DVBSCENE
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# DVB-I: READY TO TAKE FLIGHT




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# Toasting new directions and new opportunities

This is a very special September in a very special year. September without IBC is like December without the festivities. Most of us will really miss IBC as the best place to meet and share knowledge on a topic we are passionate about. This year would have been my 15th 'back-to-school' in Amsterdam and probably one of the most exciting for me personally. Some of the most experienced IBC-goers would have been returning for their 28th time!

Looking at the half-full glass, 2020 is a year of change for absolutely all of us, and several sectors of our industry will emerge stronger. For DVB, I feel the glass is much *more* than half-full, and even perhaps sparkling a little. The winds of change have brought fresh air and blown us in a new direction, where we can leverage significant opportunities.

The most recent DVB Steering Board meeting marked important milestones for two recently initiated work items. First, there was approval to proceed with the creation of Commercial Requirements (CRs) for the use of DVB-I as a service layer on top of 5G technologies: a new task force has been created and the work, supported by at least 11 Members, is off to a strong start. Secondly, the completed CRs for native IP video delivery to IP-enabled end-user devices over broadcast links were approved and the subsequent work is now being dispatched to the technical working groups (see page 10).

Both of these work items go with the flow of DVB-I, our new internet-centric generation of specifications. The fundamental building blocks of DVB-I are the Service Discovery specification (A177) and DVB-DASH, with DVB-MABR and DVB-TA also a part of the wider picture. These are all very hot topics that will be showcased during our *DVB Demos 2020* event on 26 November. In the absence of tradeshows, this new online event is designed as an opportunity to raise the profile of the newest solutions that build on DVB's next generation standards; and for the exhibitors, it provides a welcome focal point on their own innovation timelines.

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

Finally, because having fun at work is another key ingredient for business success, the famous *DVB Drinks* rendezvous, a veritable IBC institution, is maintained: same day, same time. The 2020 edition, is online, so you'll have to bring your own refreshments, but this annual tradition should never be missed!

"In the absence of tradeshows, this new online event is designed as an opportunity to raise the profile of the newest solutions that build on DVB's next generation standards."



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# DVB News

## NEW & UPDATED SPECIFICATIONS

Below we list DVB documents published since the last issue of DVB Scene.
They include the first *R-series* BlueBook, which will be used to denote official DVB recommendations.

**ETSI TR 101 290 V1.4.1**
Measurement guidelines for DVB systems (June 2020)

**ETSI TS 101 162 V1.9.1**
Allocation of identifiers and codes for DVB systems (July 2020)

**DVB BlueBook R001**
Recommendation on interpretation of PAPR techniques in DVB-T2 (July 2020)

**DVB BlueBook A177r1**
Service Discovery and Programme Metadata for DVB-I (July 2020)

**ETSI TS 101 545-1 V1.3.1**
Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 1: Overview and System Level specification (July 2020)

**ETSI EN 301 545-2 V1.3.1**
Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 2: Lower Layers for Satellite standard (July 2020)

**ETSI TS 101 545-3 V1.3.1**
Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 3: Higher Layers Satellite Specification (July 2020)

**ETSI EN 302 307-2 V1.2.1**
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) (August 2020)

**All available from: dvb.org/specifications**

## NEW DVB MEMBERS

**Google LLC**, headquartered in Mountain View, California, is a multinational technology company that specializes in internet-related services and products. With regard to media and entertainment, Google is aligned across the value chain, on content development, content distribution, viewer acquisition and engagement, and monetization.
**More: about.google**

**Shenzhen Skyworth Digital Technology Co. Ltd.**, established in 1997, is a provider of solutions for the smart home, supplying a wide range of devices to customers worldwide, including traditional pay-TV operators as well as OTT and state operators. It is the fourth largest set-top box manufacturer in the world, delivering to more than 90 countries.
**More: en.skyworthdigital.com**

**SpaceBridge Inc.** is an established supplier in broadband satellite communications systems technology, headquartered in Montreal, Canada. The company develops and provides satellite network equipment and services, including VSAT hubs and terminals, as well as SCPC and broadcast modems.
**More: spacebridge.com**

**Tsingshen Tech**, headquartered in Shanghai, is a start-up satellite operator specializing in communications satellite design and manufacturing and high-speed satellite broadband services and solutions for industry. The company is collaborating with Tsinghua University and the Shanghai government on the creation of a MEO satellite constellation.
**More: tsingshen.com**

**V-Nova** is a London-based IP and software company dedicated to improving data compression by building a portfolio of innovative technologies based on the game-changing use of AI and parallel processing for data, video, imaging, and point cloud compression, with applications across several verticals.
**More: v-nova.com**

# DVB & 5G: a new approach

PETER MACAVOCK, CHAIR OF THE DVB PROJECT

"We are proposing that other networks, even mobile networks, could distribute DVB services."

Is DVB 5G-compatible? Well, yes and no. Perhaps "maybe" is the best answer for now. Isn't that the answer to any question about 5G?

DVB's work with 5G has been based on a report finalized in late 2019, resulting from a study mission led by Thomas Stockhammer (Qualcomm). Of a number of scenarios proposed in the report, three proved most popular: 1) the delivery of DVB services over "5G unicast", 2) the delivery of DVB services over "5G Broadcast", and 3) the delivery DVB services over "5G Fixed Wireless Access".

In giving the green light, during its July 2020 meeting, to the gathering of a set of formal Commercial Requirements (CRs), DVB's Steering Board has approved the first step to ensuring compatibility between DVB-I and 3GPP's 5G technologies in these areas. Those CRs may or may not lead to one or more new DVB specifications, or perhaps revisions of existing ones. This is an important step for an organization that has prided itself on developing the specifications that set the standard for state-of-the-art media distribution. We are proposing that other networks, even mobile networks, could distribute DVB services.

## INTERNET-CENTRIC MODE

This is all part of the DVB-I initiative, which represents DVB's shift into an internet-centric mode. The core DVB-I Service Discovery specification is published, designed to complement DVB-DASH delivery. The first phase of work on a set of targeted advertising specifications, built in conjunction with HbbTV, has also been completed (see page 8). Attention now turns to how to address the distribution of these new services over mobile networks based on 5G technologies.

The change here is that DVB is proposing to examine its own work to verify compatibility with existing 3GPP technologies. Thus, the focus will be on whether changes are required to DVB-I to make it compatible with the almost-finalized 3GPP Release 16. This is a subtle difference to the past, which would have typically taken a more cooperative approach in developing future systems.

A collaborative approach hasn't been ruled out but, on the advice of its common members, DVB is to rely on 3GPP members to influence the Release 17 requirements capture rather than seeking to do this at an institutional level. We remain friends of course, with high-level discussions between leaders of the two groups forming the basis of DVB's approach. 3GPP is a complex organization that is best influenced by the member representatives who work at the coalface rather than liaison letters.

## DVB-I MEDIA LAYER FOR 5G

One of the other scenarios envisaged in DVB's 5G Study Mission report, but not pursued as yet, is to exploit the potential of hybrid 5G Broadcast high-tower-high-power networks coupled to 5G unicast networks.

Put simply, the aim of the current work is to prepare the ground for DVB-I

Andreas Gall laid down a challenge at DVB World 2017

**Peter MacAvock** is the Chair of the DVB Project. He has been Head of Delivery Platforms and Services in the EBU Technology & Innovation Department since 2008. He was Executive Director of DVB from 1994 to 2008.

to be used as a media services layer in the 5G context, but to do so by focusing on existing 3GPP technologies for now.

So, returning to the question about whether DVB is 5G-compatible, the answer becomes "we're checking to make sure it is".

One of the many lessons of the last six COVID-19-dominated months the importance of a holistic approach to media distribution. Broadcast networks are unbeatable when it comes to distributing information to the masses but lack the flexibility to match the personalization and choice of broadband networks. A seamless combination of the two provides for high levels of reliability, coverage, choice and personalization at the same time.

### ANDY'S CHALLENGE

DVB's effort to abstract the concept of a media layer from the access network is designed to address a challenge laid down at DVB World 2017 by Andreas Gall, the then CTO of Red Bull Media House. I was newly elected as DVB's chair at the time. He challenged DVB: "Broadcast is easy for us. We just provide a pipe with DVB to our


Ulrich Reimers

broadcast partner. Broadband distribution is a mess. DVB please sort this spaghetti out and do what you have done to broadcast for my broadband distribution and platforms!"

Our response is DVB-I. For DVB-I to really deliver on its promise, it needs to work with fixed and wireless broadband networks, 5G included. Andy, we're getting there!

It has been and remains a long road for DVB, and the organization has had to swallow some of its pride. Known as the place where the best media distribution technologies are developed, we are now recognizing that one of DVB's strengths is to standardize the interfaces between components to facilitate interoperable, multi-vendor, cost-effective solutions.

### A WORD ABOUT MR DVB

As DVB approaches 3GPP, it reminds me of a time when such approaches were led by the world's first 'DVB-compliant human being' (as he was known) Professor Ulrich Reimers, of the Technical University of Braunschweig. As Mr DVB he led the development of the digital television systems we use today.

In April this year, the university announced Ulrich's retirement. Those close to him will know that he will continue to be active in various roles for some time to come. COVID-19 caused the postponement of his "final lecture". Aside from his towering ability to drive complex issues forward, he is remembered fondly in DVB circles as a most human and approachable genius. We're sure he will watch DVB's approach to 3GPP with great interest. It is different now to what it was in earlier times; let's hope we are successful.

# In case you missed them...

Our library of webinars has expanded greatly in the past months, with the addition of ten new videos on a variety of topics. The COVID-19-related cancellation of DVB World 2020 prompted the swift launch of a series of webinars based on the conference programme, to which others were subsequently added.

The webinars listed below attracted more than 840 unique participants, many of whom attended several webinars. As of August 2020, the post-event views for the videos of these webinars stood at more than 3,600, demonstrating their high value as a learning resource.

You can view the videos and download the related slide decks at: dvb.org/webinars

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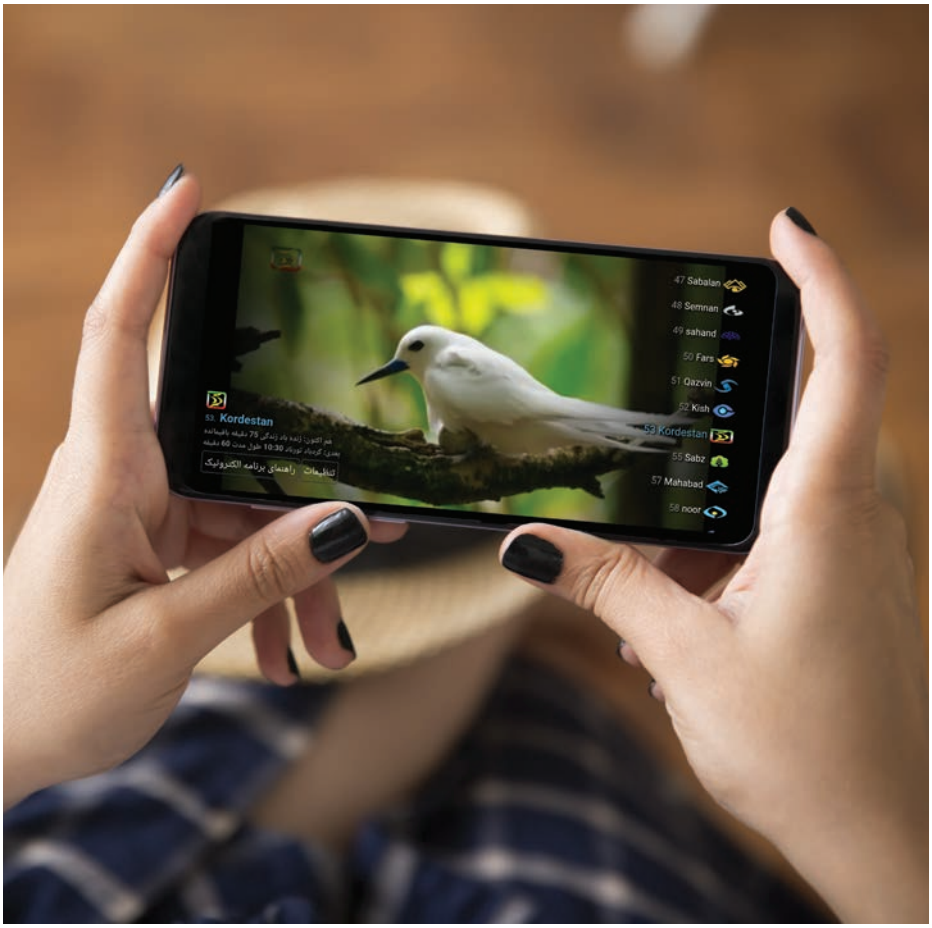
|---|---|---|---|---|
| **MULTICAST ABR OPENS THE DOOR TO A NEW DVB ERA**<br>MARCH 2020 | **CODECS, STANDARDS AND UHD FORMATS – WHERE IS THE INDUSTRY HEADED?***<br>MARCH 2020 | **ENCODING AND PACKAGING FOR DVB-I SERVICES**<br>MARCH 2020 | **BEAM HOPPING IN DVB-S2X**<br>MARCH 2020 | **DASH: FROM ON-DEMAND TO LARGE SCALE LIVE FOR PREMIUM SERVICES****<br>MARCH 2020 |
| **DVB-I SERVICE LISTS & PROGRAMME INFORMATION**<br>APRIL 2020 | **BUILDING A REFERENCE CLIENT FOR DVB-I**<br>APRIL 2020 | **UHD – COMMERCIAL SUCCESS OR WORK IN PROGRESS?***<br>MAY 2020 | **INTRODUCTION TO DVB'S TARGETED ADVERTISING SPECIFICATIONS**<br>JUNE 2020 | **MAKING A CASE FOR DVB-MABR**<br>JULY 2020 |

* In collaboration with the Ultra HD Forum
** In collaboration with the DASH Industry Forum




# DVB-I takes flight in Tehran

FATEMEH FALLAHI (IRIB R&D)

In this new competitive age of media, DVB-I brings new opportunities for broadcasters to overcome limitations related to spectrum and infrastructure for offering higher quality content and more services. DVB-I makes accessing broadband services as easy as broadcast services on the receiver by providing common service list. It was these features that drove IRIB R&D to initiate a DVB-I trial.

IRIB R&D* develops innovative new products and technologies in broadcasting and broadband delivery, laying the groundwork for future services from IRIB (Islamic Republic of Iran Broadcasting). IRIB R&D has a strong track record of major advances in forward-looking basic research and innovation in media technology.

## DVB-I LABORATORY TEST

The testing of DVB-I in the IRIB R&D laboratory began in March 2020.The goal of the trial is the evaluation of DVB-I with regard to its feasibility and the potential benefits for IRIB.

As a first step, we set up a laboratory test. For this purpose, a DVB-I service list was created. It included services with either a DVB-T or DVB-DASH instance and some services with both instances. Also, a content guide was added to the service list. The service list was registered in IRIB's service registry.

The targeted devices for laboratory test were Android smartphones as well as both Android TV and HbbTV receivers. A locally hosted version of the DVB-I reference application was used for both the DVB-I backend and for the frontend as a client application. The reference application had been developed by Sofia Digital on behalf of the DVB Project. All of the code is openly available via GitHub. The service registry address was hard coded in the client application.

The laboratory test helped us to carry out our own evaluation of different features of DVB-I and to assess how it could be applied to the current and future services of IRIB. One of the positive outcomes we noted was that any change in the service list content could be displayed on the client side immediately without need to update the application.

## DVB-I PILOT IN IRAN

The laboratory test helped us to define the best parameters for a DVB-I service list for IRIB and led us onto a pilot phase. The pilot has now been implemented in Tehran.

The service list is based on serving a need within the local audience, which is the reception of provincial services from elsewhere in the country.

This has not been possible up to now owing to limitations of spectrum availability and infrastructure. The IRIB service list is therefore composed of national services (DVB-T instance) and provincial services (DVB-T and DVB-DASH instances). In the next step, IRIB's OTT services will be added to the service list.

As the DVB-I reference application is further enhanced, newer features will be added to the IRIB client application and service list too.

Through this pilot, we hope to determine the challenges and requirements related to implementing the service countrywide.

**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.

*www.rd.irib.ir/en

# Building on the promise of DVB-I

GORDON MAYNARD (ONSCREEN PUBLISHING)

Like many people, my introduction to DVB-I was the demo given at IBC2019. This caught my attention for a number of reasons. DVB-I appeared to offer a solution to several challenges: how to merge broadcast and IP channels into a seamless experience, how to provide TV-like navigation to IP-only devices in a standardised way, and how to prepare for a future of IP-only delivery. From OnScreen Publishing's perspective there was a close fit with existing developments: multi-screen client apps and flexible data management tools.

## DVB-I APPLICATIONS

We began our work on DVB-I by using our app development platform to create compliant web applications for HbbTV and generic tablets and phones, while in parallel creating a version written in Swift for iPhones, iPads and Apple TV. In both cases custom objects were created to interface between the DVB-I sources and existing display objects such as EPG grids. It became obvious that to test these apps a supply of metadata would be needed, so a management tool was created using our data management components. This management system has scaled well to accommodate the many data types required by DVB-I, at the time of writing comprising more than 40 data tables and editing screens.

The apps, management tools and XML generators are now hosted on Amazon Web Services to provide scalability. The tools can be used by interested parties for test, evaluation and interoperability purposes.

The key to the success of any new broadcast standard is interoperability and it is encouraging that we have already seen a willingness to exchange metadata and applications between developers.

## SERVICE LIST QUESTIONS

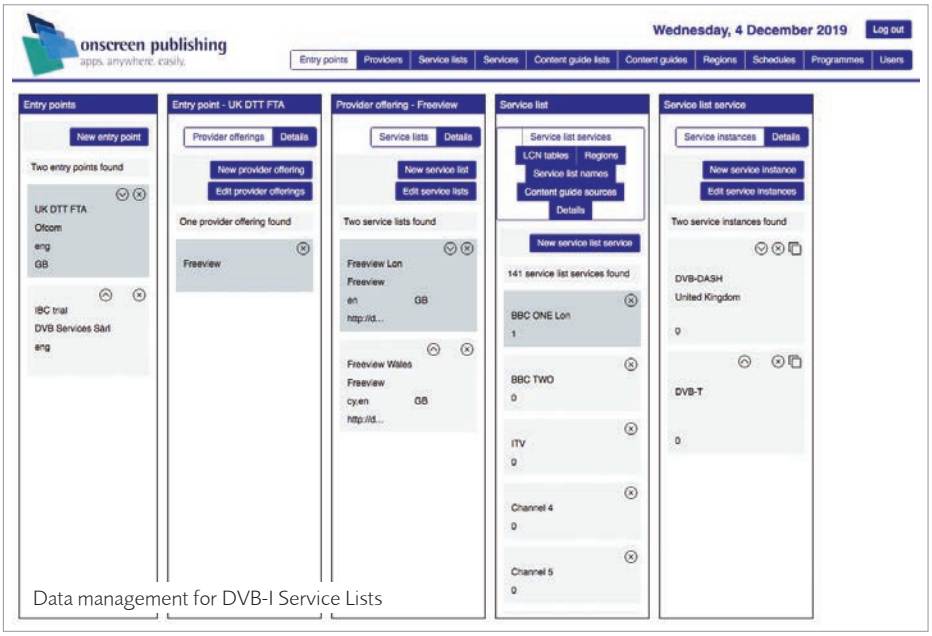
A number of questions remain unanswered for now. Will platform operators and broadcasters, who understandably want to control the presentation of their service offerings, be willing to work with an open standard? DVB-I envisages a process whereby viewers pick service lists from a selection offered in a receiver, but we don't yet know how this process will work and whether providers will feel they have sufficient opportunity to promote their offerings to viewers.

Another question is who will manage the presentation of service lists: will it be platform operators, receiver manufacturers, national regulators or DVB itself? While these are largely business issues they interact with the technology. We're looking forward to assisting with the debate.

### DASH & HLS

DVB-I is built on the presumption that streams will be delivered using DVB-DASH. However, this standard is not supported on Apple devices. We've demonstrated that DVB-I metadata can be delivered to Apple devices and broadband media using HLS and, in a world where broadcasters think in terms of 'all-screen' delivery, this is a key issue for the adoption of DVB-I. The DVB Project has recognised this in its July 2020 specification update, which offers the possibility to signal an HLS manifest as the delivery mechanism. This opens the door for a third party to create an application note or best practice guidance for the use of HLS as the delivery mechanism in DVB-I, expanding its reach to a much wider population of devices.

After working with DVB-I for some months, I believe that the Service Discovery specification (DVB BlueBook A177) lives up to its promise of providing a powerful toolkit for delivering a broadcast-like experience in a hybrid or all-IP environment. What is needed now is work to create real-world use cases to stretch the specification and to gain a full understanding of the business issues.

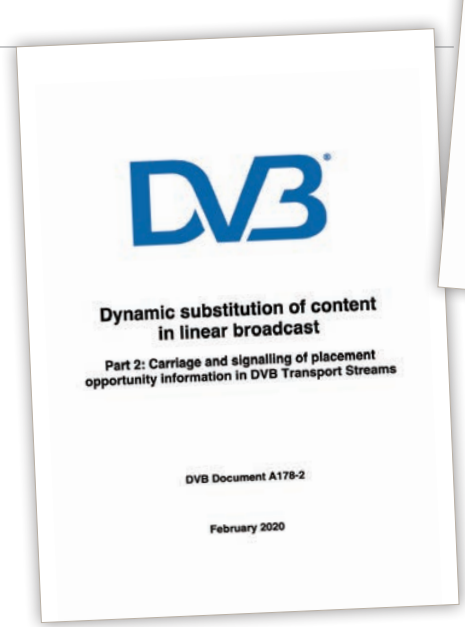


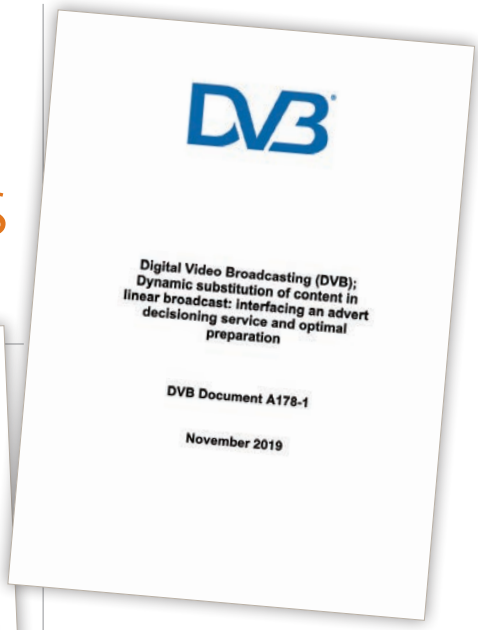
Data management for DVB-I Service Lists

**Gordon Maynard** has many years' experience of delivering innovative services based on both DVB and IP standards. Gordon is the founder of OnScreen Publishing (www.onscreenpublishing.com), a consultancy specialising in providing tools for the rapid development of multi-screen apps and data management systems.

# How DVB-TA will help broadcasters and operators hit their targets

ANGELO PETTAZZI (MEDIASET)




DVB's Targeted Advertising specifications are available as BlueBook A178 parts 1 and 2.

Excitement is building in the broadcast community over Targeted Advertising (TA). For years, online video distribution had a distinct edge over broadcast since it could deliver targeted ads to mobile devices, including PCs, smartphones, and tablets. But new solutions will help broadcasters and operators gain ground towards delivering targeted ads that can increase viewer engagement and satisfaction.

DVB and HbbTV have been working closely together to make TA a reality for broadcasters. The DVB Commercial Module defined the relevant business use cases, which led to the Technical Module creating the signalling specification, used to tell broadcast receivers about placement opportunities within a DVB Transport Stream. It has also provided guidance on the interfaces — between the inserted content and the original stream — and how to best prepare media to ensure an optimized viewer experience. HbbTV was tasked with developing specifications that deal with how the content substitution is handled within the receiver itself.

## SPECS PUBLISHED

Both DVB and HbbTV have now published their complementary technical specifications for TA. They are available to anyone within the industry wishing to implement the DVB-TA framework. Recently, the HbbTV Association shifted its attention to creating a TA test suite, which would allow implementations to be tested prior to devices supporting the DVB-TA framework hitting the market, expected in 2021.

While some TA deployments have already taken place, they have generally been limited to pay-TV, IPTV, and cable television operators. The key reason: these operators have control over the full delivery chain, including the end user's set-top box (STB) or client software. Sky, in the UK, Italy and Germany, is an example of a prominent operator that has deployed TA services.

Prior to jumping on board with TA, broadcasters and advertisers want to be assured that the substituted advertisement will play without stalling, buffering or cutting back to the broadcast content. This can only be achieved if the ad is loaded into the device RAM and played without any network access. The new DVB-TA framework addresses these concerns, and we expect that broadcasters will begin testing it within the near future.

## DVB-TA & SET-TOP BOXES

As a next step, DVB is working on an additional possible technical solution for TA based on watermarking, or as DVB working groups commonly refer to it, Signalling on Media Essence (SoME). The goal is to resolve instances where TA signalling is unable to reach TV sets that receive broadcasts from an STB. By enabling TVs to replace the output signal of the STB, delivered through the HDMI link, with an advertising spot received by the TV over its broadband connection, the reception of the substituted ads can be ensured.

A key concern some in the industry have with using a SoME solution is that the STB user experience might be impaired. To ensure that the user experience is not affected, a set of specific commercial requirements and guidelines for implementers (i.e. broadcasters and operators) has been drafted. The DVB TM-TA group is working on translating those requirements into a new DVB technical specification for this specific TA use case.

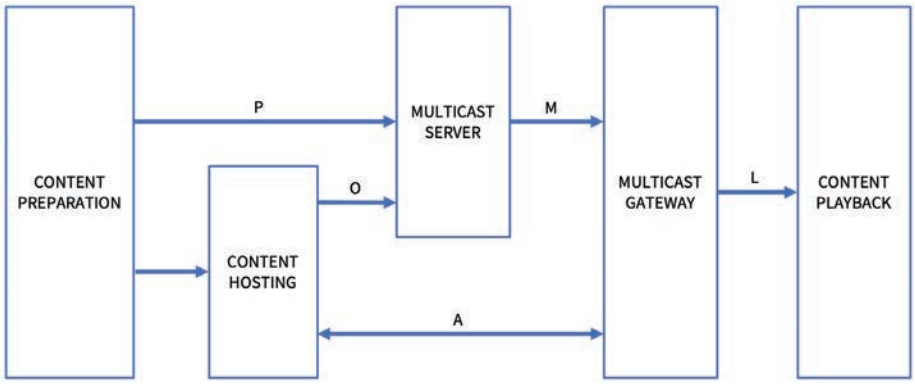
All of this work clears up some of the challenges and uncertainty that previously surrounded targeted advertising for broadcast applications. By deploying TA services, broadcasters can increase the value of their content and drive new revenue, using SoME to ensure that substituted ads are also seen on TV sets that receive broadcasts via STB. It's an exciting future for broadcasters, with TA deployments expected to take off in DVB markets starting in 2021.

**Angelo Pettazzi** is Senior Strategic Marketing Manager with Mediaset in Italy. He is the chair of the DVB Commercial Module working group on Targeted Advertising and also chairs HbbTV's Marketing and Education Working Group.

# DVB-MABR: a standards-based solution for multicast media

RICHARD BRADBURY (BBC)

Figure 1. Simplified DVB-MABR architecture




In mid-2015, the DVB Project initiated work to standardize the application of adaptive media streaming to IP multicast. The primary aim was to enable efficient mass distribution of linear and non-linear media across multicast-enabled IP networks while retaining broad compatibility with existing adaptive media packaging technologies, in particular DVB-DASH. A critical requirement was for existing DVB-DASH media players to be able to consume the output of the new DVB-MABR (multicast adaptive bit rate) system without modification. This combination of features would allow consumption of streams by a wider range of end-user devices than the precursor DVB-IPTV specification.

The use of IP multicast greatly reduces peak demand on unicast infrastructure, such as origin servers and CDN nodes, but there was a desire to knit multicast and unicast distribution together seamlessly. IP multicast transmission alone cannot guarantee reliable delivery; unicast mechanisms remain useful in recovering data lost in transit that cannot be recovered through other means (e.g. forward error correction). Conventional unicast media distribution can also speed up the start of a streaming session and is therefore useful in achieving fast channel-change.

## THE DVB-MABR MODEL

The complete phase 1 technical specification (DVB BlueBook A176, second edition) was approved by DVB's Steering Board in February 2020. It built on the reference architecture that had been published two years earlier. The model (shown in a greatly simplified form in Figure 1) includes all control plane and data plane aspects of an end-to-end DVB-MABR system.

Multicast transport sessions are conveyed from a multicast server to a population of multicast gateways over the primary data plane interface M. Media objects, such as DVB-DASH segments, are ingested by the multicast server via either pull- (O) or push- (P) based interfaces. They are then serialized into a packet stream according to a DVB-standardized multicast media transport protocol. Phase 1 specifies two transport options: FLUTE (with DVB-MABR extending the 3GPP MBMS profile to support low latency) or ROUTE (again with DVB-MABR additionally specifying low-latency delivery).

At the receiving end, the multicast gateway subscribes to IP multicast groups of interest and reassembles packets from each multicast transport session back into the original media objects. Any missing information is recovered via forward error correction techniques or via HTTP-based unicast recovery at interface A. The reconstructed media objects are presented to a standards-compliant media player at L.

## GATEWAY LOCATIONS

The location of the multicast gateway function determines where a multicast transport session is converted back to one or more conventional unicast streaming sessions, and therefore the 'fan-out' point for the purposes of scaling the deployment. Three possibilities are described:

1. a node at the edge of the operator's network, meaning multicast transmission is terminated in the network core and multiple unicast sessions are presented to terminal devices across individual access network links;
2. embedded in a piece of customer premises equipment such as a home gateway router, so that multicast transmission is extended across the access network, but multiple unicast streams are still presented to terminal devices across the home network;
3. embedded in individual terminal devices, where multicast transmission is extended across core, access and home networks, maximizing the potential reuse of network capacity.

Other important aspects of the final specification include the technical metadata required to run a DVB-MABR system, the interfaces that are used to configure the multicast servers and gateways, and means by which a media player can be redirected towards a multicast gateway.

**Richard Bradbury** is a Lead Research & Development Engineer with BBC R&D in London. He leads a team investigating IP-based technologies for content contribution and distribution.

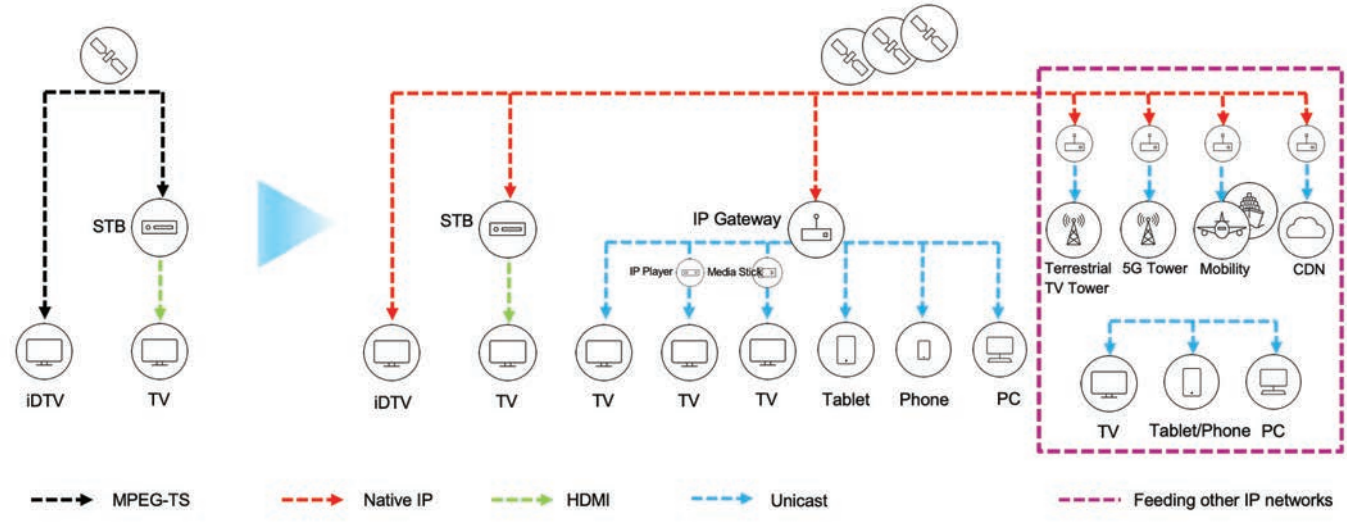



Figure 1. Moving from the world of MPEG TS to Native IP brings an explosion of possibilities. Note that this drawing limits the 'Today - MPEG-TS' scenario to DTH, as it is the most dominant use case. There are also other, more specific use cases concerning mobile, maritime and aeronautical applications, usually involving customer specific modems.

# Native IP: best of both worlds

THOMAS WREDE (SES)

DVB's broadcast solutions have many well-established strengths: low latency, high quality of service (QoS), scalability, and optimal use of bandwidth. Over-the-top (OTT) streaming brings different benefits, like the ability to target a multiplicity of end-user devices and easy personalization. Can these two be combined to create a future-proof, next generation broadcast solution? DVB plans to achieve that goal by creating a new Native IP media distribution specification.

The broadcast and streaming ecosystems for video distribution have evolved largely in their own silos, meaning that most content providers have dual-platform operations: a legacy DVB broadcast headend, using MPEG Transport Stream, serving TV sets and set-top boxes, and an OTT streaming platform supporting live and on-demand content distribution. The latter typically uses unicast ABR streaming to address personal electronic devices, but also delivers on-demand services, such as catch-up and start-over, to hybrid broadcast/OTT set-top boxes and TVs.

## MULTIPLE BENEFITS

With a Native IP specification, the satellite industry can take advantage of adaptive bit rate (ABR) technologies to target the full range of end-user devices, as well as offering content personalization through regionalization or targeted advertising, among other features. Furthermore, it will allow operators and broadcasters to converge on a single content packaging and distribution platform using a single format, thus reducing distribution costs.

And the benefits don't end there. To mention just a few more: a single DRM solution can be used to protect the content all the way to the display device, without the need for trans-crypting content; fallback solutions to seamlessly switch from satellite to broadband and back again can be deployed to secure continuity of service in case of loss of the satellite reception (e.g. during rain fades); and because of its broadcast nature, Native IP distribution via satellite will greatly help to contain the power consumption associated with streaming, thus actively contributing to a more sustainable digital world.

## USE CASES: INITIALLY B2B

The most relevant use cases for a new DVB Native IP specification in the satellite domain will initially be B2B.

**Thomas Wrede** is VP New Technology & Standards at SES Video. He chairs the DVB Commercial Module working group on satellite, CM-S, and is president of the SAT>IP Alliance.

For example, mobile ecosystems could be fed very cost-effectively with Native IP broadcast content – especially live – originating from an OTT headend, eventually even feeding 5G towers directly. Delivery of video content to public Wi-Fi hotspots is another key use case, whether complementing terrestrial broadband connectivity or as the sole distribution channel. The applications include educational institutions, hospitality, oil/gas rigs, digital signage, and distance learning. Mobility applications are also relevant, whether on land, at sea or in the air.

Demand from B2C sectors seems likely to come later, with a Native IP specification powering next generation DTH services, with or without return-path connectivity.

## COMMERCIALLY DRIVEN

As with all DVB specifications, the journey begins with Commercial Requirements (CRs). The CRs for Native IP were developed within the Commercial Module's Satellite working group (CM-S) during the first half of 2020, with participation from 18 DVB Member companies representing the full value chain.

The document approved at July's DVB Steering Board meeting sets out general requirements for a Native IP specification as well as specific requirements related to transport, signalling, content protection, content delivery, and the timeline, which calls for the specification to be ready by the end of 2021.

Notable CRs include the need for the specification to be contained in a single document; a system that delivers a user experience equal to or better than that possible with today's terrestrial unicast OTT services; the ability to operate over single or multiple transponders/beams present on single or multiple LEO, MEO and GEO satellites; and support for multi-DRM solutions to protect the media content.

## TERRESTRIAL DEMAND?

It is worth noting that most of the CRs would also be applicable to a terrestrial Native IP delivery system, but it is unclear whether there would be a commercial demand for such a specification. In any case, as with all DVB solutions, the Native IP specification will be designed to re-use, as far as possible, existing DVB specifications and otherwise existing international standards, e.g. IETF, 3GPP, etc. Another CR is that the Native IP system should be designed in such a way that it can be easily transposed to single or multi-channel/carrier terrestrial DVB-T2 networks.

At the time of writing, technical work on the Native IP specification is about to begin. It will involve several Technical Module sub-groups, with ongoing support and guidance from CM-S. The specification that emerges over the next 18 months or so will meet the industry's need for an interoperable universal standard that can work from today's internet infrastructure and deliver via satellite a consistent high-quality audiovisual experience to end users.

## GET INVOLVED WITH DVB'S WORK

The creation of a specification for Native IP video delivery is just one of several ongoing work items within the DVB Project, where a committed community of experts from around the world are building the standards that will underpin next generation media delivery.

The work to create the Commercial Requirements described in this article took place entirely online, making use of DVB's web-based tools and regular online meetings. **If your company is already a Member of DVB, we strongly encourage you to follow and contribute to our working groups. Join more than 1,000 active users by registering at: member.dvb.org**

Non-members can access DVB specifications only once they have been approved for external publication, so if you'd like to get an early view of where the technology and the market are headed, you should consider becoming a Member.
Visit: dvb.org/join

## EMILY'S VIEW

I am really glad to see this new work item taking shape. It has been long awaited, and the solution that will emerge will be valuable not only to satellite providers and broadcasters, as Thomas Wrede outlines, but for other players too.

To mention just one of the market needs it can address, imagine the many places around the world where streaming is not yet possible. This is not only the case out on the ocean or in remote areas of developing countries. Even in countries where broadband penetration is very high, it's not unusual to lose network coverage when travelling between towns. All these contexts can benefit from one of the many new business opportunities offered by the anticipated Native IP solution: taking advantage of the large audience reach of satellite, it will enable the delivery of OTT services (linear channels and push VOD) where terrestrial broadband networks would fail. This could, for example, be in rural areas, or in high-density areas where networks become congested; on a long – but often daily – bus journey in Brazil; in a boat linking the thousands of islands in the Philippines, etc. Establishing partnerships with stakeholders from the satellite field, OTT providers will see significant opportunities to enlarge their footprint.

I believe that all players in the television industry will be able to gain by addressing together a new B2B market segment: bars, hotels, malls, schools, all kinds of public venues. And transport companies will also be eager to boost their attractiveness by proposing a streaming-like experience to their customers.

*Emily Dubs,*
*DVB Head of Technology*

# A bright future for UHD on terrestrial networks

FRANK HERRMANN (PANASONIC)

DVB-T2 is undoubtedly the dominant system globally for digital terrestrial television. Services are on air in at least 93 countries around the world, with a combined population of about 3.5 billion people. Coverage comprises large parts of Europe, Africa and Asia.

While the provision of HD services using either MPEG-4 or HEVC video coding has been the most common deployment scenario, UHD has now also become a realistic option, with all required components in place. Most UHD TV sets offered in Europe in 2020 are equipped to reproduce HEVC-encoded UHD services received via DVB-T2 (and this has been the case for several years already). It is, therefore, rather a matter of content and service providers taking advantage of this opportunity.

## FLEXIBLE SYSTEM

DVB-T2 (ETSI EN 302 755 V1.4.1) primarily defines the physical layer of the related terrestrial broadcasting system. Following the principle of layer independence, there is a choice regarding the layers above the physical layer and DVB offers several options.

Implementations today, in mid-2020, are based on the MPEG-2 Transport Stream (TS), using the protocol stack outlined in Figure 1.

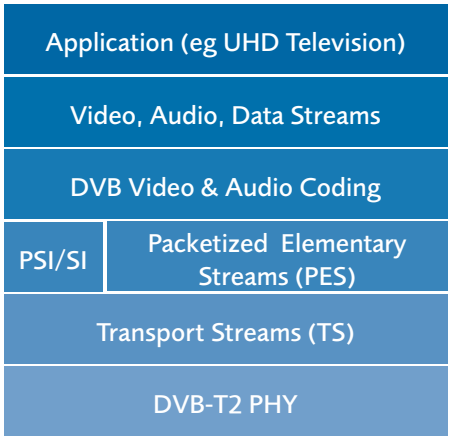



Figure 1. DVB-T2 protocol stack

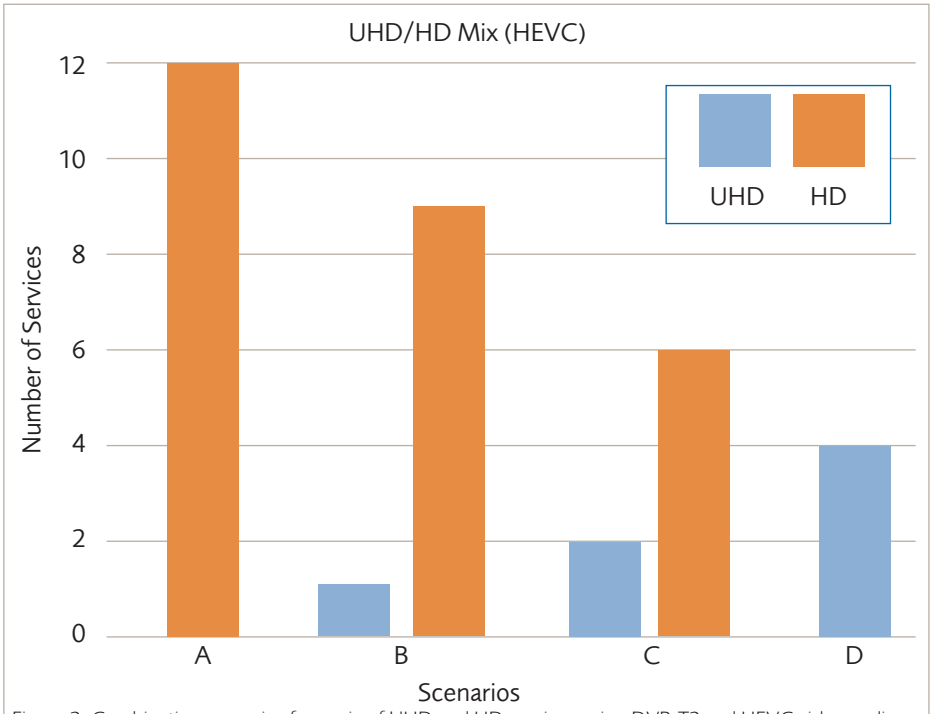



Figure 2: Combination scenarios for a mix of UHD and HD services using DVB-T2 and HEVC video coding

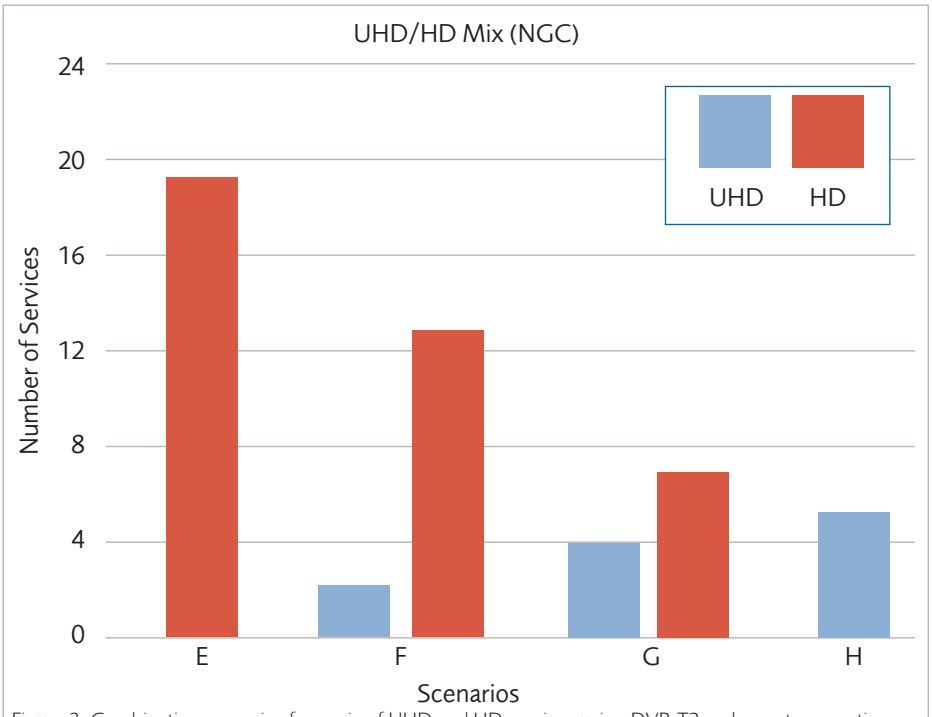



Figure 3: Combination scenarios for a mix of UHD and HD services using DVB-T2 and a next-generation video codec, assuming bit-rate saving of at least 35%

**Frank Herrmann** is a project leader at the Panasonic R&D Center Germany. He has been involved with the DVB Project for around 15 years, leading several working groups related to terrestrial transmission. He is currently chair of the DVB TM-T group.

The performance of the DVB-T2 physical layer is set out in the DVB-T2 Implementation Guidelines (ETSI TS 102 831 V1.2.1). The guidelines include tables that outline the signal-to-noise ratios required under different channel conditions, depending on the chosen constellations and LDPC code rates.

A typical DVB-T2 set-up, addressing stationary rooftop reception with directional aerials in a multi-frequency network (MFN), deploys a 256-QAM constellation and an LDPC code rate of 2/3. This provides a net throughput of about 40 Mbits/s in an 8 MHz RF channel. For the estimation of the number of UHD services that can be provided per multiplex, this throughput figure is taken as the starting point.

## SUITABILITY FOR UHD

For UHD services, DVB's video and audio coding specification (TS 101 154 V2.6.1) currently recommends the use of the HEVC codec. One or more next-generation video codecs, which will deliver bit-rate savings of at least 35%, will be added to the DVB specification in due course. The published workplan targets sometime around the end of 2021 for the completion of this work.

The average bit rate for a UHD HEVC service using statistical multiplexing is in the range of 10–13 Mbit/s. On that basis, the number of UHD services per multiplex with the settings outlined above would be in the order of three to four (noting that audio needs to be provided as well).

Meanwhile, as not all services would have UHD content available all the time, and as spectrum capacity is often limited, countries planning such deployments envisage services switching seamlessly between 1080p50 (HD) and 2160p50 (UHD) content in an integrated service-capacity-sharing scheme.

Outlined in Figure 2 are a few possible combination scenarios with different numbers of UHD and HD services in a DVB-T2/HEVC multiplex at any given time assuming:

- 40 Mbit/s net throughput per 8 MHz multiplex
- 10 Mbit/s per VBR-encoded 2160p50 service
- 3.25 Mbit/s per VBR-encoded HD 1080p50 service (see implementations in the field).

Applying the same approach to a next-generation codec scenario – with at least 35% bit-rate savings – the related figures would be:

- 40 Mbit/s net throughput per 8 MHz multiplex
- 6.5 Mbit/s per VBR-encoded 2160p50 service
- 2.1 Mbit/s per VBR-encoded HD 1080p50 service.

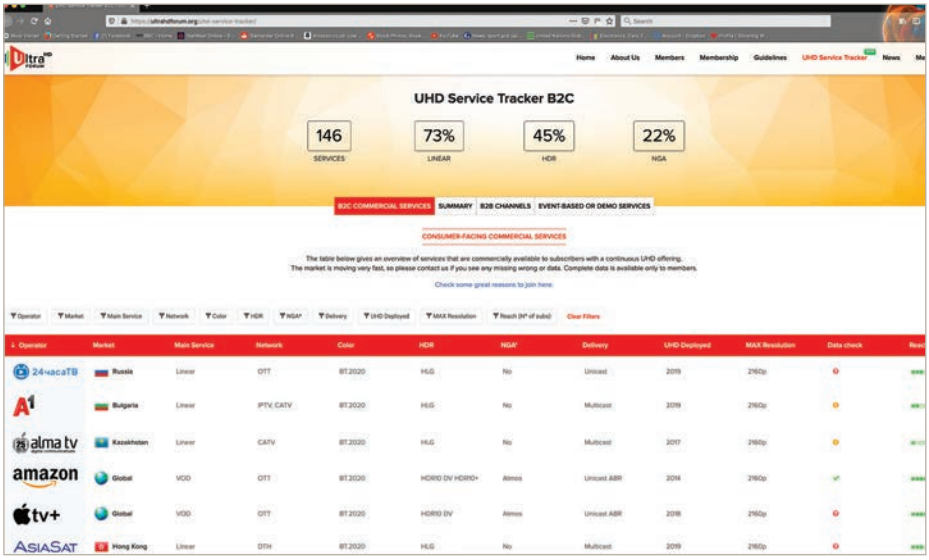
Figure 3 shows the resulting comparable combination scenarios for a next-generation codec. (Note the different scaling on the "number of services" axis – compared to the HEVC-related figure.)

## DEPLOYMENT PLANS?

With regard to UHD services on DVB-T2 networks, planning is under way in some countries and regions.

The NorDig group, which publishes guidelines for terrestrial television services in the Nordic countries and Ireland, has defined the specifications to be used for a UHD terrestrial service. Meanwhile in France work continues on finalizing the specification of the DVB-T2 UHD service that should be launched at the Paris Olympics in 2024. The roadmap is being reviewed by the CSA (French regulator for television).

With next-generation video coding it will become even more promising to envisage UHD provision via terrestrial means. Nevertheless, a related receiver base would still need to be established.




## TRACKING UHD PROGRESS

DVB collaborated with the Ultra HD Forum on a pair of webinars in March and May 2020, both available to view at dvb.org/webinars. The first was originally planned as a full conference session for DVB World 2020 (cancelled owing to the COVID-19 pandemic) and provided an overview of the key UHD technologies and standards. It also included a discussion on what was needed to take UHD to the next level.

The second webinar marked the launch of the Forum's UHD Service Tracker (screenshot above), a new web-based tool that provides an overview of commercially available services with a continuous UHD offering.

As of July 2020, the tracker indicated that 146 B2C services were on air, of which 73% were linear. Just under half of the services tracked included HDR (high dynamic range) content, while 22% came with NGA (next generation audio). Only five of the UHD services on air in mid-2020 used terrestrial broadcast.

A regularly updated ITU-R report (BT.2343.5) provides an overview of field trials for UHD over DTT networks. The July 2019 edition detailed trials in Japan, Korea, France, Spain, Sweden, Brazil, China and the UK. All of these trials used HEVC video coding.

# Tunisia: a mature DTT market in Africa

SOFIAN-MOHAMED JELILI (ONT, TUNISIA)

By African standards Tunisia was an early adopter of digital terrestrial television (DTT). Trials started in 2001 and the commercial roll-out took place eight years later in 2009, just two years before the dramatic events that sparked a revolution at home and political upheaval throughout the Arab world.

Tunisia's move to DTT therefore anticipated a sharp increase in demand for local TV content that came with the advent of democracy in the country.

Initially digital signals were transmitted using 17 transmitters. Some 40 more were added in 2015, which allowed Tunisia's state broadcaster to reach roughly 98% of the population.

## MPEG-4 AT LAUNCH

Initially signals were transmitted using MPEG-2 video coding, but the country switched to the more advanced MPEG-4 format at the time of the commercial roll-out. In 2010 the government passed a law requiring all TV sets to be sold with an integrated MPEG-4 receiver.

Today Tunisia has three public channels, one broadcasting in standard definition (SD) and another in both SD and separately in high definition (HD). There are also seven private channels. This compares with four channels in total that existed in Tunisia before the commercial roll-out of DTT in 2009.

All ten television channels in Tunisia air local content; there are also five radio services broadcast over DTT. The move to digital has therefore generated a lot of jobs.

(Digital Audio Broadcasting (DAB) was also rolled out in Tunisia last year. There are 18 radio stations that currently reach 25% of the population. That is due to rise to 75% this year, and to 100% by 2022.)

The DTT infrastructure is based on DVB-T. As of now there are no plans to upgrade to DVB-T2. As MPEG-4 video coding is already in use, moving to the newer standard would only provide scope for the addition of two extra channels. Although there would be an improvement in the strength of the signal that could enable better image quality, the government has no plans presently to switch to DVB-T2.

As in other countries, part of Tunisia's aim when switching to DTT was to free up bandwidth for other services such as mobile telephony as well as applications including Internet of Things (IoT) and Big Data. In 2016 the government used some of the money paid by telecoms providers for a share of the 690–860 MHz bandwidth – the digital dividend – to purchase 60,000 decoders, which were then given away to families without access to television.

## NEW CHANNELS

Unlike larger countries in Africa, Tunisia with a population of just 11.5 million people only has one broadcast signal distributor – the national broadcaster. The public channels are also available via international satellite operators such as the Saudi-based Arabsat network.

But domestically there is a perceived need for more and better-quality television content. That's why the public broadcaster plans to launch a new television channel devoted to providing viewers with national and international news.

The Director of the public TV channel Watania 1, Fathi Chroundi said in January that the move should respond to the "will and need of the Tunisian citizens for rapid and accurate information."

There is also a plan to introduce a parliamentary TV channel devoted to airing political debate from the Assembly of People's Representatives. One idea under discussion is to use the second existing public channel, Watania 2, for this.

**Sofian-Mohamed Jelili** is Deputy Director of Implementation at Tunisia's national broadcaster ONT (Office National de la Télédiffusion).

# Challenges converting between standards

PATRIK LANTTO (WISI)


"While some may argue the conversion from a newer standard to an old is a failure of the new standard, I would rather see the ability to convert as an important enabler for success during the introduction of a new standard."

The work undertaken by DVB is very much about enabling *new* technology to be introduced in a structured and interoperable way – thus by definition it operates at the forefront of technology. But what happens during and after the introduction of a new standard?

With my 20+ years of experience with DVB standards – primarily in the area of re-distribution – I have learned that a very clear indication a new standard is gaining acceptance is when requests for conversion start coming in: receive DVB-T2 and re-modulate to DVB-T, transcode HEVC into H.264, convert an HLS stream to DVB-C, to name a few. And what may come as a surprise is that those requests are not only for a transition period. Still, after more than two decades of digital television, development for PAL/NTSC modulation is very much active – only nowadays the content originates from a DVB-T2, HEVC 1080p source.

## WHY CONVERSION MATTERS

While some may argue the conversion from a newer standard to an old is a failure of the new standard, I would rather see the ability to convert as an important enabler for success during the introduction of a new standard. Most new DVB standards target direct-to-home applications, while requests for conversion are more from a business to business perspective. Often serving a larger number of end users, re-distribution – re-encryption, re-modulation, re-multiplexing, transcoding, etc. – is a more economically viable alternative than new end-user equipment. And if the conversion is possible, it will certainly be easier to find approval for a new standard from those businesses.

Are these re-distribution scenarios well covered by DVB standards? Well, one of few places that mentions re-multiplexing is the document "Implementation and usage of Service Information", known as DVB-SI, that simply states that *"transitions with re-multiplexing"* represent *"the most complicated and expensive solution"*, but provides no guidelines. This re-multiplexing has been basic functionality for even the smallest hotel installation for the past 15 years, so the statement may be somewhat inaccurate...

## ENCRYPTION CHALLENGES

A related re-distribution functionality for hospitality is re-encryption. Content encrypted over satellite or terrestrial broadcast should, from the content owner's viewpoint, still be encrypted when distributed in, for example, a hotel. There are several dedicated conditional access systems for hospitality provided by major TV set vendors, but to apply the new encryption the original broadcast obviously must be decrypted. CI+ is an excellent standard providing technology to ensure content is never exposed unencrypted, but the use case of re-encryption for hospitality is unfortunately disregarded. Alternatives include using a set-top-box combined with an encoder or using standard Common Interface. In both cases, the weak link addressed by CI+ remains exposed. CI+ is a success but had the re-distribution use case been considered, adoption may have been even broader.

DVB being a member-driven organization, there is of course no one to blame but ourselves. It is up to each company providing solutions for re-distribution to engage and ensure our use cases are considered, and I urge both partners and competitors to do so. But understanding the role of legacy formats is important for all of us, and it is my strong belief that awareness of the extent to which old standards are still being used is an important factor when defining new standards. And it will help us enable the introduction of all the forthcoming new fantastic DVB standards!

**Patrik Lantto** is VP Technology at the WISI Group, working in Sweden. He has more than 20 years of experience in product development across a wide range of DVB-related technologies and is always happy to talk about how operators and networks use (and misuse) DVB standards.

# DVB DRINKS

## SOME TRADITIONS ARE WORTH MAINTAINING!

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