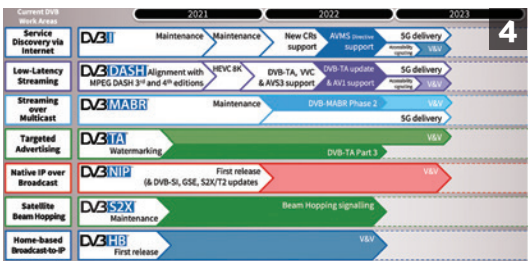
DVBSCENE

DVB

SEPTEMBER 2022

ISSUE 60

Open discussions on open standards



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DVBSCENE

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

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Travelling again, but with purpose

Emily Dubs
Head of Technology, DVB Project

The real hunger for a return to physical events can be seen in the high level of willingness among Members to contribute to the DVB-I and DVB-NIP demos we are preparing for our booth at IBC2022. In total, almost 20 DVB Members are joining forces to illustrate DVB's role in unifying the delivery of media across all networks and devices.

The return of these events is essential to foster collaboration within the cross-value chain, accelerating implementation and easing market adoption. Also, the possibility to meet in person greatly facilitates cooperation between organizations, which is one of the focal points for DVB with our mandate to harmonize media delivery in a fragmented and fast-changing media environment.

DVB has long been collaborating with a variety of organizations on different topics. A good example is in targeted advertising, where DVB-TA benefited from close partnerships on the technical level with the HbbTV Association, for the definition of the interface between the device and the broadcaster's DAS (dynamic advert substitution) application, and SCTE, for the signalling of advert placement opportunities in DVB-I services.

While several other partnerships are active, for instance in codec profiling, one worth highlighting is the recently created joint task force between DVB and 5G-MAG. There, the aim is to map the commercial requirements for the use of DVB-I over 5G technologies into deployment guidelines, identifying any specification gaps to be later handled by the respective organizations, and feeding into the 5G-MAG reference tools activity. The latter task already translated into the joint organization of the OSMART – Open-Source Media Application Reference Tools – workshop, where both DASH-IF and CTA WAVE also got involved, along with HbbTV.

A similar joint activity with ATSC may soon emerge, to study how DVB-I could interface with ATSC 3.0 services and, in this way, act as an abstraction layer between 5G technologies and DTT systems in the future. Indeed, the need for DTT standards to speak with one voice to media distribution systems that are already global in scope, such as those developed by 3GPP, was one of the topics tackled in a wide-ranging discussion panel during the recent IEEE International Symposium on Broadband Multimedia Systems and Broadcasting in Bilbao. There, I had the pleasure of sharing the podium with Madeleine Noland, ATSC President, and we also enjoyed very fruitful discussions behind the scenes.

These are the kinds of unique moments that are only possible when we meet in person and can expedite business! I don't, however, expect that we will ever again travel as intensively as before. I hope the lessons learned and the efficient ways of working developed during the pandemic will combine intelligently with the possibility to meet in person for exceptional and specific reasons. That was the idea behind the totally revamped DVB World (see pages 10–11) and that's also what we will try to achieve through the reorganization and clustering of the DVB meetings next year, which Peter MacAvock writes about on page 5. I hope to meet you in Amsterdam, if you're ready to travel again! Find us on booth 1.B73.

NEW & UPDATED SPECIFICATIONS

Here we list DVB documents published since the last issue of DVB Scene. They include an update to DVB's core specification for audio and video coding, DVB-AVC. BlueBook A001r20 sees the addition of the AVS3 video codec that you can read more about on pages 12–13.

The DVB-DASH specification has also been updated, with the addition of both VVC and AVS3 video coding as well as the required signalling to deliver DVB Targeted Advertising (DVB-TA) in DASH-based services. Find the latest published version of every DVB specification in our library: dvb.org/specifications

Dynamic substitution of content in linear broadcast (DVB-TA); Part 3: Carriage and signalling of placement opportunity information in DVB-DASH
August 2022 • DVB BlueBook A178-3 (Interim draft TS 103 752-3 V1.1.1)

DVB MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks (DVB-DASH)
July 2022 • DVB BlueBook A168r5 (Interim draft TS 103 285 V1.4.1)

Specification for the use of Video and Audio Coding in Broadcast and Broadband Applications (DVB-AVC)
July 2022 • DVB BlueBook A001r20 (Interim draft TS 101 154 V2.8.1)

Frame structure, channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)
June 2022 • DVB BlueBook A182 (Draft TS 102 755 V1.1.1)

Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH); Part 4: Hybrid MIMO Profile
March 2022 • EN 303 105-4 V1.1.1.

Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH); Part 3: Hybrid Profile
March 2022 • EN 303 105-3 V1.1.1.

Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH); Part 2: MIMO Profile
March 2022 • EN 303 105-2 V1.1.1.

Next Generation broadcasting system to Handheld, physical layer specification (DVB-NGH); Part 1: Base Profile
March 2022 • EN 303 105-1 V1.1.1.

A word from the PCM chair

Elfed Howells (Hisilicon/Huawei)

At the PCM we consider 2022 as being, in many ways, a year of firsts. We completed the first Listening Project, where we interviewed the industry for feedback on our work and the trajectory of the sector (see page 18). The Steering Board has worked hard to interpret and convert the recommendations made in the report into actions that also respond to the valuable feedback we received. Peter MacAvock covers some of these on page 5.

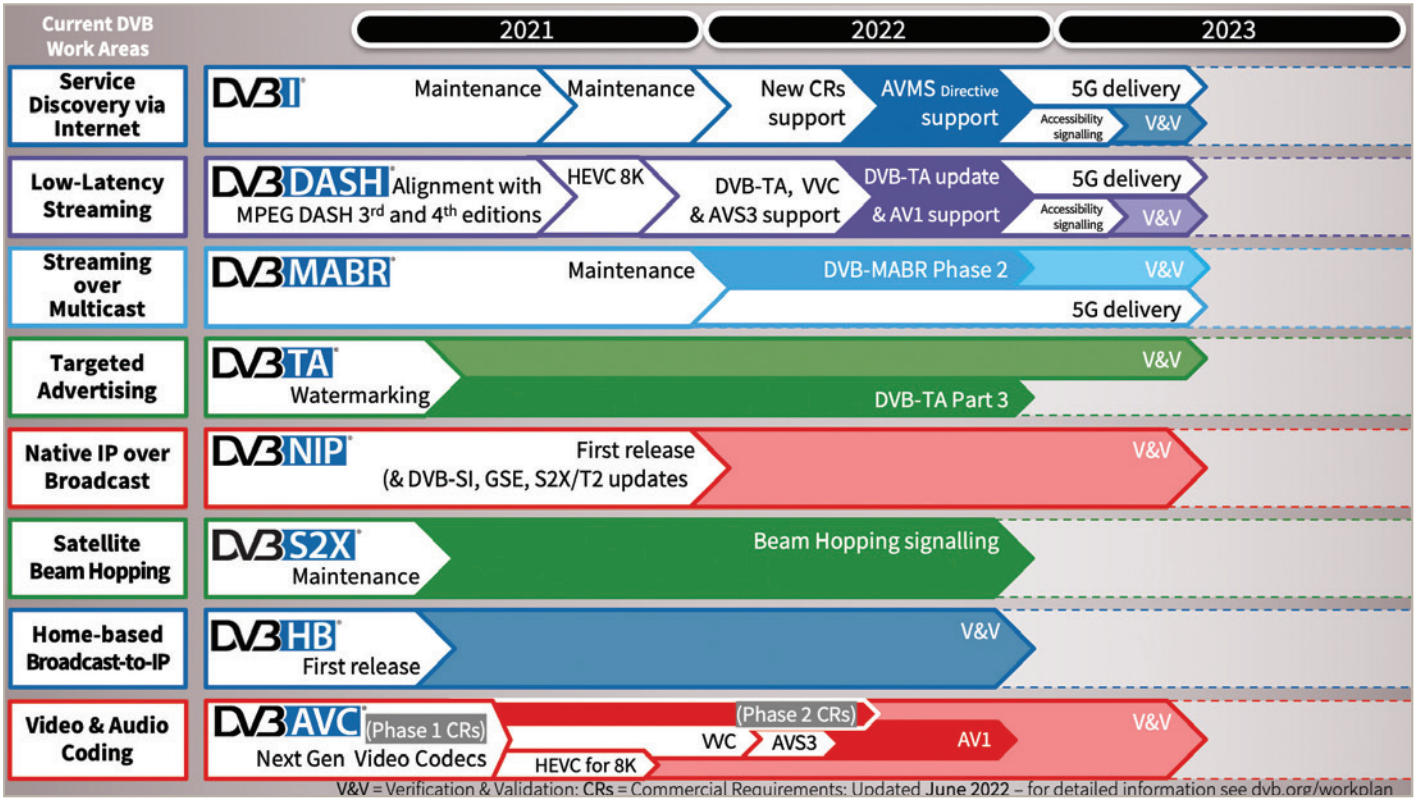
This year has also seen a major first for DVB World, where we debuted the *unconference* format, which transformed the experience into something very special and gave both Members and non-members the permission and opportunity to discuss new ideas, suggest projects and showcase some of the technologies that are transforming the industry. The feedback from those attending was overwhelmingly positive and we thank the DVB World team for daring to be different and pulling off a fabulous event. (More on pages 10–11.)

Also in May, we held the first OSMART event, an online workshop on open-source tools for the media distribution industry, which brought together the valuable work of HbbTV, 5G-MAG, DASH-IF, CTA WAVE and DVB, showcasing the wealth of tools available for implementing our specifications. While this was the first such collaborative workshop, the feedback suggests it won't be our last and we look forward to further events under the OSMART banner and other such collaborative projects.

We are seeing increased activity around DVB-I, with multiple pilots and proofs-of-concept (with updates from both Germany and Italy on the pages that follow), and for the first time we see companies starting to offer DVB-I products and services to the industry across the value chain.

The PCM is also celebrating the fact that DVB is embracing its global market: at a panel in June, we discussed collaboration and synergies with ATSC, and in July the Steering Board approved the addition to DVB's toolbox of a codec developed by the Audio and Video Coding Standard Workgroup of China (see pages 12–13).

Finally, we're celebrating the joys of the familiar, such as the return of face-to-face events and meetings and our first IBC (including DVB Drinks!) since 2019. These are indeed things to savour and remind us that cooperation, new ideas and consensus grow stronger when we gather around the same table.



Reworking the workplan

For many years now, we have made DVB's workplan available on the website, with updates two to three times per year to reflect progress and planning across the different work items (see dvb.org/workplan). As it's quite a heavy document and not easy to interpret at a glance, we recently introduced an additional lighter format. You can see the latest version of it above, updated in June 2022.

This high-level view, showing the areas in which DVB is working and the main public milestones, will continue to evolve. It does not yet indicate the three new study missions introduced to the right. We'd love to have your feedback on whether this way of showing our work is useful. Perhaps you have ideas on how it could be improved. Don't hesitate to send a note to dvb@dvb.org or, even better, drop by our booth at IBC2022 for a chat!

NEW DVB MEMBER

Find out how to join the DVB Project by visiting: dvb.org/join

Standards Australia is an independent, non-governmental, not-for-profit standards organization. Alongside offering Australian stakeholders from a variety of sectors pathways to develop standards, it also participates in the development and adoption of international standards and accredits other standards development organizations in Australia.

"Standards Australia is pleased to be recognized as an Observer of standardization activity in the DVB Project," said Roland Terry-Lloyd, Head of Engagement at the organization. "This allows us to support the development of Australian digital television standards, which are focused on the adoption of ETSI / DVB standards. Standards Australia is aware of the exponential development of audiovisual technologies in an expanding digital media sector. We look forward to working with DVB to help shape Australian standards and guidelines." **(standards.org.au)**

Three new study missions for DVB

Preliminary studies on three topics that may lead to new standardization activities have been launched under the DVB Commercial Module. DVB Members can already join the respective groups via the Members' portal; others who wish to get involved are encouraged to contact the DVB Project Office.

Object-based media – examining how programmes containing multiple media elements can be carried in DVB systems and identifying where existing specifications may need to be enhanced to support object-based media. The scope of work required may include the carriage of media objects and related metadata, and the support for rendering at each stage of delivery. (See page 16.)

Energy-aware service delivery and consumption – focusing on how DVB could contribute to lower energy consumption during service delivery and consumption, this study mission will initially examine the potential for energy saving in delivery networks and home networks, later looking at potential savings in the receiver devices.

Ultra low-latency interactive services – building on the recent publication by DASH-IF of a report on DASH and WebRTC-Based Streaming that sets out several use cases that would rely heavily on very low latency and interactivity capabilities, including sports betting, live interactive music events, cloud-based game streaming, and in-stadium interactivity. DVB will investigate the level of interest among its Members to work on such use cases and identify relevant gaps in existing DVB specifications.

Getting DVB's house in order

Peter MacAvock (EBU), Chair of the DVB Project

During the pandemic lockdowns, opportunities to spend our marketing budget on conferences, demonstrations and representation were greatly reduced, so we decided to invest in polling stakeholders, themselves travelling less because of the pandemic, on their ideas about the role DVB should have. Whatever the outcome, we felt that DVB post-COVID needed to be different to pre-COVID one way or another.

Of course, it depends on who you interview, what position they have in their respective company and who writes the interviews up, but we were pleased to learn that there *is* a continued role for DVB in today's media industry; even if that industry is leaving the broadcast world that is DVB's mainstay behind. But there is much work to be done to turn what some might consider the DVB dinosaur into an organization fit for today's purpose.

LISTENING PROJECT

The findings of what we called our Listening Project (see page 18) could be divided into two main areas: one focused on reaching out to the internet-only media companies, reliant on their own vertical solutions loosely based on industry standards, to bring them to our table. And the second focused on getting DVB's own house in order.

Streaming media is very different to broadcast media. However, don't be fooled: it's still about media. Product lifecycles are shorter, so we need to be able to turn new ideas into specifications quicker, but the commercial drivers still need to be there. For example, whereas a broadcaster might upgrade codecs every five to six years, an OTT provider might do it every three to four years. Let's not forget that providing a media asset that forms part of a vast library to a global audience at different quality levels is a massive undertaking.

KICKSTARTING NEW WORK

Critics argue that DVB's procedures are outdated and cumbersome, but the basic premise has withstood the test of time – and the test of our Listening Project. DVB is about developing media solutions – not just technical standards – on the basis of market requirements and by achieving consensus among its Members.

What we're doing now is to make DVB an easier place to do work. By launching a 'kickstarter' initiative, we'll help manage a funnel of new ideas from Members, gathering sufficient support to initiate work in DVB. It's not revolutionary, but DVB has recently responded to Member inputs for new work items (see page 4) and this is about making that process smoother and encouraging Members to continue to submit new proposals.

MEETING CLUSTERS

One thing that we have come to acknowledge is that, post-COVID, it will be almost impossible to gather all stakeholders discussing a given topic in one room. Hybrid meetings are the future. DVB had already moved most of its requirements capture and specification work online, but the core DVB Modules still met in person. We'll change that to focus on two annual clusters of physical meetings, one around our very popular DVB World conference.

The downside of hybrid or online meetings is that they don't lend themselves to the resolution of controversial issues. Since the start of the pandemic, DVB's Steering Board has run four indicative votes to seek consensus among Members on different topics. Prior to this, the only previous vote in DVB's Steering Board had been in 1995. As a result, we're taking a hard look at the rules that govern voting, while retaining the core principle of consensus, which is one of DVB's hallmarks. We're also looking at ways in which we can ensure really controversial topics can be hammered out in face-to-face discussions.

We've been busy in DVB and with these few changes – and more to come – we hope that the coming two years will see DVB better serve the media industry.

"We're taking a hard look at the rules that govern voting, while retaining the core principle of consensus, which is one of DVB's hallmarks"

Peter MacAvock is Chair of the DVB Project, a position to which he was re-elected in July 2022. He is also Head of Distribution Platforms and Services at the European Broadcasting Union.

The German DVB-I Pilot – evaluating DVB-I on a national scale

Remo Vogel (rbb/ARD)

For broadcasters, DVB-I offers a way to maintain our sovereignty over content distribution. Our world is changing fast: on the one hand we see video-on-demand gaining importance, while on the other, IP-based distribution is also becoming more and more important for live television. Aggregators are working with new business models, and super-aggregators are trying to expand their coverage to linear video as well. We need an open and standardized way to reach our audience's devices in the future. This is exactly the point where DVB-I comes into play: it extends classic broadcasting with over-the-top technologies in a very clever and hybrid way.

ARD has been running a technical pilot for some time to gain initial experience with DVB-I generation and playback. At the same time, we've been having intensive discussions in various places on how the partners in the market cooperate and what the introduction of DVB-I might look like. That was the motivation for us to take the next step. With an alliance of several participants, we are assembling the building blocks for a national DVB-I scenario.

THREE CRITERIA

We have set ourselves three criteria. First, we want to show an additional benefit for users. Of course, DVB-I works as transparently as possible in the background of the TV set; in the best case, the user does not even notice the device switching back and forth between broadcast and broadband. Beyond that, however, we have completely new possibilities that go beyond the limitations of classic broadcast. Therefore, we are adding additional services such as playlists, temporary event streams and features like NGA (next generation audio) to raise the television experience to another level.

The second criterion is the hybrid mode. Even though DVB-I works on IP-only devices such as desktop PCs or mobile phones, it is very important for us to show hybrid operation in real TV sets. The combination of broadcast and IP transport is an important feature for us. DVB-I allows the prioritization of the reception mode. This gives us as broadcasters a tool to control the process of digital transformation ourselves.

Thirdly, it is important for us to demonstrate cooperation between public service media and private programme providers. Sometimes the emphasis is different, for example in the use of DRM (digital rights management).

WEAVING THE COMPONENTS

As a broadcaster, we primarily make our programmes and the associated data available. For the pilot, we need a complete setup. This includes the creation of service lists and streams, aggregation, and the integration of a CSR (central service list registry). The DVB-I clients have special significance, since their implementation must fit our features and our understanding of the standard. We are very happy that we can work closely with some major vendors on this.

The service lists of the individual providers must be combined (see illustration). We have set up an aggregation service for this. This aggregator generates a national service list. Each provider sends its list to an aggregation API. The service validates technical consistency and adds them to the national service list. Regions and LCNs (logical channel numbers, which define the order of services) are maintained separately on the aggregation service, so we can ensure homogeneity. This also corresponds to the understanding in the DVB-I specifications of a regulator list. The content guides, on the other hand, are delivered in a distributed manner, so that each provider can ensure up-to-date data and we have no problems with caching and latency.

GERMAN REGIONS

Regionalization is a particular challenge. Germany has different states and within the states there are different regions. On both levels, ARD provides individual programmes and regional variations for these. Altogether this makes 28 different television programmes within ARD that have state/region-specific content. In addition to this, there is also an even higher number of regional commercial television programmes. This situation makes the regionalization of service lists, and specifically the regionalization of the ordering within the service lists, an important aspect of the offer. Consequently, this is also a relevant aspect of the introduction of DVB-I and therefore has become part of the pilot.

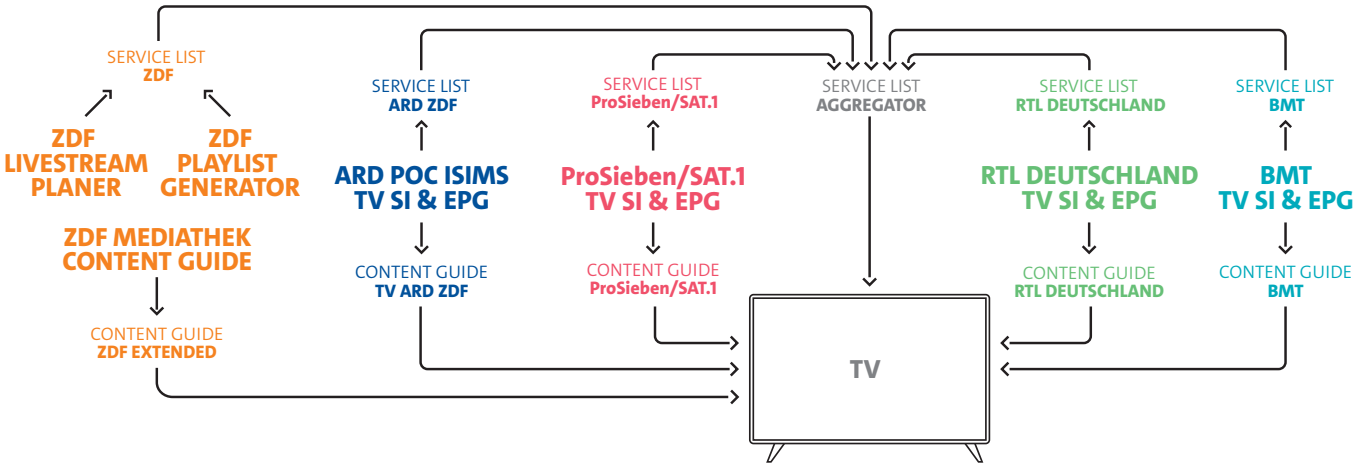
The DVB-I standard foresees the option to define regions within a service list and to associate distinct LCN lists with each region individually. This is the mechanism we are using within our pilot to demonstrate the capabilities of DVB-I with regard to regionalization, based on a small number of six different regions plus one national LCN list.

Due to the high number of regions we will see in practical operation later, plus the multitude of services, however, this procedure of regionalization will lead to huge amounts of regionalization data in the service lists. Therefore, we intend to migrate later to an alternative procedure that is currently being specified by DVB: this would allow the receiver to send the postal code of the current region as a parameter of the service list request to the service list server. The server will then deliver back a service list with an LCN ordering specifically for the respective region, avoiding the need to carry bulky regionalization within the service list.

PILOT FEATURES

With the mix of providers and focal

Remo Vogel is responsible for the strategic development of distribution technology for Rundfunk Berlin Brandenburg / ARD. His focus is on hybrid systems for programme publication. He is co-chairing the EBU HbbTV & DVB-I group.



Each content provider sends its list, via an API, to the service list aggregator, which generates a national service list.

points, we can cover many different aspects in the pilot.

HbbTV – the integration of HbbTV plays a crucial role, enabling the realization of additional services, barrier-free services, the integration of media libraries, and targeted advertising. Only a service with functioning HbbTV signalling is a complete service. This also applies to DVB-I, which is why we pay attention to client implementation.

DRM – broadcasters have different business models, so digital rights management in combination with access to subscription services is an important feature. When switching to one of our DRM-protected programmes, an HbbTV application is launched to manage DRM handling and decryption.

Event streams – temporary special events are a common occurrence for broadcasters, for example, live event streams for major sporting events. DVB-I offers us the possibility to include these live streams as regular channels in the service list. When the channel is deactivated, we show an out-of-service banner.

Playlists – another form of integrating video-on-demand are playlists, which are displayed in the channel list as a service. This gives us an interesting possibility to bring particularly valuable content back into a linear usage situation.

Media library – there is increasingly mixed use of linear television and on-demand content in media libraries. We look at the user journey across the board. That's why some services have a content guide that links to the media library, allowing the user to navigate directly from the programme guide to other videos on a particular topic. The media library is then started as an HbbTV application.

Radio – as we also distribute ARD's radio programmes over satellite, we include radio in our DVB-I service lists. Anyone who thinks that this is the wrong format for the big screen is mistaken: we enhance our radio programmes with entertaining and informative visual radio applications. Here, the listener can find additional information about the music being played or the news. We have added radio services for the pilot but only on an experimental basis for now, because we don't yet have MPEG-DASH for radio. (Radio live streams are mainly distributed via Icecast or HLS.)

In addition to all of the above, there are many more features. Almost all programmes can be received hybrid. There is an experimental programme with low-latency DVB-DASH and HEVC. Instance prioritization and fallback switching are supported. Naturally we offer an EPG and the now/next banner. And an NGA programme will demonstrate dialogue enhancement.

TOWARDS MARKET LAUNCH?

The most important task at present is to agree on a common understanding of the value of DVB-I, with all market participants involved. So far, not everyone is aware that we have a special opportunity here to make television fit for the future, an opportunity with long-term significance.

Before we can consider a market launch, there are still some interesting questions. For example, the relationship between broadcasters and aggregators needs to be clarified. Two different scenarios are conceivable. On the one hand, aggregators could offer their own service lists. These would be limited to the services offered by the aggregator. Another approach would be for the broadcaster to include the aggregators as service instances in their own list. In this way, the aggregators would also function in a national list.

The aim of our pilot is to get this whole discussion going. It tests implementation proposals for a market introduction scenario and shows which questions still need to be clarified. Once these goals are achieved, we will end the pilot. For a subsequent DVB-I launch, it is important that all stakeholders share the vision and a plan for the next steps.

WHERE TO LEARN MORE

You can experience the German DVB-I Pilot in action at IBC2022 on the booths of both the EBU (10.D21) and the DVB Project (1.B73) and also at Media Days Munich in October. Find more information about the pilot on the DVB-I website (dvb-i.tv/services/#germany) or send an email to: dvb-i@rbb-online.de

Developing a DVB-I strategy for broadcasters in Italy

Marco Pellengrinato (Mediaset)

Having recently presented the results of our DVB-I proof of concept (PoC), a set of technical tests and developments that started in 2020, Mediaset is now ready to proceed with a market trial in the field, expected to start in 2023. This article sets out the motivation behind our DVB-I activities and the objectives of the market trial.

DVB-I is the natural evolution of broadcast television: from mass media to personal media, unifying the user experience of the broadcast model (one-to-many) with that of the unicast model (one-to-one), closer to the internet world, completing the cross-platform hybridization of TV 4.0.

BROADCASTING ON BROADBAND

DVB-I therefore, with reference to the traditional television-viewing experience, allows broadcasters to assert themselves more easily in the modality that belongs to them, by definition, providing 'broadcasting services' also through IP technology with many more advantages than the alternative method of streaming through dedicated apps. It allows a user experience very similar to traditional broadcasting with, for example, zapping between linear channels using the remote control (thanks to the implementation of logical channel numbering, LCN), or by direct switching from over-the-air channels to thematic and personalized services coming via broadband IP connections. Such content can be delivered at a significantly lower and more scalable cost than over-the-air transmissions, without abandoning the usage model of traditional television or requiring the launch of applications or widgets.

In this context, therefore, the publisher's brand extended to distribution on DVB-I retains its guarantee of protection and brand trust towards the end user. This is the same trust already earned from viewers through the dissemination of programmes over traditional broadcast channels. Extending, rather than changing, the user experience, DVB-I brings to the broadband world the set of services already widely characterized and known in the broadcast world: protection of minors and minorities, publisher identification, access to scheduled programmes' associated metadata (title, network, synopsis, schedule, etc.), catch-up services supporting interactive functionalities (like on-air programme restart), targeted advertising, user profiling, guaranteed quality of service, and much more. All these features are available on the main screen under the full control of the traditional remote-control experience.

REGULATED ACCESS

Here we see the real strength of DVB-I, as well as the more purely economic aspects deriving from lower internet distribution costs for those channels with reduced audiences, compared to the cost of transporting them on over-the-air broadcast networks. The weakness of DVB-I, on the other hand, lies in the lost privilege of traditional broadcasters: access to the DVB-I platform is no longer their exclusive prerogative. The platform can also be used by third-party, online-only FAST[1] publishers. These are globally operated through broadband networks and can enter domestic TV sets through the internet and be selected directly by the remote control without launching any special apps.

DVB-I is therefore also a formidable gateway capable of providing access to home TV sets for third-party publishers, not necessarily broadcasters, who offer their television channels online and across borders, using this technology. Precisely for this reason it is more than ever necessary to guarantee fair and regulated access to the emerging DVB-I platform for new publishers, especially online. This includes, for example, regulating access to this new platform with equivalent rules, rights and conditions to those already applied to national broadcaster publishers, as has been the case since the early days of television. It also means binding the use of the current LCN numbering to broadcasters that already have it under licence, avoiding unnecessary conflicts on access to television channels due to duplicated or arbitrarily assigned numbers.

FROM STANDARD TO SERVICES

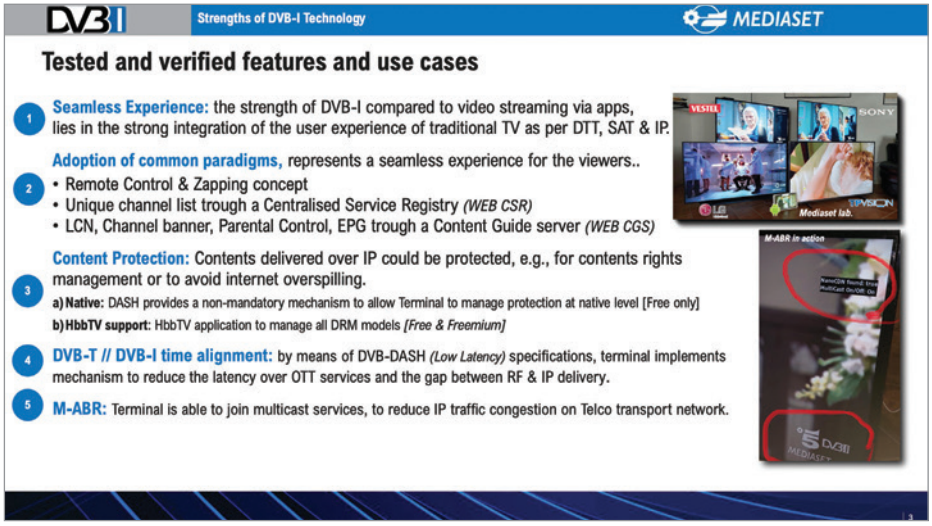
On the technological side, with the publication of DVB-I as an ETSI standard in 2020, it was necessary to work immediately to establish commercial requirements and technical specifications shared across Europe's television systems. The launch of experimental services by European broadcasters would stimulate the growth of DVB-I and the development of compliant smart TVs on the market.

To do this, Mediaset supports the technical profiling initiatives that HD Forum Italia (HDFI), together with Confindustria Radio Televisioni (CRTV), conducts through the publication and constant updating of the UHD Book collection, to ensure the correct DVB-I profile in future smart TV receivers on the market. We have seen similar activities elsewhere in Europe, such as through the DTG in the UK and the Deutsche TV Plattform in Germany.

It is essential that broadcasters demonstrate their interest in DVB-I technology to TV manufacturers by announcing precompetitive market trials such as that recently announced by Mediaset for the Italian market.

DVB-I is by far the most promising technology to allow broadcasters to guarantee viewers the best transmission quality of their present and future linear channels by overcoming the already significant limitations of the electromagnetic radio spectrum. In addition, it is the only experimentally tested technology that enables an indistinguishable, consistent and

Marco Pellegrinato is Standards & Innovation Director at Mediaset and Vice-President of the HD Forum Italia. He has been active within the DVB Project for more than twenty years, with a particular interest in television broadcasting and Interactive standards and technologies.



Some of the key strengths of DVB-I that were validated in the proof of concept

functional user experience that combines broadband with DTT and satellite transmissions.

Over the past three years, our PoC has extensively validated and verified the main use cases shown in the illustration above. The increase in project partners from three up to 12 showed the real interest in collaborating on the development of this technology. The sharing of the PoC results at various international events has generated significant interest both in Italy and elsewhere in Europe.

We are now in a position to move into a new implementation phase in the field, enabling verification of the entire DVB-I supply chain, while maintaining in parallel a development activity to test new DVB-I use cases supported by the additional functionalities in the emerging 2.0.4 release of HbbTV.

MARKET TRIAL

Our forthcoming market trial of DVB-I takes DVB-I out of the laboratory and into the field, making it accessible to a progressively increasing number of real viewers and broadcasters, with a voluntary 'self-recruiting' method. The market trial targets the DVB-I capable TV sets that will be available from next year on the Italian market. It is reserved for manufacturers that have actively participated in the PoC or who intend to join from now on with their own compatible products. As of now, devices from at least four different brands are expected to be available.

The basic hypothesis is to promote an activity specifically dedicated to professionals: manufacturers, integrators, operators, institutions and authorities. It will enable the development of the necessary technical and functional skills in an end-to-end environment, verifying the entire distribution chain, including metadata nodes like the CSR (central service list registry) and content servers. The initially low availability of compatible receivers on the Italian market in 2023 also implies a low impact on the costs and criticalities of OTT distribution infrastructure (CDNs), etc.

DRIVERS & OBJECTIVES

There are several tactical and strategic reasons to activate a DVB-I market trial in Italy. One key driver is the possibility to use the IP platform to deliver linear services with more advanced video and audio formats than can currently be delivered through the DTT platform. The HEVC video codec can be used to deliver to DVB-I capable smart TVs, which can then fall back to the legacy format and codec on DTT if not connected to an IP network.

Through the market trial, Mediaset intends to bring together other broadcasters, operators and content providers to test the emerging DVB-I technology as a means of implementing the true hybridization phase of television. Today in Italy, because of the refarming of the 700 Mhz band, many local and regional broadcasters have had to stop or reduce their DTT transmissions due to the limitation of spectral resources. Despite this, they continue to provide linear broadcast services by streaming channels through their HbbTV apps. These operators already distribute their channels via CDNs using IP technology. They are thus perfectly eligible to test the DVB-I distribution model.

The main objectives of the market trial are as follows:

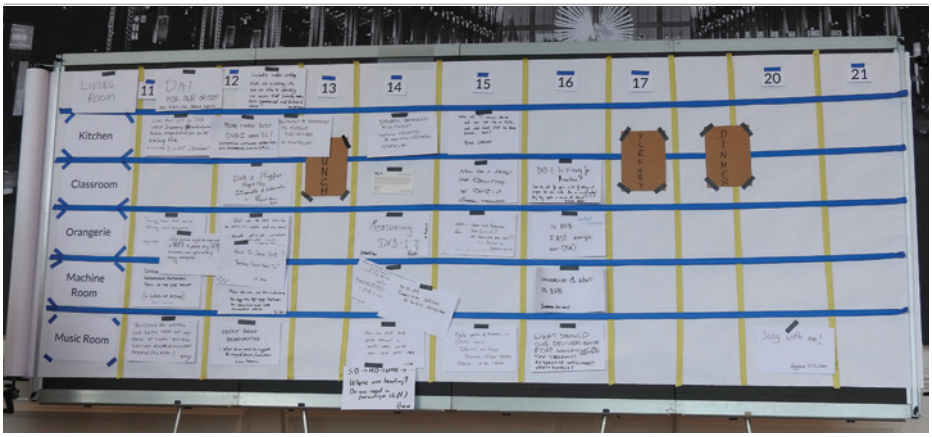
- Launch a pre-competitive phase of supplying linear television services via IP, open to all broadcasters, to prepare the ground for the future roll-out of DVB-I services in Italy.
- Sensitize the legislature to regulate the sector of television services via IP, guaranteeing adequate prominence to current broadcasting services, i.e. the presence of remote controls with numeric keypads to maintain the use of the LCN; and facilitating access to television broadcasters' channels with a simple click on the "TV app" button of the remote control from any other application, the so-called "one click away" effect.
- Collaborate with the manufacturing industry for the development and marketing of receivers compatible with DVB-I technology.
- Contribute to the creation of a minimum DVB-I baseline specification profile (for the HDFI's UHD Book collection) to support the 18-month "sunrise period" required by TV manufacturers for the creation of a specific certification, the "DVB-I TV *Bollino*".
- Prepare a legacy of DVB-I compatible devices with wide penetration on the Italian TV market on which to launch an effective DVB-I service already by the end of the decade.
- Share with other industry associations (including CRTV and ANITEC, the Italian trade association for consumer electronics manufacturing) the roll-out and harmonized development of linear broadcasting services over IP for Italian broadcaster operators.

To activate the market trial, Mediaset will prepare some of its main channels to be distributed also in IP mode, including via ABR multicast based on DVB-MABR. These services will use a progressive FullHD broadcast format, thanks to the use of highly efficient codecs, which will be deployed in multilevel and low-latency adaptive mode. These channels will be offered with a dedicated channel numbering scheme.

[1] FAST: free ad-supported streaming television

A look back at DVB World 2022 – our first unconference

Eoghan O'Sullivan (DVB Project Office)



A packed agenda with something for everyone

There was a mix of anticipation and curiosity as around 120 people drawn from the wider DVB community took their seats in a sun-filled room on the first floor of the Maison de la Poste in Brussels on a Wednesday last May. Around two thirds of them had already shared a drink and a chat the evening before, at the Gare Maritime just next door, but they remained none the wiser as to what would unfold that day as DVB World returned after a two-year COVID-enforced break.

For starters, they were not sitting in rows and had no desks upon which to place a laptop. The circular arrangement was among the first signs that this conference – or in fact, *unconference* – would not follow the usual template.

Along with this atypical seating arrangement, there was also the fact that there had been no advertised speakers and no published agenda. Instead, along the side of the room, there was a large board displaying an empty grid: the rows were labelled with the names of meeting rooms in the building and the columns showed hour-long timeslots. The task facing the participants was to fill this agenda with sessions – and it's a task they completed with unanticipated enthusiasm. It wasn't long before we had a queue of people patiently waiting to deliver their one-minute pitch and place their session on the agenda.

Within that first hour, the agenda was filled with around 25 sessions covering diverse topics: DVB-I (from several angles), video coding, native IP broadcasting, multicast, and the evolution of the media delivery sector in general. Also pitched were sessions focusing on DVB's own working processes and some potential new work areas for DVB. (Two of these have already progressed to

becoming new study missions under the DVB Commercial Module!) The rest of the day was a whirlwind of discussion, debate, interaction and energy, as people moved from room to room and session to session, with reports filed and posted progressively throughout the day.

WHY AN UNCONFERENCE?

The decision to run DVB World as an unconference grew out of the wish, in the DVB Project Office, to take the pandemic-related break as an opportunity to try something completely different. We knew from past conferences that interaction, networking and opportunities to have meaningful conversations were what attendees valued most of all. Also, we had learned during the pandemic that the delivery of information in a one-way context doesn't require physical presence or even live attendance. For many of us, watching a webinar on demand at a time of our own choosing – and often with the playback sped up – can be a more efficient way to pick up new knowledge.

Given the continued uncertainty around how the pandemic would evolve,

Each session leader provided a brief oral report in the closing circle

Eoghan O'Sullivan supports the DVB Project Office on communications and was the event producer for DVB World 2022. He first became involved with DVB when helping to run DVB World 2003.

Most sessions involved highly interactive discussions

we needed an event that could be planned and implemented in around three months; one that would work whether there were 40 or 140 attendees; that would not require firm commitments from speakers in advance; and – most importantly – would be primarily focused on interaction and meaningful conversations rather than the one-way broadcast of information from a stage to a darkened room of people sitting in front of their laptops.

Preliminary research brought us to the unconference, which has its modern roots in Silicon Valley in the early 2000s and is based on a practice known as *open space technology*. It is a flexible and highly participatory format that seemed to perfectly fulfil our criteria. We engaged the support of Michaela Sieh, an experienced open space practitioner who had run unconferences in the past. She was the ideal person to accompany the Project Office team for this event.

DVB WORLD 2023

The feedback from participants was overwhelmingly positive – you can read a selection of comments to the right. Watch out for an upcoming opportunity to learn what happened next on many of the topics discussed in Brussels. (You can find the full list of sessions at dvbworld.org.)

We plan to repeat the unconference format again in 2023, with some improvements based on lessons learned this year. There is still a place for the traditional conference but for DVB World, the unconference seems to be a winning proposition. To quote our Chair, Peter MacAvock: "It was the best conference I've ever attended."

"The unconference format enabled open discussions around topics and opinions that would never have been shared in a traditional one-to-many presentation style. This was really refreshing."
Thomas Kramer, VP Strategy and Business Development, MainConcept GmbH

"The unconference format worked very well. Every session I attended was relevant to my interests and I could have usefully attended many of the others. I hope this format is retained for the future. Brussels is also a good location."
William Cooper, CEO, Service List Registry

"DVB World 2022 was a great example of how television is changing from a broadcast medium to an interactive medium. After two years of remote events, the team had a good sense of what the broadcast community wanted: sharing and discussing ideas in person. So they focused on the social aspect and combined it with the best possible format to leverage attendee expertise for fruitful discussions. In the end, there was a real sense that the discussions were going to change things. All this would not have been possible without the highly motivated DVB team and the decision to hold the event in a warm, historic building full of human atmosphere. In short: great atmosphere, great location, great format and, above all, great team!"
Andreas Tai, Media Accessibility Consultant, a2a11y – Access to Accessibility

"I went to Brussels with an open mind but only moderate expectations. While I had been less involved over the previous three years, I wanted to get a view as to how the future of DVB may look. My compliments to the team: the event was superb, the agenda that crystallized was superb, and seeing everyone again was superb! My enthusiasm for the future of DVB was significantly refreshed – an excellent event."
Ted Laverty, VP Global Standards, Xperi

"This first renewed version of the DVB World was very inspiring. This new method of co-construction allowed me to create links with many other participants (broadcasters, manufacturers, etc.) and to interactively choose the topics I wanted to follow. I'm already looking forward to the next edition!"
Gaëlle Kaminsky, Deputy Director & Director of Transformation, Audiovisual Business Unit, TDF

"Everything was very well organized and I appreciated how open the discussions were. Not knowing the content or the sessions beforehand made it hard to prepare before attending but I really liked the unconference approach."
Eduard Aldea Borruel, Broadcast Engineer, RTBF

"I really appreciated the laser-sharp focus of the event – you could tell that everyone was committed to making DVB and all its related technologies better, while fostering an open and respectful environment. I noticed that very few people were trying to sell anything, but to further the common goal of better products, services, user experiences."
Juha Joki, Director of Broadcast and Testing, Sofia Digital

"I was still buzzing when I got back from Brussels. It was an inspirational event where we were given the permission to really engage in debate, discussion and free thinking. Kudos to DVB World team for suggesting and executing on this bold and rewarding format so well."
Elfed Howells, Senior advisor and DVB Steering Board representative, Huawei

DVB WORLD 2022

AVS3: new video codec underlines DVB's truly global scope

Jianhua Zheng (Peng Cheng Laboratory) & Paul Higgs (Hisilicon/Huawei)

In a landmark for both the DVB Project and for AVS, the Audio and Video Coding Standard Workgroup of China, the latter's third generation video codec was recently added to the DVB codec toolbox as a next-generation video coding solution. An updated specification that includes AVS3 was approved by the DVB Steering Board in July 2022 and is available as DVB BlueBook A001r20. It will be published by ETSI as a revision of the DVB-AVC standard (TS 101 154) in due course.

The revised DVB-AVC specification includes four conformance points for AVS3, to be used for all DVB delivery methods, terrestrial, satellite, cable, IPTV and DVB-DASH. The specification was developed by the DVB Technical Module's AVC working group (TM-AVC) as part of its ongoing work on next-generation video codecs. This work is intended to support use cases such as 8K UHD video and more efficient coding of 4K and HDR content.

The use of AVS3 for DVB applications is specified in the revised DVB-AVC specification for both transport stream and IP-based delivery. China plans to use the specification for its DVB-based delivery systems, with other countries expected to follow.

THIRD GENERATION

AVS3 is the third generation of the video coding standards family developed by the Audio and Video Coding Standard Workgroup of China. The AVS workgroup was founded in 2002, and its first generations of the AVS video standard, AVS1 and AVS+, were widely used in HDTV broadcasting in China. The successor, AVS2, was published as a Chinese national standard in 2016 and was subsequently adopted as the video coding standard for 4K television broadcasting in China.

Development for AVS3 began in December 2017, with the main profile completed in March 2019 and the high profile, now added to the DVB toolbox, finalized in August 2021. It has been published as an AVS industry standard, known as T/AI 109.2-2021.

CODING EFFICIENCY

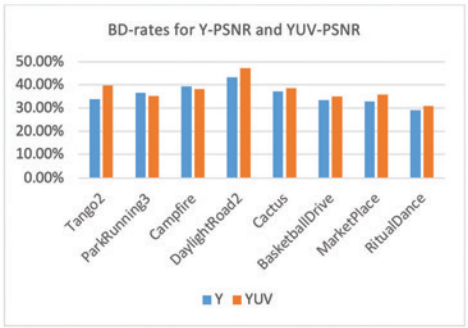
AVS3 is capable of providing improved video coding efficiency, as compared to the HEVC (High Efficiency Video Coding) coding scheme, for UHD video content. Objective performance test results, shown in Figure 1, demonstrated that AVS3 provides a bitrate saving of approximately 40% over HEVC for 4K video content and a 35% bitrate saving over HEVC for HD 1080P video content.

Independent subjective testing provided by the Academy of Broadcasting Planning (ABP) at the National Radio and Television Administration (NRTA) further verified the subjective performance of AVS3 compared to HEVC on 4K UHD content, as shown in Figure 2 and Table 1. These results also verify that five AVS3 4K UHD video services can be transmitted within a 40 Mbps multiplexed DVB channel while the average subjective MOS score is higher than 8 (i.e. "excellent" quality).

CONFORMANCE POINTS

To meet the DVB commercial requirements and based on the technical capabilities of AVS3, the TM-AVC group defined four conformance points (as illustrated in Figure 3) for interoperability of both transport stream and DVB-DASH delivery for AVS3 receivers.

The central blue box in Figure 3 shows the baseline conformance point that a DVB AVS3 receiver must support as a minimum. The detailed parameters are available in BlueBook A001r20. It is important to note that, while the minimum receiver capability requires support of resolutions up to 4K (3840x2160), content providers can use HD resolutions of 1920x1080 or less together with HDR (high dynamic range) transfer characteristics for delivery. Such HD HDR bitstreams are fully covered by the AVS3 HDR UHDTV-1 conformance point.



	Y	U	V	YUV
Tango2	-33.93%	-55.25%	-50.16%	-39.73%
ParkRunning3	-36.60%	-25.58%	-28.20%	-35.16%
Campfire	-39.38%	-25.78%	-52.52%	-38.23%
DaylightRoad2	-43.36%	-59.35%	-56.39%	-47.24%
Cactus	-37.23%	-50.32%	-40.83%	-38.54%
BasketballDrive	-33.50%	-43.11%	-39.01%	-35.06%
MarketPlace	-32.81%	-48.44%	-48.96%	-35.79%
RitualDance	-29.12%	-39.33%	-38.52%	-30.89%
4K	-38.32%	-41.49%	-46.82%	-40.09%
FHD (1080P)	-33.17%	-45.30%	-41.83%	-35.07%

Figure 1: Objective performance of AVS3 compared to HEVC for HD and 4K content. The BD (Bjøntegaard delta) rate shows the bitrate reduction offered by a codec while maintaining the same quality as measured by objective metrics.

Jianhua Zheng has been involved in video coding standardization work for 17 years. He is a distinguished researcher in Peking University and is the primary delegate of Peng Cheng Laboratory.

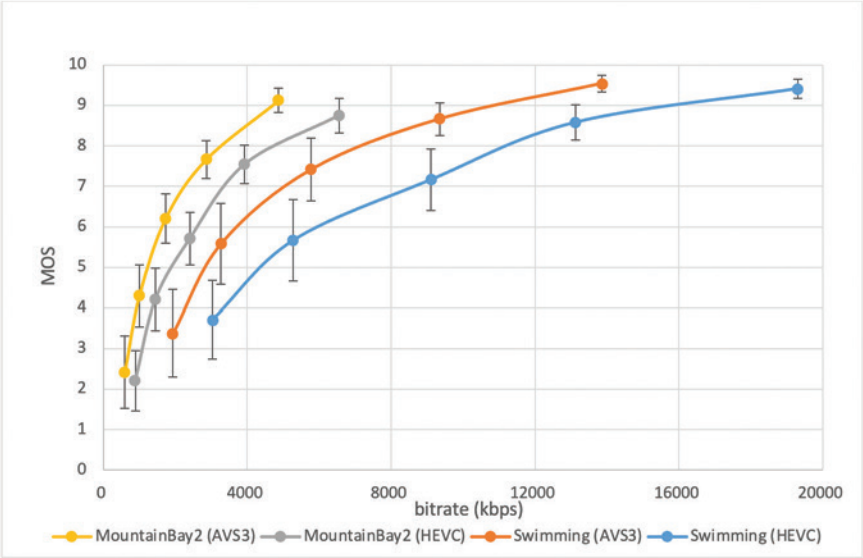


Figure 2: 4K subjective performance of AVS3 compared to HEVC

No.	Test sequence	AVS3 BD-MOS rate saving over HEVC
1	Flowers2	-51.71%
2	Dance	-33.92%
3	Mountainbay2	-33.87%
4	PekingOpera	-44.25%
5	Swimming	-35.91%
6	Swan	-38.55%
Overall		-39.70%

Table 1: Bjøntegaard delta rate relative to HEVC based on bitrate and MOS

It is also assumed that all AVS3 receivers will be HDR-capable, whereby both HLG and PQ transfer characteristics are supported, while also being SDR-compatible. On top of that baseline conformance point, three additional conformance points are specified for premium receivers and services:

- The AVS3 HDR HFR UHDTV-1 conformance point adds support for high frame rates with 100 Hz and 120 Hz (both fractional and integer).
- The AVS3 HDR UHDTV-2 conformance point adds support for higher resolutions up to 8K (7680x4320).
- The AVS3 HDR HFR UHDTV-2 conformance point adds support for both HFR up to 120 Hz and higher resolutions up to 8K (7680x4320).

DVB MILESTONE

To cater for DVB's worldwide market, different solutions from several standards bodies were profiled for audio coding and for HDR dynamic metadata, but this had not been the case for video. For many years the DVB codec toolbox strongly leveraged video codecs developed by MPEG and standardized by ISO/IEC. However, during the DVB study on next-generation video coding, it became evident that there were multiple successful coding solutions that fulfilled the defined commercial requirements and that more than one would be needed to cater for DVB markets worldwide.

In China, the AVS Workgroup had been developing video and audio coding standards for 20 years, and while these codecs were in widespread use in China and several other countries, they had never been included in DVB's codec toolbox. This created a situation where AVS codecs were used in DVB systems but without formal DVB profiles and signaling. For the latest generation codecs, however, many DVB Members, especially those with business interests in China, were keen to ensure that full DVB-compliant profiling and signalling would be available for AVS3, to ensure interoperability of streams and receivers.

China is one of the largest markets for 4K (UHDTV-1) and 8K (UHDTV-2) using DVB-based distribution; ensuring that the profiles used in China are fully catered for by DVB's specifications is truly an important and welcome landmark. Stakeholders in China look forward to the imminent start of DVB services with AVS3 in the coming months, and to the continued collaboration between DVB and AVS to promote further the reach of our standards.

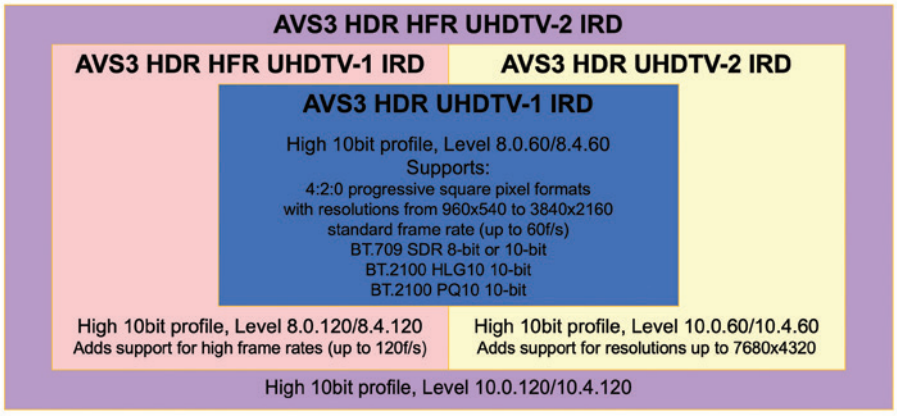


Figure 3: Four conformance points specified for AVS3 in the DVB-AVC specification

Paul Higgs is a Senior Director in the Strategy and Industry Development department at Huawei Technologies where his focus is on video related technologies and applications. He chairs the DVB TM-I group.

Opportunity knocks for DVB Native IP

We invited some of companies that have been most active in developing and promoting DVB's new solution for native IP broadcasting, DVB-NIP, to share their thoughts on where the most interesting opportunities are likely to emerge.

Guillaume Bichot
Director & Head of Exploration
Broadpeak

Broadpeak is a key contributor to the DVB-NIP specification, adapting DVB-MABR technology to broadcasting. With DVB-NIP, adaptive streaming technology can now be operated in a coherent way across all segments of a media/video distribution network, including the broadcast segment.

The underpinning technology, as provided in our nanoCDN product, is already in commercial operations, powering Astro Sini for example.

Initial commercial demand is likely to be in B2B sectors, for example delivering live television channels or popular live events via satellite, as a contribution link to local PoPs (points of presence), to public Wi-Fi hotspots, or addressing satellite mobility use cases (such as maritime or in-flight entertainment).

Though very relevant, DVB-NIP deployment in the B2C segment may take longer depending on the ability of operators to update existing set-top boxes.

DVB-NIP may potentially see the TV set acting like an OTT terminal (and not an HDMI display) while the STB will act as an access point, increasing the value of the combination and the user experience. This would probably allow the switch-off of legacy MPEG transport stream broadcasts in a reasonable term and to finally operate with one single ABR-based distribution platform, rather than operating two siloed ecosystems forever.

Mohsen Haddad
Co-founder and Chief Revenue Officer
EasyBroadcast

DVP-NIP is a game changer in the broadcast, media and satellite industry. Combining classic satellite broadcast and OTT to get the best of both worlds will lead to improved operational efficiency, cost savings, and additional revenues for all players.

The keywords here are reach, quality of service, efficiency, and providing consumers with the live and on-demand content they want, anytime, anywhere, on any device, with broadcast-grade quality. Providing such experiences through satellite, using either one-way or two-way distribution, means that we can reach more consumers (i.e., improving revenue) in places or contexts where it was not possible before because of the lack of connectivity or its quality. Can you imagine the potential of deploying such technology on boats and planes or providing video services in shopping malls with Wi-Fi hotspots? How about bringing education to rural areas? We firmly believe that the short-term business will come from deploying OTT over satellite for B2B, B2G and greenfield B2C.

Contributing to the technical development of DVB-NIP was important for EasyBroadcast because such an endeavour can only be achieved through collaboration with industry players. The interoperability brought by these standardization efforts is essential for accelerating the adoption of this technology.

Richard Smith
CEO, EKT

We strongly believe that the DVB-NIP standard is going to change the way content delivery over satellite is perceived. Satellite video delivery has essentially not really changed since the 70s: we went from analogue to digital, then SD to full HD and now 4K, but it is essentially a multicast transport stream delivered to the main TV in the house. This has not kept track with changing multi-screen and multi-device viewing habits and new OTT competition.

NIP changes all of this, with the ability to stream to mobile devices and deliver VOD over satellite, and makes satellite as a delivery platform relevant again.

EKT is playing a major role in bringing affordable DVB-NIP solutions to operators. By being one of the early developers and adopters of the standard and by integrating with various partners, we are able to deliver affordable NIP-enabled consumer devices.

We have thought a lot about the existing and new market opportunities, along with the challenges of legacy DVB and security. As such we developed a number of solutions covering low cost one-way DTH to high-end commercial solutions for schools, shopping centres, ships, etc. We and our partners have embraced DVB-NIP and can bring you an 'out-of-the-box' working solution!

Christophe Trolet
Products Director
ENENSYS Technologies

ENENSYS, with its focus on new technologies and especially video delivery, has participated in the development of the DVB-NIP standard since the work began in DVB. We strongly believe in the optimization DVB-NIP can bring to the industry and the opportunities it enables.

Consumer demand for OTT live-streamed content is significant and can create traffic storms on networks, sometimes beyond the network capacity, resulting in a poor customer experience. ENENSYS already offers MABR technology with its OTT@scale product to reduce bandwidth occupancy on delivery networks; we have now invested in DVB-NIP, as it is the ideal solution to broadcast MABR OTT content over satellite for large-scale distribution to edge devices. By offloading traffic from existing CDNs and distribution networks using broadcast

and multicast technologies, DVB-NIP optimizes delivery directly to the network edge, is infinitely scalable for a fixed distribution cost, and optimizes satellite capacity.

Furthermore, DVB-NIP is also capable of working in delivery-only (unconnected) mode, which is particularly relevant for addressing remote regions, underserved by internet access, enabling delivery of the most popular broadcast content.

DVB-NIP is the ideal technology to optimize OTT distribution!

Laurent Leveil
Head of Multiscreen Services
Eutelsat

There is a great opportunity for the media industry with any technology that enables the convergence of OTT and satellite broadcast. At Eutelsat, we believe that DVB-NIP is the appropriate standard for this. DVB-NIP will bridge the gap between OTT and traditional broadcast services.

With DVB-NIP, we will develop services that allow service providers to integrate satellite broadcast along with their CDN-based terrestrial delivery in a seamless way. This will benefit our traditional customers – broadcasters and pay-TV operators – looking to streamline their delivery. For native OTT service providers looking at extending their reach or addressing scalability challenges, access to satellite broadcasting will be made much easier.

We believe that DVB-NIP is the right standard and by choosing this we feel we are on the right path to transition from legacy transport technology for the benefit the whole media-industry chain.

Xavier Battas
CEO & CTO
Quadrille

The adoption of DVB-NIP represents a market opportunity for satellite operators to converge satellite and IP network technology. It also streamlines the required technology for DTH operators: instead of MPEG-2 for satellite and IP streaming for OTT services, operators will only need to manage a single IP protocol. This also mitigates the risk of obsolescence and the cost of maintaining MPEG-2 equipment as it becomes increasingly niche in comparison to massively deployed OTT equipment.

What's more, this convergence allows DTH operators to offer a solution with new network efficiencies. As per the 'fat tail', 80% of users watch only 2% of the entire content catalogue, so operators can deliver the most popular content over the satellite network and reserve the IP network for specialized content. The benefits include a high-quality viewer experience, reduced congestion and operational costs for IP networks, and lower CO_2 emissions associated with the IP network.

DVB-NIP will likely have its initial impact on new DTH operators looking to offer broadcast and OTT bundled services. Other likely implementation verticals include entertainment services on transportation and 'hotspot' locations that attract a large number of users around a single access point in places with limited internet infrastructure.

Tom Christophory
General Manager, New Technology and Standards
SES Satellites

IP clearly is the future direction of the broadcast industry – already widely used in production, it is only natural that over-the-air broadcasting will follow. The new DVB-NIP standard is a fantastic opportunity for satellite operators and their media customers to provide existing and new content formats that consumers can watch on their tablets and other IP connected devices, be it at home or in public locations.

The fact that DVB offers a standards-based solution for native IP will contribute to the development of an ecosystem with headend equipment and consumer devices from different manufacturers. Initially, the most prominent use case will be the feeding of video to the edge, whether in cell towers, terrestrial transmitters, or cache servers on transportation (ships, planes) and in local communities.

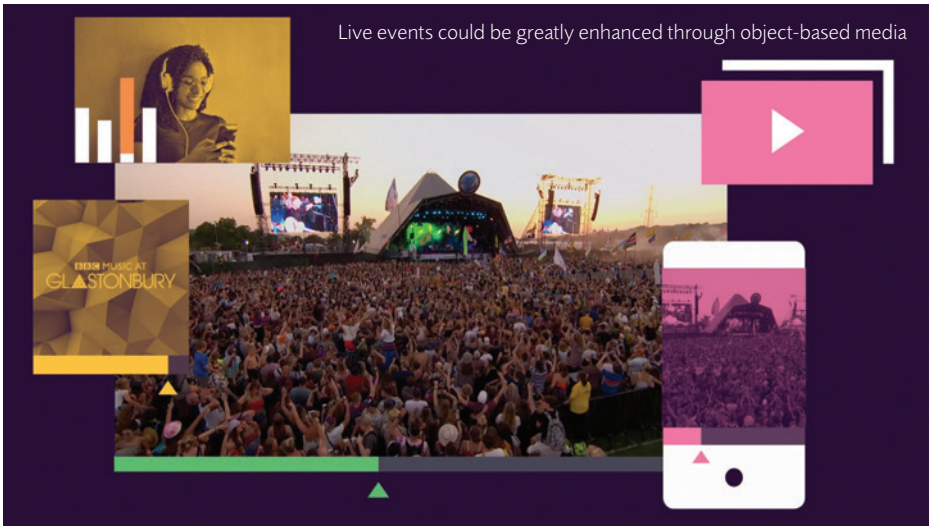
Over time, DVB-NIP has the potential to become the future satellite DTH broadcasting standard. For SES, the market introduction of DVB-NIP is an important milestone as it will provide cost savings (a unified headend for OTT and broadcast, plus lower CDN and technology costs) and added revenues (reaching beyond traditional STBs and IDTVs) to our broadcast customers.

Rami Moussawi
Senior Product Manager
ST Engineering iDirect

At a time when the broadcast sector is seeing unprecedented change, with digital firmly on the scene, the classic challenge of latency issues around internet media has been a barrier to satellite formatting. Now, the arrival of new technology allows the industry to dramatically reinvent OTT outreach and completely change the status quo.

Combining the power and bandwidth of satellite with huge viewer convenience and flexibility, the ability to send OTT video content over satellite represents a completely new – and highly significant – industry landmark. The delivery of native IP over satellite, with a standards-based approach thanks to DVB-NIP, creates a range of possibilities for mobile and multi-room viewing, education and many other use cases, and enables significant network cost savings.

From the perspective of ST Engineering iDirect, the coming together of the companies to create the innovative SKYflow ecosystem has redefined satellite's role in OTT delivery. It will enable service providers and telcos to deliver content to any device in any location and will satisfy the many use cases that require satellite delivery of OTT services.



Live events could be greatly enhanced through object-based media

Unlocking the full potential of content through media objects

Matthew Brooks (BBC)

Object-based media. As a technical concept, it's one that's fairly well understood in our industry: rather than delivering content as a single asset, OBM delivers a collection of well-described individual assets, with additional data that enables content to respond to the user, either through direct interaction or through stored preferences and customization to the individual's device.

This presents a valuable opportunity for personalization and a considerable challenge in changing content production processes – as well as in understanding what new forms of content will be most valuable to audiences on a daily basis.

At the BBC, we are investigating how audiences currently consume our linear content, and uncovering ways in which they already interact with on-demand offerings. We are also developing our understanding of the role the audience currently takes when consuming content, from passive consumption of ambient content through to actively seeking out favourite moments.

OBJECT-BASED OPPORTUNITIES

We already know that people would value mechanisms such as chapterization. However, while this makes it easy to instantly skip between different stories in a news bulletin, or articles in a magazine show, delivering content as individual, richly described objects unlocks much more than this.

By flagging time-sensitive objects, such as news bulletins or promotional trails in radio, we can deliver podcasts free from old news or irrelevant trails – either skipping these objects or replacing them with new content.

OBM production can also enable audience members and production teams to share individual moments from any piece of content – as each moment is individually addressable, well described, and time-bound.

OBM content could also be made indexable by search engines, resulting in greatly enhanced discovery, with individual moments from programmes surfacing through internet search.

We can also personalize programmes based on preferences selected at the beginning of a programme, stored in a profile, or based on the amount of time the viewer has available. For the audience member short on time, an automatically shortened version can provide an improved experience.

We're also investigating how can OBM enhance live events, combining live and on-demand content in new ways to help audiences get the most from music festivals and sports events, through enhanced navigation and improved interfaces. This could enable them to manage their own schedule based on what's already available, what's live now, and what they might not want to miss in the future.

Layers are also a great opportunity for OBM. We already see examples of dynamic rendering of graphics in sports applications. Resolution-independent representations of on-screen graphics could ensure pixel perfect overlays, even if you're watching in 8K. Using layers in both visual and audio domains, we can enhance accessibility through personalized audio mixes, signing, and additional information to help viewers follow a story, such as character names.

CHALLENGES

There are many challenges to be overcome before OBM can reach its potential. Much of the editorial data needed to drive these applications exists during the production process, but is lost when the final content is rendered. We need to build workflows within our tools that preserve this information, and describe it in a common way, to ensure we can distribute objects and associated metadata throughout the industry, and build one OBM standard that enables interoperation and content exchange.

A role for DVB?

Following expressions of interest and support from several DVB Members, a new study mission has been formed to explore whether DVB could carry out standardization work on the carriage of OBM via broadcast and IP. This may include signalling for OBM elements and support for rendering and personalization.

The study mission, taking place under DVB's Commercial Module, is chaired by Elfed Howells (Hisilicon/Huawei). DVB Members can join via the member portal, where the group is titled CM-SM-OBM. Non-members should contact the DVB Project Office.

Matthew Brooks is Head of Flexible Media at BBC Research & Development. He has been working in object-based media for eight years, and has a particular interest in enhancing the audience's experience of content through personalization and interactivity.

How important will the metaverse be for DVB?

The newly created Metaverse Standards Forum aims to foster interoperable standards for an open metaverse

David Wood (EBU)

Barely a media or internet conference goes by without mention of the metaverse. Facebook announced it will be recruiting thousands of staff in Europe to develop it. DVB Members need to understand where and when the metaverse may fit into their media landscape, and its impact on DVB and its specifications .

The metaverse uses virtual reality (VR) and augmented reality (AR) to create an immersive – sometimes interactive – environment, one where the user's senses experience physical presence at a location, event or performance, while their physical presence is in practice remote. This is usually achieved by wearing a head-mounted display (HMD).

The metaverse is predicted to become a major part of all our lives. It will be part of the evolution of the internet, employed in business, shopping, medical treatment, events, performances, and more.

The metaverse will need many innovative technologies (such as object-based), protocols, innovations, languages, and discoveries to be successful. It will need interoperability. It will certainly take time, and will complement rather than replace entirely current media systems.

DELIVERY CHALLENGES

VR is a foundational technology for the metaverse and there are many standards groups investigating some of the necessary parameter values for it. As an example, the ITU-R has recently concluded that to appear real, the pixel density of the VR images should be of about the same density as receptors in the eye. But the pixel density needed is not yet clearly understood, as it changes over the surface of the eye. One thing we can be sure of is that the metaverse is going to need huge bandwidths – maybe gigabit broadband. Delivering the metaverse may need to wait for new generations of network technology, with 5G and 6G as likely candidates.

The IEEE has worked for many years on protocols for delivering VR, using X-VRML, a high-level XML-based language. The MPEG group has developed MPEG-VR, standards for the way VR images can be constructed.

Recently, a group of companies has founded the Metaverse Standards Forum, which hopes to bring all the players together to create an interoperable metaverse based on standards. Watching developments here may be the best way to keep up to date with the metaverse journey.

"Delivery formats, protocols, software and capacities can be found or developed given time and resources, but market acceptance strongly depends on the quality of the user experience."

MANY UNKNOWNS

Could the kind of content and services that broadcasters and OTT providers offer also eventually be part of the metaverse? These are some of the still many unknowns:

- Could the required HMD be worn for prolonged periods without discomfort?
- Can the world agree on interoperable global baseband technical standards?
- Will the metaverse serve lean-back or lean-forward audiences?
- Can content in the formats needed be economic and practical to produce?
- Would the creative community respond positively to the metaverse?
- Would the necessary delivery capacity be available and economic?
- Would the anthropological consequences of spending time in the metaverse be positive or negative?

Management theory tells us that the likelihood of success may be found in many ways. A simple analysis method for this period of unknowns may be to ask the question "what needs to be true for the metaverse to be successful?"

I suggest that the system will need to provide realistic 3D images via a comfortable HMD for prolonged periods without discomfort. DVB should always be ready and waiting for technical evolution, and should be following developments, but we should watch this aspect most carefully. Delivery formats, protocols, software and capacities can be found or developed given time and resources, but *market acceptance strongly depends on the quality of the user experience.* That may be determined by the needs of physics and human physiology, and it must be good.

David Wood is a consultant to the EBU Technology & Innovation Department. He has chaired several standardization groups at the ITU and the DVB Project, covering areas such as digital television, HDTV, UHDTV, next generation audio and media accessibility.

Listening to stakeholders on the future of media delivery – and of DVB

In autumn 2021, DVB's Promotion and Communications Module (PCM) launched the Listening Project as a means of gaining fresh insight into how DVB is perceived by the leading players in the global video distribution ecosystem. MTM, an international research and strategy consultancy, specializing in media and technology, was engaged to conduct a set of interviews and analyse the outcomes. **Richard Ellis**, Managing Partner at MTM, explains how the project worked and shares some of the main takeaways.

Who did you interview and how were they selected?

Our starting point was to develop, with the PCM, a longlist of the top 100 organizations in the television and video ecosystem, based on criteria like turnover, usage/adoption, and presence in key industry organizations. The final list ended up including a broad mix of DVB Members and non-members, an accurate reflection of the ecosystem as a whole. This proved invaluable as we wanted to ensure we captured a range of viewpoints on the DVB Project, the wider television and video ecosystem, and DVB's role within it.

What was the scope of the interviews?

Once we had identified the top 100 organizations, we looked to speak to relevant individuals within as many of them as time and budget would allow. Our interviewees all had an intimate knowledge of the distribution process in both the broadcast and IP environments. We wanted to hear their thoughts on three key areas. Firstly, we wanted to understand their awareness and perceptions of DVB – especially some of the younger, IP-first organizations that might be less familiar with DVB's outputs. Secondly, we were keen to hear about their biggest challenges and whether or not DVB could help play a role in addressing them. And finally, we sought to understand some of the wider trends and developments in the sector today, as we emerge from an unprecedented period of global turbulence.

What emerged as the principal concerns?

The growth of IP-based viewing, something we're all familiar with as both industry professionals and consumers, has led to a complex and fragmented viewing and distribution environment. From a hardware perspective, this manifests as TV sets, STBs and other consumption devices adding hybrid capabilities: viewers can watch linear broadcast and on-demand IP content on the same device. From a software perspective, content providers have added software development capabilities to their wheelhouse – they typically own and operate live and catch-up streaming services across multiple devices. While this complex, fragmented viewing environment seems markedly different from where we were just a few years ago, it does rhyme with the world into which DVB launched back in the mid-90s!

What are some of the implications of this for the DVB Project?

This fragmented landscape creates a number of challenges for an SDO with a broadcast heritage. We heard that the IP environment is far less reliant on standards than the traditional linear broadcast environment and that, when required, it is often driven by industry (think HDMI) rather than by SDOs; in many instances IP-first organizations are in the driving seat.

The DVB Project faces a lot of challenges, but there are still many opportunities for it to support the television and video industry. We heard that it needs to collaborate effectively with other organizations, and that it needs to undertake some significant internal, structural changes to its operating practices. As DVB approaches its 30th birthday, what we heard in these interviews gave us confidence that it will be around for many more birthdays to come!

Richard Ellis is a Managing Partner and co-founder of MTM. He leads MTM's commercial strategy, B2B research practice and many of its largest international developer relations and video distribution projects.

DVB Chair Peter MacAvock presenting Honorary Fellowship of the DVB Project to Alberto Morello during DVB World 2022 in Brussels last May

On DVB's newest fellow: Alberto Morello

Ulrich Reimers

DVB-S, DVB-S2, DVB-S2X: three of the most successful products in the DVB standards shop window. What do they have in common? No, not in terms of FEC algorithms or modulation – in terms of pedigree.

Well, they all have roots in the wonderful Italian city of Turin. This is where the research center of Radiotelevisione Italiana (Rai) is located. It is today called CRITS (Centro Ricerche, Innovazione Tecnologica e Sperimentazione). Even before DVB was officially inaugurated in 1993, the then director of the centre, Mario Cominetti, was part of the project's launching team and specifically interested in satellite-based distribution of digital video. In consequence, he became the chair of the DVB Technical Module working group that developed the first ever DVB system, DVB-S. ETSI turned DVB-S into a European standard in 1995 and in the same year the IEEE Transactions on Broadcasting published a paper entitled "The European system for Multi-programme Television by Satellite", co-authored by Cominetti, Mignone, Morello, and Visintin.

SECOND GENERATION

In 2001, with Alberto Morello having followed Mario Cominetti as the Director of CRITS, US satellite operators wishing to launch HDTV services in the near future approached DVB. They wanted to find out whether a second-generation satellite transmission system could be developed, offering significantly higher data rates per channel bandwidth than DVB-S. In June 2003, the DVB-S2 specification was finished. The working group that gave birth to the new baby was chaired by Alberto Morello. The most comprehensive publication explaining DVB-S2 can be found in the January 2006 Proceedings of the IEEE: "DVB-S2: The Second Generation Standard for Satellite-broadband Services". The authors? Alberto Morello, Vittoria Mignone.

For me personally, Vittoria's incredible dedication to supporting DVB-S2 on a global basis is something I will never forget. In my lecture on Image Communication, I show a slide with the title page of ITU Document 6/308-E (31 August 2006), "Draft Recommendation on a Digital Satellite Broadcasting System with flexible configuration (television, sound, and data)". This was to a large extent the result of Vittoria's activities. DVB-S2 now was THE world standard and people heard me say that there would "never be something better than DVB-S2". Well, I think I was somehow right and somehow wrong.

In 2011 a discussion arose as to whether for professional services an extension of DVB-S2 might be useful. The main topic of the discussion was the fact that DVB-S2 specifies a fixed roll-off and that by offering more flexibility for certain applications, the data rate per channel could be optimized. Under the leadership of Alberto Morello, an extension of DVB-S2, DVB-S2X, was developed and finalized in 2014. The core publication? "DVB-S2X: Extending DVB-S2 flexibility for core markets and new applications" (2015 International Journal of satellite communications and networking). Authors? Morello, Mignone.

AND SO SAY ALL OF US

Could anybody have doubts that Alberto Morello, and to some extent the whole Rai CRITS, more than deserves honorary fellowship of DVB? For me he is a personal friend. He is a great guy, always friendly and full of ideas. Before he retired from Rai in 2019, we cooperated on a project in which the TU Braunschweig invention Tower Overlay over LTE-A+ (TOoL+), a predecessor of 5G Broadcast, was implemented by Rai CRITS in the Aosta Valley and field tested. The collaboration was great fun.

Congratulations, Alberto (and be careful when climbing sheer rock walls)!

Ulrich Reimers was a leading force in the creation of the DVB Project and chaired its Technical Module from 1993 to 2012. In 2020, he retired as director of the Institute for Telecommunications Engineering at the TU Braunschweig. He is an Honorary Fellow of the DVB Project.

Our Members. And you? dvb.org/join