), HDR, WCG, High Frame Rates and drone video. Although Virtual Reality and 360 degree video are currently hot topics, they are investigated in a separate activity because more explorative work on formats and quality assessment is needed.

For testing, new video coding tools, to be explored in JVET, are integrated in a Joint Video Exploration Model Software (JEM). The current version from October last year, JEM 4.0, already reveals a notable increase in bitrate savings of about 28% relative to the HEVC reference software (HM) with about 12 times encoder and about 10 times decoder runtime. Figure 1 shows the steady increase in bitrate savings since the beginning of the future video exploration activities in February 2015.

Regarding the timeline for future video coding, there is a plan to perform a subjective verification of current JEM coding efficiency compared to HEVC with a Call for Evidence up until July 2017, followed by a Call for Proposals, including submission and subjective evaluation of new video coding technologies, up until February 2018. The finalization of the standard is scheduled for October 2020.

Besides the usual VCEG/MPEG standardization suspects, the Alliance for Open Media (AOM) started work on non-standardized, 'royalty free' video coding techniques beyond VP9. An experimental software model, AV1 derived from VP9, was released in 2016 and according to a recent study of an AV1 software snapshot [2], it is fully based on VP9 with two additional in-loop filters which are supposed to provide about 2.5% bitrate reduction on top of VP9. The additional filters are disabled by default, enabling results in compilation errors. Currently the AV1 software is a moving target with no official release versions.

The aforementioned study compared the open source x265 and commercial Fraunhofer HHI real-world HEVC encoder implementations with the reference software encoders of HEVC (HM), H.264/AVC (JM) and AOM (AV1). The average bitrate savings for common test sequences from 416 x 240 to cropped 4K (2560 x 1600) relative to the HEVC HM encoder are summarized in Figure 2. In order to allow a fair comparison, the encoders are configured to use fixed quantizer settings (constant quality) without encoder-agnostic rate control techniques. It can be seen that the AOM AV1 encoder performs even worse than the H.264/AVC JM reference encoder.

[1] HEVC Products Forecast Overview, http://www.dtcreports.com/weeklyriff/2016/03/20/hevc-products-forecast-overview/

[2] D. Grois, T. Nguyen and D. Marpe: "Coding Efficiency Comparison of AV1/VP9, H.265/MPEG-HEVC, and H.264/MPEG-AVC Encoders", PCS 2016

Figure 1. Evolution of bitrate reduction relative to HEVC with relative encoder/decoder runtimes.

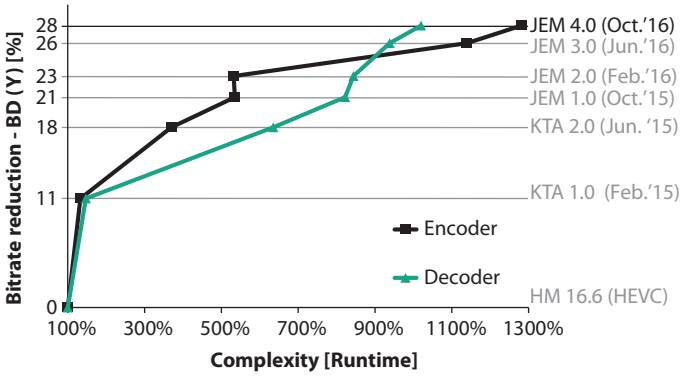
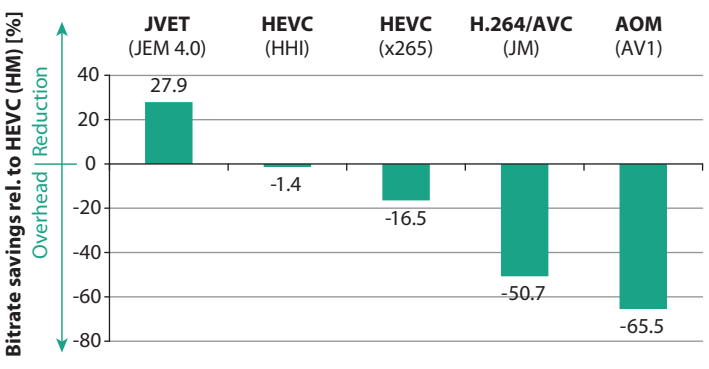


Figure 2. Average bitrate reduction/overhead of various encoders relative to the HEVC HM reference encoder.



WORK MICROWAVE

we are the wave –
excellence in high frequency

Connectivity Without Limits

From high throughput satellites (HTS) to IP migration, our solutions are designed to ensure that operators stay on top of next-generation technologies and developments. Through our extensive range of frequency converters, DVB-S2/S2X equipment, and other digital signal processing technologies, satellite operators can ensure connectivity in any application environment and be well-equipped for the future.

Satellite Frequency Converters

- Extreme Wideband
- Multichannel
- High Frequency

DVB-S/S2/S2X

- Modulators
- Modems
- Demodulators

Redundancy Systems 1:1/N:1

V-Band

All-IP Platform

Wideband Technology

DVB S2X

www.work-microwave.com