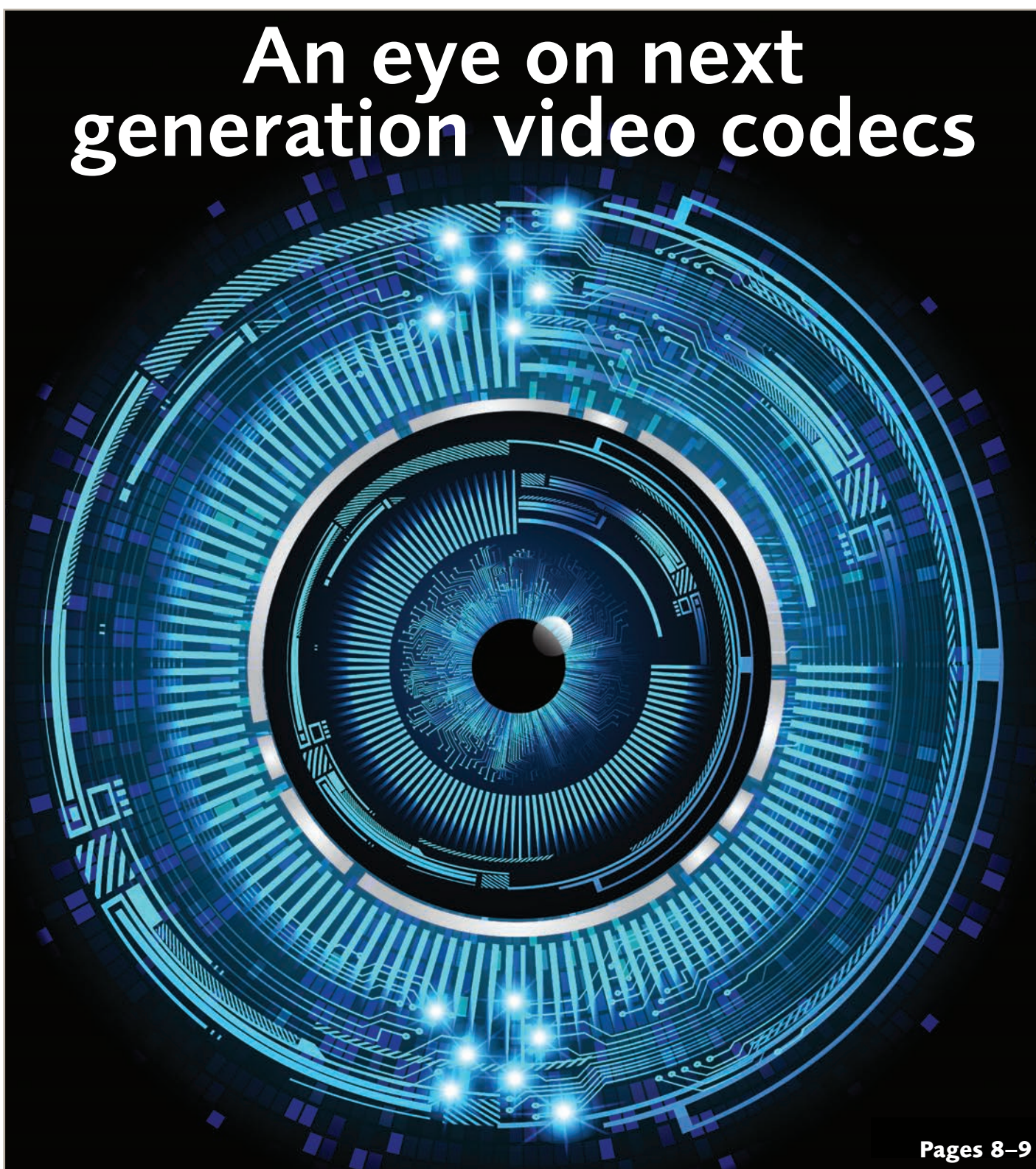


## An eye on next generation video codecs



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**DVB**  
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**2021**

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# DVBSCENE

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## The future media ecosystem is taking shape

This is our second “back-to-school” without the traditional Amsterdam rendezvous. But as we approach our DVB DEMOS 2021 event (detailed on page 4), I am struck by the progress made in the 10 months since our first edition, and it really cheers me up. In preparing for this event with our exhibitors, we see that DVB's new IP-centric solutions have found their place in the market, and their value is being acknowledged.

DVB-I service discovery being a key element of most of the demonstrations proposed, it looks set to be the cornerstone of any modern implementation of future-proof delivery of television services, using both broadcast and broadband networks, and both traditional DVB and non-DVB networks, such as 5G broadcast (read about DVB's work in this area on page 6).

In a few words, no matter the physical layer being used, DVB-I makes any type of service easily discoverable from any kind of device. And in some cases, the use of a DVB-I Central Service List Registry (CSR) will make this discoverability even more powerful. By making a wide set of service lists accessible through a central entry point, a particular service will be made easily retrievable among thousands according to the users' language or interests. This is why DVB is working on launching a skeleton CSR implementation by December this year, to be used as a further feature of – fingers crossed! – the forthcoming IBC 2021 demonstrations.

But in the meantime – coming back to September – DVB DEMOS will also illustrate that DVB-I and its wider ecosystem create a range of new opportunities for all players, from boosting the viewers' engagement (giving seamless access to enhanced offers such as greater video resolutions or personalized sound experiences) to ultimately reducing the delivery costs. And this is where DVB's forthcoming Native IP solution also comes into play, making the best use of



**Emily Dubs**  
Head of Technology, DVB Project

the specificities of each type of network, allowing, for instance, the most popular OTT services to be delivered using broadcast networks, or ultimately allowing the use of a single and unified distribution platform for addressing both legacy and connected devices (see more on page 7). Even if this new Native IP solution is not yet finalized, five DVB Members will showcase early implementations during DVB DEMOS 2021, with some even partnering to demonstrate a multi-vendor end-to-end solution. What a great programme!

Largely absent from this edition of DVB DEMOS – and this issue of the magazine – is targeted advertising (based on DVB-TA), despite its promise to boost the value of broadcasters' advertising slots, including in horizontal markets. Perhaps more collaboration is needed between broadcasters and manufacturers to congregate around the standards and move away from proprietary solutions that negatively impact both market adoption and reach? I can say with certainty that ongoing work to expand targeted advertising to DVB-I services, with finalization expected for January 2022, will open further perspectives.

P.S. We recently launched a new microsite providing clear information on the benefits of implementing DVB-I, along with useful resources. Find it here: [dvb-i.tv](http://dvb-i.tv)

To subscribe to DVB Scene free of charge visit: [dvb.org/dvb-scene](http://dvb.org/dvb-scene)

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## NEW & UPDATED SPECIFICATIONS

Below we list DVB documents published since the last issue of DVB Scene. They include the first DVB BlueBook in the C-series, denoting commercial requirements (see page 6). The BlueBook updates to DVB-I and DVB-DASH will await further revisions before being forwarded to ETSI.

### **ETSI TS 101 211 V1.13.1**

Implementation and usage of DVB Service Information (May 2021)

### **DVB BlueBook A167-2r2 (Draft TS 103 286-2 v1.3.1)**

DVB Companion Screens and Streams (DVB-CSS) part 2: Content ID and Media Synchronization (June 2021)

### **DVB BlueBook A168r3 (interim update of TS 103 285 V1.3.1)**

DVB MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks (June 2021)

### **DVB BlueBook A177r2 (interim update of TS 103 770 V1.1.1)**

Service Discovery and Programme Metadata for DVB-I (June 2021)

### **DVB BlueBook C100**

Commercial Requirements for DVB-I over 5G (July 2021)

### **ETSI EN 302 307-2 V1.3.1**

Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 2: DVB-S2 Extensions (DVB-S2X) (July 2021)

### **ETSI EN 301 192 V1.7.1**

Specification for data broadcasting (August 2021)

**All available from: [dvb.org/specifications](http://dvb.org/specifications)**

## NEW DVB MEMBERS • Find out how to join the DVB Project by visiting: [dvb.org/join](http://dvb.org/join)



**ARD** – the long form of which translates as the “Association of Public Broadcasting Corporations in the Federal Republic of Germany” – is composed of nine self-governed regional public broadcasting corporations. ARD offers a diversity of programmes on television, radio and several online platforms. ([www.ard.de](http://www.ard.de))



**ASELSAN**, based in Ankara, Turkey, is a defence electronics company whose product portfolio includes communication systems for military and public safety, space technologies, navigation and avionic systems, transportation, security, traffic, automation and medical systems. ([www.aselsan.com.tr](http://www.aselsan.com.tr))



**EasyBroadcast** provides an end-to-end OTT streaming solution, using its patented viewer-assisted delivery technology and enabling the reliable delivery of high-quality video and audio content over the internet or private networks. The company is headquartered in Nantes, France, and has offices in Paris and San Francisco. ([www.easybroadcast.fr](http://www.easybroadcast.fr))



**EKT**, headquartered in China and with offices in Hong Kong, Germany, Russia, the Netherlands and Colombia, designs and manufactures a range of DVB set-top boxes for satellite, terrestrial and cable reception, including hybrid IP-connected models. EKT also offers multicast ABR (MABR) gateways from various providers. ([www.ekt-digital.com](http://www.ekt-digital.com))



**Netflix** is one of the world's leading entertainment services with 204 million paid memberships in over 190 countries enjoying TV series, documentaries and feature films across a wide variety of genres and languages. The company is headquartered in Los Gatos, California and has legal entities in several other countries. ([about.netflix.com](http://about.netflix.com))



**TCL**, headquartered in Shenzhen, China, is a leading player in the global TV industry, engaged in the R&D, manufacturing and distribution of consumer electronic products. One of the world's largest CE brands, TCL has extensive manufacturing expertise, a vertically integrated supply chain, and a state-of-the-art panel factory. ([www.tcl.com](http://www.tcl.com))



**ZDF** (Zweites Deutsches Fernsehen) is Germany's national public television broadcaster. On air since 1963, the nationwide channel ZDF is today joined by two thematic channels, ZDFneo and ZDFinfo. ZDF is also a partner in the internet-only offer funk, the German channels PHOENIX and KiKA, and the European channels 3sat and ARTE. ([www.zdf.de](http://www.zdf.de))



## A word from the PCM chair

ELFED HOWELLS (HISILICON / HUAWEI)

Despite the lack of our usual friendly face-to-face meetings the PCM (Promotion and Communications Module) – and the DVB Project at large – has been a very vibrant place over the last few months.

So far this year, we've welcomed 11 new Members to DVB from various business sectors and countries worldwide. These include huge global corporates such as Netflix and TCL, broadcasters such as ZDF and ARD, and SMEs such as EasyBroadcast and Quadrille. This shows clearly that DVB remains a very relevant place that's valued across our industry. It's also great to see our new Members already getting involved in our specification work and events.

While this is of course excellent news, we in the PCM refuse to become complacent and have just launched a new initiative to interview key companies in the media distribution ecosystem. We aim to listen to their views on our work, on the future of standardization, and on the role that DVB is and will be playing in defining the future of media.

Another significant communications development was the decision of the Steering Board to share newly approved commercial requirements (CRs) more widely. Thus, the CRs for DVB-I over 5G have been published in full (see page 6) while an overview of the CRs for next generation video codecs can be found on page 8. This openness gives the wider industry an improved opportunity to review and choose to join our specification work.

With an equally busy few months ahead – DVB DEMOS, IBC, and an exciting new format for DVB World 2022 – we welcome all DVB Members to join our work in the PCM!

# Back for 2021: DVB DEMOS

On Thursday 30 September, 15 DVB Members will demonstrate innovative products and services based on the latest generation of internet-centric DVB solutions. With each live demo just five minutes long, you can learn a lot in under two hours. You can also book private meetings with each exhibitor for more in-depth discussions and further demos.

First up will be **TPV Technology**, showing how a single DVB-I deployment can adapt to deliver the best experience possible across a range of different device types. Several DVB-I features will be shown on three different types of client: native, HbbTV and HTML5 web application.

Next, we'll hear from the NESTED project, which brings together four DVB Members: **ATEME, Orange, Viaccess-Orca** and **ENENSYS Technologies**.

Together, they will demonstrate a vision for universal delivery of TV services using DVB standards, from terrestrial to mobile networks. DVB solutions are used for video coding, delivery – broadcast and broadband, including multicast ABR – and, with DVB-I, making services universally available across devices regardless of the physical layer. The IETR research institute is also part of the NESTED project.

DVB-I will again feature strongly in the demonstration from **Kineton**, showing their Kinacar infotainment system. It's a DVB-I compatible native application for use in full-electric vehicles, allowing users to access and watch IP channels.

**ENENSYS Technologies** will demonstrate the capabilities and potential uses of the forthcoming DVB Native IP solution, showing how it will enable the end-to-end delivery of OTT content over satellite and terrestrial networks.

Increased viewer engagement is the goal of **Dolby's** contribution to DVB DEMOS 2021, and specifically how DVB-I facilitates the roll-out of new services with enhanced audio and video. The demo will show how a linear streamed service including Dialogue Enhancement – a potential driver for adoption of new platforms – can be launched with DVB-I and AC-4 audio, with no change in production infrastructure required.

Another four DVB Members have partnered to show an end-to-end, multi-vendor demo of the B2C use case of DVB Native IP, demonstrating origination, transport, reception and consumption of live OTT video over satellite. This collaboration between **Broadpeak, ST Engineering iDirect, EKT** and **EasyBroadcast** offers a ready-to-deploy next generation video delivery platform – ultra fast, low latency delivery of live video to mobiles and large screens alike for a global audience at the lowest cost.

**Huawei** will demonstrate the global potential of DVB, presenting the DVB-I reference client with DVB-DASH streaming, a Chinese EPG and service lists, and showing Chinese content.

The demo will run on an Android-based player interacting with a browser on a set-top box with the AVS3 video codec integrated.

**Qualcomm** will be up next, showing a first glance of DVB-I over 5G. The demo will feature a typical mobility scenario, switching back and forth between multicast and unicast reception depending on network availability or content popularity.

**Eurofins** will stress that interoperability through testing is the key to success for DVB standards. They will demonstrate this with reference to two recent solutions: the HbbTV receiver tests for ensuring interoperability of targeted advertising based on DVB-TA; and the company's CI Plus testing tools.

Last, but not least, we will hear from **DTG Testing**, demonstrating the DTG DVB-I Test Suite. It's a cloud-based tool that contains the metadata for all the endpoints of the DVB-I specification and provides a set of structured tests, enabling implementers to expedite development and launch services with confidence.

**Find the livestream and make appointments:** [dvb.org/demos2021](http://dvb.org/demos2021)

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REGISTRATION: [dvb.org/demos2021](http://dvb.org/demos2021)



# Setting the right standard, in the right place, at the right time

PETER MACAVOCK, CHAIR OF THE DVB PROJECT



Is standardization of any use in today's world? And how can we do it so that it remains relevant, is built on industry consensus and comes in a timely manner? Let's take two contrasting examples of where DVB can add value, among many others that might be worth looking at.

The first is the all-important work done on satellite and terrestrial physical layers. DVB-T2 and DVB-S2 are the cornerstones of the broadcast industry and, with their predecessors, underpinned the digital revolution that transformed the way in which we watch television. In today's hybrid world, we often forget that these broadcast technologies are still state-of-the-art, and we continue to work in DVB to ensure that they remain so.

Looking at how they were developed,

they are composed of building blocks with standardized interfaces. Each specific element came from a meticulous search for the best solutions and together they are proof that a large group can indeed develop state-of-the-art solutions. In this case, DVB developed its own solutions, as it still does in some areas. Some elements come from calls for technologies, followed by extensive technical analysis to achieve consensus on the best solution.

## THE CODEC CHALLENGE

The other example I want to mention is the important area of next generation video codecs. DVB has approved commercial requirements that are designed to facilitate efficient 4K and 8K video (see page 8). In addition to producing the all-important commercial requirements, DVB's Steering Board also ratified three codecs as the first candidates for inclusion in its core specification for the use of video and audio coding: AV1 from AOM, AVS3 from AVS, and MPEG's VVC. Their inclusion is subject to ongoing verification that DVB can reference these codecs.

In contrast with our work on the core physical layer standards, DVB is working here to profile existing, or soon-to-be-finalized, specifications from other bodies for use in conjunction with other elements of the DVB ecosystem. These discussions are always complex because the solutions already exist and bringing them together into a single DVB solution set involves

achieving consensus among competing organizations on a way forward for the mutual benefit of all involved. Here DVB is not developing a solution from the ground up. When I poll DVB Members, they view this work as being valuable to ensuring interoperability in the marketplace and work that DVB should continue.

## CULTURE CLASH

Since becoming DVB chairman, I have been trying to promote DVB as a place where organizations can work together to develop solutions for the benefit of the market. In an ideal world, these solutions would be innovative on the market and not a collection of technologies already commercially deployed. For this to happen, we need to identify commercial requirements early enough to be ahead of solutions appearing on the market. Further, we need to work quickly to ensure that there is minimal penalty and maximum benefit for organizations bringing an idea to DVB; before they develop their own market-ready solutions. But it's not easy, and if you combine the traditional collaborative approach of the consumer electronics and broadcast sectors with the more vertical and single-vendor approach of the web you often see a clash of cultures.

Key to this debate is the realization that *multi-vendor* interoperable solutions benefit the whole market. No single vendor, no matter how big they are, can match this.

Success for DVB comes from having the correct stakeholders, having a culture that fosters innovation, and ensuring that procedures are light enough to avoid any unnecessary delays in developing solutions and robust enough to mitigate the impact of those who would prefer to slow the work down.

"If you combine the traditional collaborative approach of the consumer electronics and broadcast sectors with the more vertical and single-vendor approach of the web you often see a clash of cultures."

**Peter MacAvock** is the Chair of the DVB Project. He is also Head of Distribution Platforms and Services at the European Broadcasting Union.

# Farewell to the silos: harmonizing broadcast TV and cellular networks

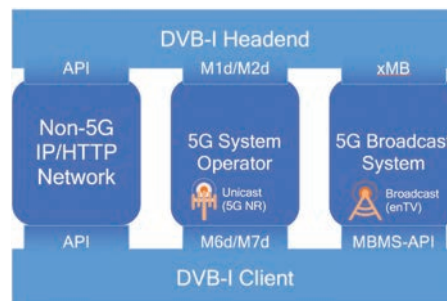
THOMAS STOCKHAMMER (QUALCOMM)

Do you remember DVB-H, MediaFLO, DMB or DVB-SH? A search for “mobile television” on Wikipedia throws up many anecdotal stories from the first decade of this millennium. The idea was to watch television on a small handheld or portable device. It included services delivered via mobile phone networks, received free-to-air via terrestrial television stations, or via satellite broadcast. However, in general, consumer acceptance of broadcast mobile television was limited, with lack of compatible devices an overriding problem.

## REWIND TO 2012

At a panel session during NAB 2012, Mark Aitken of Sinclair Broadcast Group is quoted as saying that a presentation from Peggy Johnson, then with Qualcomm, “should have scared the pants off of broadcasters”<sup>1</sup>. She had spoken about the development of LTE broadcast technologies that would help to address the capacity challenges associated with unicast. Aitken was joking of course; indeed, he agreed that broadcasters would in the long run need to move to a standard compatible with cellular technologies.

Fast-forward a decade and we find ourselves, finally, at a point where the worlds of broadcast television and cellular networks can merge. The collaborative networks that Peggy Johnson and Mark



Interfaces and APIs will enable distribution of DVB-I services over 5G

Aitken – not to mention many within the DVB community – talked about are on the verge of becoming a reality.

In an effort to address that key issue of device compatibility, 3GPP has put a massive amount of work into developing technologies that support television services with no or minimal changes to existing technologies in modern handheld devices. The Rel-16 specification, the second generation of 5G, was completed in late 2020 and provides 5G Broadcast and 5G Media Streaming functionalities. Both of these technologies ensure that existing internet-based media services can be distributed via 5G cellular networks, using MNO (mobile network operator) unicast, and/or standalone traditional broadcast networks, using 5G-defined radio technologies.

## THE ROLE OF DVB

The new paradigm between the broadcast and cellular worlds is collaboration: it’s

about making use of the commercial domain expertise and providing technologies that enable and simplify collaboration models. While 3GPP-defined technologies provide IP-based unicast and broadcast connectivity to basically any device, the role of DVB is the definition of services, the look and feel of television independent of the access network. The key technology here is DVB-I, functioning as a universal service layer facilitating collaboration between DVB broadcasters and 5G network operators.

You can find a good overview of all of this in DVB BlueBook C100, the recently published *Commercial Requirements for DVB-I over 5G*, a document that sets out how DVB intends to contribute to this harmonization.

Six guiding use cases were used to draw up the commercial requirements (CRs) that form the basis of the technical work that has now begun. It is expected that the specifications to be developed will reuse existing DVB technologies to the extent possible.

Generally, the CRs ask for specifications to support different Rel-16-based 5G operation modes, namely 5G Broadcast, unicast-based 5G Media Streaming, concurrent delivery of the same service over both modes, and hybrid DVB-I services.

While the requirements are extensive and detailed, for example also including security-related aspects, it is expected that many are already covered by the existing DVB-I specification or would demand only minor extensions. This is a benefit of the original DVB-I design to provide a television service platform independent of the access layer.

Updates to relevant DVB specifications to fully support DVB-I over 5G are expected to be completed in Q3, 2022. However, with expected continuous extensions of 5G technologies in upcoming releases, the first release of DVB-I over 5G may be only the starting point in a long-lasting endeavour to enhance DVB-based television services by also leveraging 5G-based distribution systems.

**DVB BlueBook C100, *Commercial Requirements for DVB-I over 5G*, is available from [dvb.org/specifications](https://www.dvb.org/specifications)**



**Thomas Stockhammer** is Director of Technical Standards with Qualcomm. He is an active contributor to a wide range of standardization activities, often taking on leadership roles. In the DVB Project, most recently he led the group that developed the *Commercial Requirements for DVB-I over 5G*.



In a DVB webinar held last May, **Emily Dubs** (DVB), **Jean-Claude Sachot** (Broadpeak), **Richard Lhermitte** (ENENSYS Technologies), **Thomas Wrede** (SES) and **Régis Moulin** (Eutelsat) explained the business opportunities that will be enabled by the forthcoming DVB Native IP specification. Below, **Thomas Wrede** addresses some of the questions that came up during and after the webinar, which is available via: [dvb.org/nativeip-webinar](http://dvb.org/nativeip-webinar).

# Facilitating next gen broadcasting with Native IP

## WHY DID DVB ENGAGE IN DEVELOPING A NATIVE IP SPECIFICATION?

Recently, several new broadband-focused technologies (including DVB-MABR, DVB-DASH and DVB-I) have emerged that in principle are also applicable to broadcasting. Along with the consumers' desire to watch linear content on portable IP-based devices, this has created business opportunities that some DVB Members would like take advantage of. The satellite working group (CM-S) in DVB's Commercial Module hence started to investigate use cases and potential commercial requirements (CRs), which were approved last year. Consequently, a new Technical Module working group was created, called Native IP (TM-NIP), tasked with defining a next generation broadcast system based around the use of IP technologies.

## WHAT ARE THE MAIN USE CASES FOR NATIVE IP?

The vision of Native IP is that in future all linear video broadcast is delivered using the same IP-based video formats currently used for OTT, thereby allowing

broadcast to natively reach a plethora of viewing devices from a single platform. The use cases for Native IP comprise several B2B and B2C applications, all flowing from the possibility of using one standard and a single broadcast transmission to feed everything from 5G cell towers, digital terrestrial television transmitters and public hotspots to satellite video CDNs, triple-play satellite ISP consumer services and next-generation DTH systems (with and without return path connectivity). All these use cases are detailed the CRs\* that were developed by CM-S and that underlie the ongoing technical work.

## WHAT ARE THE CORE TECHNICAL ELEMENTS OF NATIVE IP?

The TM-NIP group, co-chaired by Régis Moulin (Eutelsat) and Tom Christophory (SES), has already endorsed several existing DVB technologies: DVB-GSE Lite for the data link layer, MPE (multi-protocol encapsulation) for backwards compatibility, DVB-MABR for multicast streaming, DVB-DASH for video, and DVB-I as the application layer. Three TM-NIP sub-groups – covering

signalling, transport, and content protection – are currently working on the technical specification, with the final draft to be delivered by the end of 2021.

## ARE THERE ANY SPECIFIC CHALLENGES DEVELOPING THE NATIVE IP STANDARD?

There are some adaptations of existing standards required. For example, DVB-MABR must be adapted to broadcast networks, where all services will not necessarily be constantly available in parallel (as they would be on a typical IP network), for example being on different transponders or channels. The NIP standard must thus contain a mechanism for locating specific services in a broadcast network. Another major task will be to identify a secure content protection system for the so-called unconnected broadcast use case. The security experts' group, CM-SEG, is assisting this task and is working to identify best-in-class content protection solutions.

## HOW WILL NATIVE IP BE INTRODUCED TO THE MARKETS?

Jean-Claude Sachot (Broadpeak) outlined the challenges related to market introduction in his article in Issue 57 of DVB Scene (March 2021). The good news is that there is market demand from operators and engagement by satellite operators and manufacturers. The first services are likely to be deployed in the B2B and B2B2C areas, reaching consumers via local hotspots in, for example, hotels and public places. Other deployment opportunities already pursued by DVB Members can be found in the maritime and aeronautical sectors.

## IS DVB'S NATIVE IP WORK ONLY TARGETING SATELLITE USE CASES?

With the best of DVB broadcast and OTT streaming converging into a new Native IP broadcasting standard, there is the potential to create a future proof, next generation broadcast solution. This solution could also work for terrestrial broadcast, potentially closing the existing 'IP gap' in the DVB-T2 standard.

*\*Employees of DVB member companies can access the commercial requirements in document CM-S0072.*

**Thomas Wrede** is Managing Director of his own company Technology Vision Consulting. He chairs the DVB Commercial Module working group on satellite, CM-S, and represents satellite operator SES in DVB CM, SB and GA meetings.





# New video codecs for DVB services: fast-forward to 2024...

JASON POWER (DOLBY), CHAIR OF DVB CM-AVC GROUP

New video codecs are a key component of DVB's vision for a new era of television, powering new experiences and creating new efficiencies. Last June, the DVB Steering Board approved a set of commercial requirements (CRs) that will ultimately lead to the addition of one or more new video codecs to DVB's core toolbox specification (published by ETSI as TS 101 154).

While the phenomenal growth in OTT video traffic is perhaps the biggest driver for new video codec solutions, the new codecs could also be important enablers of new enhanced video experiences for broadcast and broadband like 8K, as well as accelerating adoption of 4K UHD on terrestrial networks.

This work to add new video codecs in DVB is particularly timely and valuable as it comes at a time when several new video coding technologies are emerging from standardization. As DVB specifications are a global reference point for television services and devices, the inclusion of new video coding solutions can assist the market to more rapidly achieve interoperability and scale, and hence to more quickly see the benefits of coding advances. New codecs could enable new markets or new geographies to be addressed with DVB solutions. And, with broadcast and web media converging, the profiling of new codecs in DVB can further assist in creating new hybrid broadcast-broadband solutions and services.

Let's look ahead to 2024, and consider how the DVB CRs for new codecs might map to future user experiences...



## Getting 8K to Enrique

**The year is 2024... Enrique buys a new TV set that offers full 8K resolution and has interfaces to receive content over both broadcast and broadband networks. 8K services are available in the region where Enrique lives and are presented by his TV set as part of the overall service list. He can zap seamlessly between all of the services shown in his programme guide, whether they are SD, HD or UHD at 4K or 8K.**

Scaling 8K video service delivery to end users will require more efficient video codecs. This applies to both broadcast (DVB-S2/C/T2) and broadband (DVB-DASH) delivery. One of the goals of this work is to enable 8K standard frame rate delivery over legacy broadcast multiplexes at "excellent" video quality.

**The CRs require** support of 16:9 images up to 7680x4320 pixels. High dynamic range (HDR; PQ with optional dynamic metadata and HLG) and standard dynamic range (SDR) are to be supported (10 bits only). Conformance points for standard frame rate (up to 60Hz) and high frame rate (up to 120 Hz) will be defined, with non-integer frame rates supported for global applicability.

It is required that the specification enables 8K delivery over MPEG-TS and DASH, and that appropriate signalling is enabled for DVB-I, DVB-SI and DVB-DASH mechanisms.

To enable flexibility for 8K deployments and to maximize service interoperability, DVB is also expanding its existing profiles of the HEVC codec to support 8K resolutions.



## 4K moves into the mainstream

**The year is 2024... While linear 4K services were initially slow to take off – until recently being mostly over DTH satellite in vertical markets – we are now seeing increased offers in many markets, including on terrestrial networks. Both the biggest terrestrial markets and ones where DVB-T2 services have significant but relatively low penetration have been able to offer viewers a wider selection of 4K UHD services, especially for sports and movies.**

Although DVB UHD-1 in conjunction with DVB-T2/S2 enables the broadcast of UHD 4K services, as of 2021 these are more niche services than mainstream. Satellite offers higher bandwidth than terrestrial but could also benefit from increased coding efficiency. On terrestrial networks, some country-specific DVB profiles allow for UHD 4K. However, the bandwidth usage for such UHD 4K services remains high, with typically no more than three UHD services in a DVB-T2 multiplex against six premium HD services. Consequently, some countries limit terrestrial specifications to full HD (e.g. Germany) and others confirm this choice based on economics and bandwidth issues using DVB UHD-1 Phase-1/2. The bandwidth savings from a new video codec can help move UHD 4K SDR/HDR broadcast from a niche to a mainstream service.

**The CRs require** that solutions are at least 27% more efficient than HEVC on average for 4K broadcast usage. It is also required that the specification enables five 4K services to be deployed in a typical DVB-T2 40 Mbps multiplex, where three 4K services might be deployed with the existing DVB coding toolbox.



**Jason Power** is Senior Director of Commercial Partnerships and Standards with Dolby. He chairs the DVB Commercial Module sub-group on audio and video coding, CM-AVC.



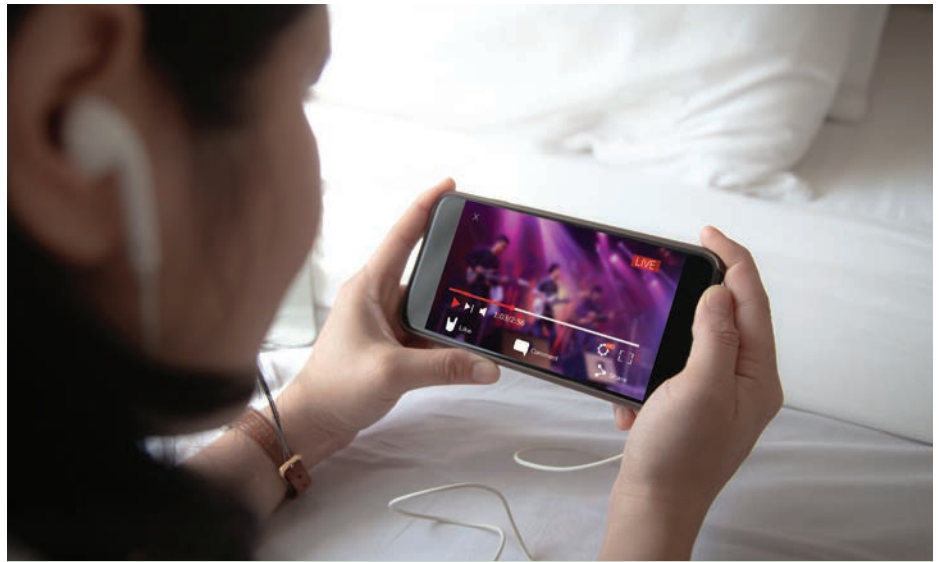


## Saving money, saving the planet

The year is 2024... In many parts of the world, broadband speeds – whether fixed or mobile – have increased to the point where UHD quality streaming poses no challenge. Nevertheless, streaming in HD and SD resolutions as part of UHD adaptive bit rate (ABR) streams is common for several reasons: in addition to improving the quality of experience on video start-up and seek processes, delivering sub-UHD resolutions to smaller screens like tablets and smartphones saves on network costs and reduces the environmental impacts of streaming, without reducing video quality.

New codecs will also provide an opportunity to improve efficiency on SD and HD streams, through the use of ABR coding. The benefits can include lower CDN costs and lower energy usage as well as increasing the video quality where there is poor network throughput or extending eligible areas where video streams can be played. Resolution could also be dynamically adapted depending on the complexity of the content to be encoded, allowing viewers to watch, say, movies in UHD even if limited bandwidth means more complex sports content is delivered in lower resolution.

**The CRs require** that new codecs enable 4K streaming delivery that is at least 30%, and ideally 40%, more efficient than HEVC. It is required that solutions can seamlessly switch across spatial resolutions, such as when switching between DASH representations. It is also required that the solution can improve compression efficiency at resolutions lower than 4K.



## Broadcast-streaming-mobile convergence

The year is 2024... After the fragmentation that characterized the end of the 2010s, media distribution has now become a much less complex endeavour, with broadcasters and other content providers being able to target the full range of end-user devices without needing to repackage their content for different delivery networks. With DVB-I established as a common service layer, next generation codecs mean that broadcasters can confidently deliver services to the widest range of devices.

Mobile devices are getting more and more important, both as the primary device, for example in developing countries, and as a device that broadly provides new technologies. By defining new codec profiles that are well aligned with the evolution of mobile devices and leveraging DVB-I for internet-delivered service information, broadcasters can minimize the number of encodes required and maximize compatibility with end-user devices.

**To assist in achieving this, the CRs require** that codec solutions are delivery-agnostic, with interoperability points for broadcast and DASH delivery that are as similar as possible. It is also required that there is at least one conformance point compatible with profiles adopted by relevant industry organizations that have profiled DASH delivery to mobile devices. To maximize interoperability and efficiencies of scale, it is foreseen that the DVB Technical Module may collaborate with organizations such as 3GPP, MPEG, CTA, DASH-IF or ATSC to come to a common set of profiles.

### SPECS COMING SOON

An update to the DVB specification to include 8K profiles for the existing HEVC codec is expected to be completed in late 2021.

For the work to add new codecs, initially three solutions were identified as candidates for meeting the CRs: AV1, AVS3 and VVC. All three are now being assessed for technical compliance with the CRs as well as compliance with DVB's IPR policy.

Specification releases are expected during 2022 to cover all three new candidate codecs, subject to successfully validating technical and IPR compliance. A first release of specifications including VVC is expected in early 2022.

For precise and complete information on the commercial requirements for new video codecs, DVB Members can see document CM-AVC0620.



# Successful trial of 4K over DVB-T2/HEVC for TVP during Euro 2020

MARCIN KLEPACKI (TELEWIZJA POLSKA)

At the beginning of June 2021, Telewizja Polska launched the TVP 4K channel in UHD quality, showing the UEFA European Football Championship, Euro 2020. The channel was broadcast for the entire duration of the tournament and an additional month thereafter, from 11 June to 11 August 2021. It allowed viewers with TV sets with a UHD/4K screen to watch all matches played during the championship (live broadcasts and rebroadcasts), pre- and post-game shows, daily reports on the Polish national team, and other broadcasts related to Euro 2020.

TVP 4K was broadcast as part of the wider test broadcasts of the new DVB-T2/HEVC digital terrestrial television (DTT) broadcasting system, with the network covering 90% of the Polish population. The TVP 4K broadcast of UEFA Euro 2020 was time-limited and experimental – its aim was to



technologically prepare Telewizja Polska and its viewers for the upcoming switch to the new DTT broadcasting system.

## UNIVERSAL AVAILABILITY

The availability of TVP 4K on terrestrial television was a breakthrough and an unprecedented event, as it was the first television channel in UHD quality offering premium content to be made

available universally and free of charge to all viewers with TV sets capable of receiving DVB-T2/HEVC broadcasts or equipped with an additional DVB-T2/HEVC decoder.

The channel was also distributed via other digital platforms that could be used to receive UHD signals (direct-to-home satellite, IPTV and cable TV).

All matches shown on TVP 4K were broadcast at a resolution of 3840x2160 pixels, with progressive scanning at 50 frames per second. High dynamic range was also offered, using the HLG (hybrid log gamma) system, and object-based audio was delivered using Dolby Atmos.

The DVB-T2/HEVC test multiplex managed by Telewizja Polska has a bit rate of 36 Mbps. The base scenario for the TVP 4K channel is broadcasting using the HEVC codec, with the constant bit rate set to 25 Mbps. However, tests were also undertaken using the variable bit rate approach combined with statistical multiplexing, with priority set for the TVP 4K channel. As part of the test multiplex, three other Telewizja Polska channels were broadcast simultaneously in HD quality and one in SD quality during the broadcasting period of TVP 4K.

In addition, the HbbTV *Euro 2020* application was made available to viewers as part of the TVP 4K channel, providing access to match statistics (also in the form of a widget), on-demand audiovisual materials, including match highlights, goals and interviews, and live broadcasts of matches using a 180-degree camera.

## VIEWING FIGURES

TVP 4K was launched on Friday 11 June at 18:00. On its first day, it had an average minute rating of 6.2k viewers and a share of 0.12% among all viewers 4+; in the commercial target audience of 16–49 years, it had 1.8k viewers and a 0.1% share. On the following day, its shares rose to 0.3% among all viewers 4+ and 0.34% among viewers 16–49. The channel's peak minute rating that day was 227k viewers 4+.

Day 3 gave the channel its highest reach to date, with nearly 1.5 million viewers 4+ watching TVP 4K for at least one minute. Monday 14 June 2021 brought another record, driven by the live transmission



**Marcin Klepacki** is Director of the Distribution Bureau at Telewizja Polska, the national broadcaster in Poland. He has been with TVP for four years and previously worked for Netia, SAS Institute and T-Mobile Poland, among others.

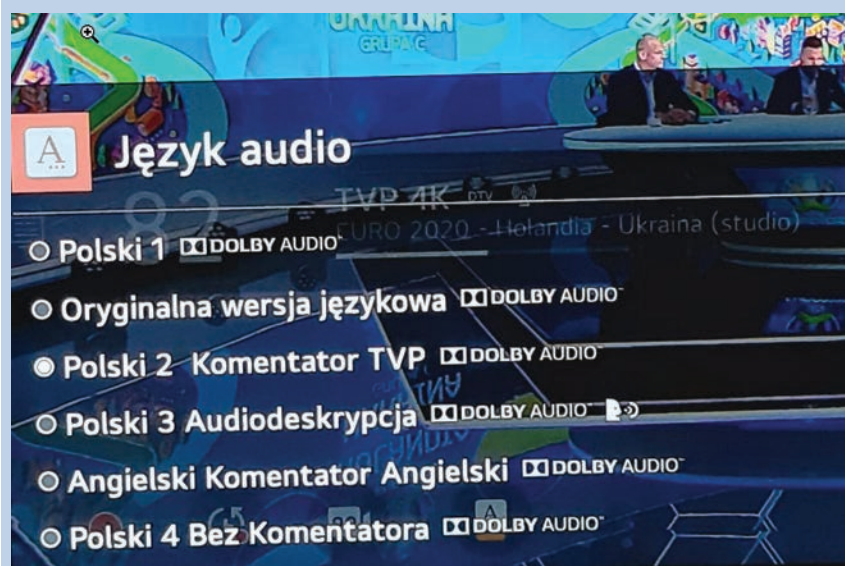


of the Poland-Slovakia match: TVP 4K achieved a share of 0.57% in the commercial target, claiming 28<sup>th</sup> place in the ranking of all channels on that day, ahead of such prominent pay-TV competitors as Fox, TVN Turbo and Discovery.

By the end of the tournament, TVP 4K had a cumulative reach of nearly 7 million viewers (i.e., those who watched the channel for at least one

minute). Audience profile data based on the first month on air showed that TVP 4K had a high affinity among men, people aged 40–59, viewers with higher education, top management, and high-income households.

All of the data provided above is based on NAM Live, all day. It is worth noting that TVP 4K aired only 12 hours per day, starting at around noon.



Viewers were able to select personalized commentary as well as audio description

## Enhancing the audio experience

TOMASZ MUSIALSKI (DOLBY POLAND)

The TVP 4K channel also provided an opportunity for further broadcasts of next generation audio. Telewizja Polska had already provided an experimental Dolby Atmos immersive audio production in 2018, for Poland's pre-World Cup match against Lithuania. For the UHD broadcasts of the Euro 2020 tournament, Dolby Atmos immersive audio was transmitted using the AC-4 next generation audio (NGA) codec as specified in DVB's audio and video coding guidelines (ETSI TS 101 154).

By providing object-based audio, Telewizja Polska was able to add a level of personalization for viewers. Viewers were able to select personalized commentary from a choice of Polish or English as well as audio description to accompany their viewing experience, the latter being particularly beneficial for the visually impaired. Fans wanting to feel the intensity of the action on the pitch were also able to choose a commentary-free option with the pure ambience of the stadium.

These personalization enhancements made use of the new *audio preselection descriptor* that was part of DVB's ground-breaking work to enable NGA.

**Tomasz Musialski** is Senior Manager, Consumer Entertainment Technology based at Dolby Poland in Wrocław.

## EMILY'S VIEW



It is encouraging to read about the efforts that our colleagues in Poland and Iran (see page 12) are putting into enhancing the terrestrial offer with UHD services. We have also seen an impressive initiative from UHD Spain, and there are ambitious plans in France and Italy.

The delivery of 4K HDR services with next generation audio over DTT has become a reality thanks to the hard work of DVB Members over many years. The combination of DVB-T2 with state-of-the-art video and audio codecs has opened the door to these new services that will play a big part in ensuring the terrestrial offer can keep pace with other platforms. While the trial services covered in this issue of DVB Scene rely on HEVC, we know that the next generation of video codecs will be crucial to the commercial viability of 4K UHD on terrestrial networks: being able to offer five UHD programmes per multiplex rather than the three that HEVC might allow makes a huge difference.

The spectrum available for terrestrial broadcasting is under constant pressure from those who believe it should be shared with mobile services. Anything that adds to the appeal of terrestrial services should be welcomed with open arms by the stakeholders in that sector.

And that brings me to Native IP. UHD services are only one part of a modern, refreshed offer on DTT. While hybrid services that leverage HbbTV have had great success in many countries, I believe the prospect of moving to a Native IP ecosystem in broadcasting holds the greatest promise for a reinvigorated terrestrial offer. The satellite industry has contributed most of the early momentum to DVB's work on Native IP (see page 7), with the prospect of clear early wins on, for example, broadcast-based OTT. There are opportunities too for terrestrial operators, not least in accessing mobile devices more easily. Increasing the quality of the offer with UHD is important, but a future-proof platform will almost certainly need to be based on Native IP.

*Emily Dubs,*  
DVB Head of Technology



# A UHD boost for DTT in Iran

FATEMEH FALLAHI (IRIB R&D)

Digital terrestrial television broadcasting, in order to remain attractive, should evolve towards a connected and interactive platform, offering more programmes in higher quality. Knowing this, IRIB (Islamic Republic of Iran Broadcasting) established a new channel named *IRIB UHD*, with the objective of offering higher quality of content (video and audio) along with innovative services. The pilot broadcast of IRIB's UHD channel has been on air since May 2020.

Currently, the new channel is offering content with 4K UHD resolution and high dynamic range (HDR) for video and 5.1 surround audio. It is being broadcast over IRIB's DVB-T2/HEVC network with a data rate of 20.215 Mbit/s. The service is available in the main cities of 31 provinces in Iran and its coverage is expanding. IRIB is also broadcasting the UHD channel over its DVB-S2/HEVC network, accessible throughout the MENA region.

## CONTENT PRODUCTION

As some older UHD TV sets don't support HDR, for better display of HDR content on such displays, IRIB selected HLG (hybrid log gamma) as its HDR standard for broadcasting. Therefore, the preparation of content for broadcasting often involves the conversion of PQ (perceptual quantizer) HDR to HLG HDR or conversion of standard to high dynamic range for some content.

Two types of content are shown: IRIB's new original productions and content acquired from other sources and producers. IRIB's own new productions are all based on the selected standards

(4K, HLG, 5.1 surround).

The acquired content comes in various different combinations, whether HDR (HLG or PQ) or SDR and with audio at 7.1, 5.1 or stereo. The content is analysed for standards compliance and subsequently delivered for colour mastering or cross-conversion of PQ to HLG or SDR to HDR as required. Conversion of the audio format to 5.1 surround is also done.

New links and equipment, much of it locally sourced in Iran, have been set up for UHD production and post-production, including an integrated software-based playout system combining automation of video, audio, graphics in a single process. The setup and testing of new equipment, links and workflows as well as training of the experts were the most important parts of this project.

A 12G-SDI link is used for live events and XAVC Long-GOP, 140 Mb, 4:2:2 is used as the file format. Finally, all content is delivered over SDI from the production department to the headend (terrestrial and satellite) to be encoded by the HEVC encoder. To help the receiver to configure its brightness and HDR features in an optimal way for the received content, an HLG flag is transmitted in the encoder.

## INTERACTIVITY

Considering the importance of interactivity and using broadband capacity to enhance broadcast services, an HbbTV red button launcher based on HbbTV 2.0.1 has been added to the UHD channel. The launcher includes several applications such as weather, catch-up, games, a rich EPG and an application offering passages from the Quran.

The broadcast of UHD content by IRIB provided additional momentum for TV manufacturers to offer more UHD TVs to the market. Nevertheless, UHD TVs have been produced in Iran since 2015, so it is clear that some of them don't have appropriate support for displaying UHD content correctly with regard to WCG (wide colour gamut) and HLG parameters. Peak brightness lower than 300 nits, inappropriate and inaccurate pre-setting of brightness, gamma factor and other picture parameters cause washout and dark images on the TV. IRIB's UHD team is cooperating with TV manufacturers to help them with delivering better TVs to the market.



**Fatemeh Fallahi** is senior project manager at IRIB R&D. She has been involved in several technology pilots in Iran, including for DVB-H, DVB-T/T2 and HbbTV.





# A proactive approach to European media regulation

STUART SAVAGE (LG ELECTRONICS)

For several months now, a DVB task force has been looking into how a key European directive affecting media services can be implemented in a consistent manner in DVB-based systems. The aim is to help avoid unnecessary fragmentation in the market.

The EU's *Audiovisual Media Services Directive* (AVMSD) has been the cornerstone of European regulation relating to our industry since 2010, when it replaced the *Television Without Frontiers Directive*, which itself had been in existence since 1989. The latest (second) revision of the AVMSD entered into force on 19 December 2018 following three years of consultations and negotiations, with implementation in national legislation by Member States due by 19 September 2020.

## REGULATORY LAG

Changes in the media industry have tended to be primarily driven by advances in technology and new business models. The surrounding regulatory

framework has been in a constant state of trying to keep up with such rapidly evolving conditions. The 1980s saw the advent of cross-border broadcasting, significantly enabled by satellite television. Thus arose the enduring “country of origin principle” whereby each Member State is responsible for ensuring regulatory compliance by media service providers under its jurisdiction and permitting transmission across borders.

As the capabilities of the internet to more widely support audiovisual services improved in the 2000s, regulations were updated to encompass the emerging “television-like” services, whose “form and content are comparable to the form and content of television broadcasting” and that “compete for the same audience as television broadcasts”, i.e., video on-demand (VOD) services.

Previously VOD services had been covered in the e-Commerce Directive as an “information society service”, and one of the prime purposes of the original AVMSD was to bring such services

under the same umbrella as traditional television services. In 2010, however, VOD was still a nascent market: Netflix didn't officially start launching in Europe until 2012, and it took until 2014 to be available in most major EU territories.

While the original AVMSD covered everything from editorial aspects to rights windows and advertising, arguably the only aspect that had any real impact on end devices related to support for accessibility services, such as subtitling and audio description. However, since the vast majority of TVs had already been supporting such capabilities for many years, there weren't really any new features for DVB or manufacturers to add. Indeed, the major issue in this respect was the ability of content providers to generate a sufficient quantity of accessible content and, in the case of live services, with sufficient accuracy.

## IMPACT ON DEVICES

By 2016 the place and impact of internet-based VOD services had become much clearer. The updated directive thus addressed issues that had largely been unknown in 2010 and for the first time included articles that had a direct impact on the development and implementation of end devices and user interfaces, notably 7a and 7b.

Article 7a requires that identified services of general interest (typically from public service broadcasters) should be given due prominence in user interfaces; 7b requires that the integrity of programmes and audiovisual media services is preserved, including prohibiting overlays without appropriate consent.

Devices cannot magically know how to implement such conditions – they must be explicitly told what to do via signalling, metadata, or, if immutably fixed, possibly by hard coding. But, as we know, such aspects are rarely, if ever, permanent and unmodifiable, so a signalling/metadata-based solution is most likely required in order to be able to realize the requirements of the AVMSD.

The DVB AVMS task force has produced an extensive report that more fully analyses the subject and as I write the group is currently turning this into the specific commercial requirements, ready for approval at the next CM meeting.

**Stuart Savage** is Director EU Innovation R&D for LG Electronics. He has been contributing to the work of the DVB Project since 1996 and is currently leading the Commercial Module's task force on the AVMS Directive.



# A new direct-to-TV experience thanks to CI Plus 2.0 and USB

ERIK GAZZONI (SMARDTV)



The next generation conditional access module, based on the USB form factor, will underpin a new way of watching television

The common interface (DVB-CI) makes it possible to offer pay-TV in horizontal market TV sets via an external conditional access module (CAM). With the introduction of the USB form factor for CAMs, based on CI Plus 2.0, we see exciting new possibilities emerging. The CI Plus 2.0 ecosystem is growing steadily. Let's understand why and how.

## WINNING COMBO

One of the key contributors to the continued growth of CAMs remains smart TV shipments, since the CAM creates a winning combo when inserted into a TV – and even more in a smart TV. Indeed, one of the key advantages of a CAM is based on its ability to benefit from the best capabilities of the TV set. Smart TVs offer a wide range of opportunities: to be IP-connected, to benefit from interactive OTT apps already available from the respective TV app stores, and enabling a new area of hybrid service. And there is now no question about the fact that the smart

TV is becoming the norm, with sales continuously growing throughout Europe, including in eastern markets.

Being hybrid is now an essential element of any future-proof television-viewing device in the home and hybrid applications are central to this. One piece of good news for CAMs is that hybrid applications are already available from pay-TV operators on several of the biggest TV brands, whether using

a proprietary smart app or the native Android TV framework.

On top of this, the trend towards support for CI Plus 2.0 in TV sets is increasing. Philips is now shipping CI Plus 2.0 compliant models. Other big brands are set to follow, with some of them having already shown prototype sets. It looks like the industry is targeting mass production in the field during Q2 2022, so we could expect that in 2022–2023, most new models will support CI Plus 2.0.

## ALSO BEYOND EUROPE

Last but not least, CI Plus 2.0 adoption is not only about Europe; even if Italy has promoted it for years in its UHD book and the Deutsche TV Plattform in Germany has recently been focused on this standard, when it comes to the introduction of a new media technology, it must be discussed in an international context. In this regard, we can see that CI Plus 2.0 is gaining traction worldwide with, for example, regulators in India (TRAI) and Malaysia (MCMC) both looking to embrace the standard.

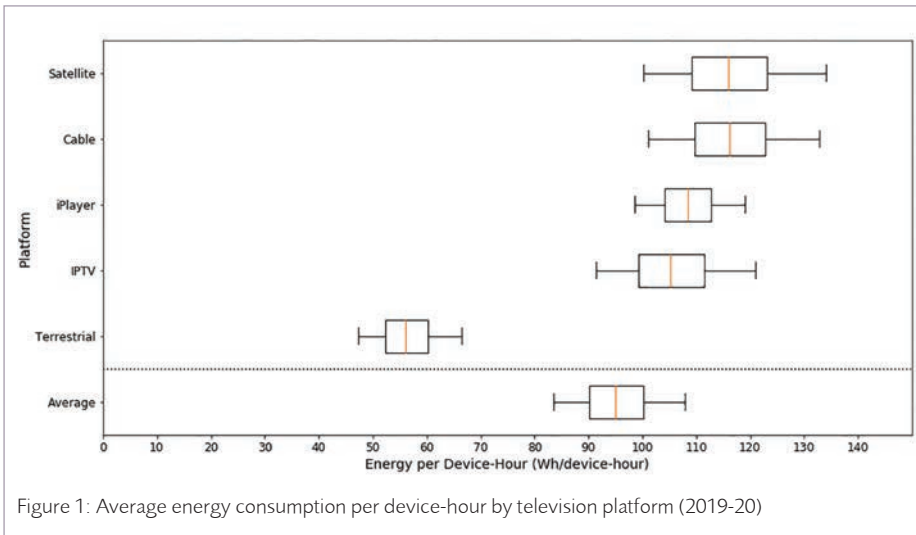
Alongside all of these developments, the next generation of CAM, based on the USB form factor, is well positioned to underpin a new way of watching television. At SmarDTV, for example, we have a USB-based product being tested widely with TV sets and early-adopter pay-TV operators. Products like this will open the door to enabling pay-TV operators to offer a simple direct-to-TV experience: neither an app in the TV nor a set-top box, but a secure, small, smart, and more eco-friendly device that, once plugged into a TV set, you forget it's there.

"Products like this will open the door to enabling pay-TV operators to offer a simple direct-to-TV experience: neither an app in the TV nor a set-top box, but a secure, small, smart, and more eco-friendly device that, once plugged into a TV set, you forget it's there."



**Erik Gazzoni** is Product and Partnership Director at SmarDTV, working closely with television operators and manufacturers worldwide. He also chairs the board of CI Plus LLP.





Evaluating the energy use per viewing hour showed that both satellite and cable had the largest energy intensities followed by BBC iPlayer, IPTV and terrestrial (see Fig. 1).

For every platform, we found that the total energy use by the in-home devices was greater than in our distribution chain. When you consider the millions of devices, it's no surprise to see consumption dominate and the scale of this means that even small changes to improve consumer devices can make a very big difference overall. Even as our audience's choice of platform changes in future, we expect consumption to continue to dominate.

There's no doubt that there's room for improvement – and the onus shouldn't be on the consumer to take all the action. We should be making television as sustainable as possible before it gets to the viewer, and then making it easy and attractive for them to watch sustainably.

Consider set-top boxes as one example: could some parts go into a low power mode even while other functions are still available? For TV sets and set-top boxes, many now ship with the eco mode as default but viewers often turn it off. How can we make using eco modes more appealing? As we design new IP-enabled devices, could the need for processing when the viewer isn't actively using the device be reduced or eliminated to reduce standby power consumption?

# DVB's role in the fight against climate change

JIGNA CHANDARIA (BBC)

Climate change is one of the biggest threats to human existence, and tackling it requires urgent action at every level. While watching television is a very low carbon activity, its cumulative impact means that we in the broadcasting industry have a responsibility to adapt the way we operate. Changing technology, particularly the move to IP, represents an opportunity for us to innovate and reduce our energy use and carbon emissions.

## GLOBAL STANDARDS

BBC R&D has been working on modelling the environmental impact of distributing and consuming BBC television services for several years now. A white paper on the environmental impact of watching television, published last year, covered the total energy use and carbon footprint of distributing and

consuming BBC television services, all of which are built on DVB standards. While our research only covers the UK, because DVB standards are international the organization is in a strong position to make impactful, global change in this area. We recently updated our models to evaluate the carbon emissions for the 2019/20 financial year. The results for this period show that the total energy use represented 0.6% of UK electricity use and approximately 0.1% of UK greenhouse gas emissions

We broke down our findings by platform (terrestrial, satellite, IPTV, etc.) and identified the most energy-intensive aspects. Across the total chain, consumption, covering consumer devices and home routers, used the largest amount of energy at 94%. This ranges from 76.1% for the BBC iPlayer streaming service to 99.6% for satellite.

## SUSTAINABLE BY DESIGN

As well as considering how we can improve existing systems, we also need to be focusing on sustainability at the outset of anything new to deliver maximum impact. When working on new standards or modifying existing ones, sustainability shouldn't just be an afterthought, but prioritized right from the start. For example, as well as energy efficiency, we should design in repairability, and sustainable disposal at the end of life right from the start.

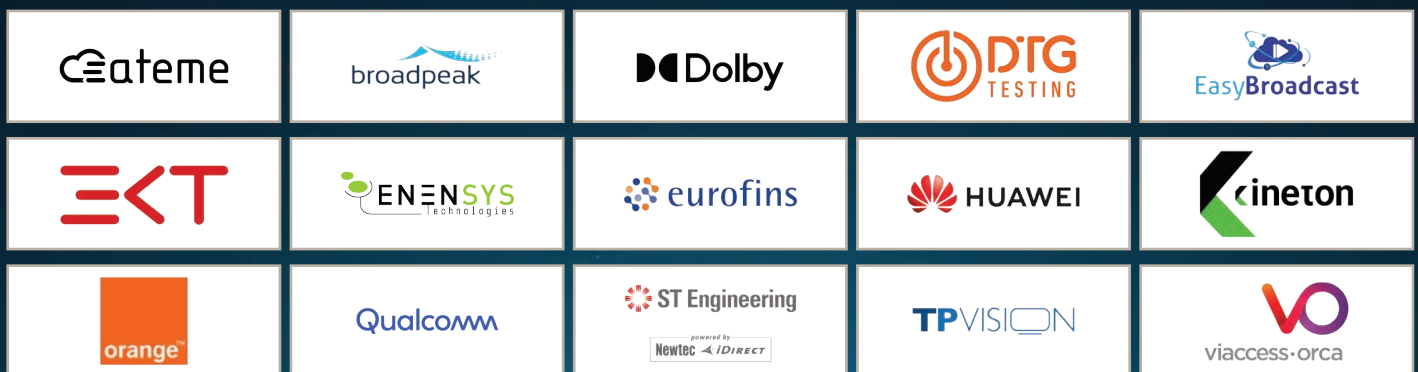
Making real change won't happen if we work in silos on this – it's about using industry collaboration to find the best way to reduce the environmental impact of broadcasting as a whole. We all have a part to play and working together across the industry we can achieve more than we would alone.

Jigna Chandaria is a Lead Research and Development Engineer and heads the Sustainable Engineering team at BBC R&D. For over a decade, her research focus has been the environmental impact of broadcasting and media technology.



# DVB DEMOS 2021

See how these companies are driving the future of media delivery based on DVB's new generation of IP-centric standards.



Thursday 30 September  
Livestream: 10:00–12:00 CEST  
Private meetings: 13:00–18:00 CEST

Watch the livestream and book your meetings:  
[dvb.org/demos2021](http://dvb.org/demos2021)