



UHD blossoms on DTT in France and Spain

8

OSMART

OPEN-SOURCE MEDIA APPLICATION REFERENCE TOOLS



10



13

- 3 New and updated specs; new Members
- 4 A word from the PCM chair; group news
- 5 HbbTV OpApp and DVB-I
- 6 UHD hits the terrestrial airwaves in France, with more to come
- 7 UHD now available for everyone in Spain, thanks to DTT
- 8 Building an open community around open-source media tools
- 10 Using DVB-NIP to close the connectivity gap in Peru
- 11 DVB-I advancing in Italy, Germany and beyond
- 12 Implementing DVB Targeted Advertising in the UK
- 13 Updating DVB's satellite toolbox to serve non-geostationary constellations
- 14 New DVB report maps the landscape for volumetric video
- 15 What we're working on, at a glance

On the cover: Springtime in Paris brings a boost for the French DTT platform with the launch of UHD services just in time for the Summer Olympic Games. UHD services have also been deployed on Spain's DTT platform. See pages 6 and 7 for more details.

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Writing on a need-to-know basis

In late January, I was excited to receive a message from the organizers of the NAB Show 2024. The paper I had proposed to the BEIT (Broadcast Engineering and IT) Conference had been accepted. Of course, submitting a proposal is the easy part: I had a clear idea about a real need that such a paper could fulfil and drafting the 500 words that described what I had in mind was straightforward. It helped that the deadline for submissions fell on the very day that I happened to check, so there was no time to think twice – type it up and hit send!

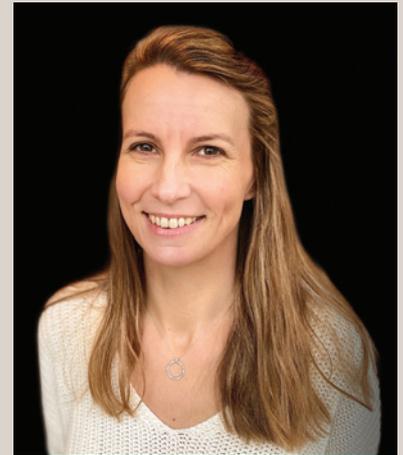
Back, then, to January and the good news: my proposal had been accepted. But there was also bad news: now I'd have to write the paper! In any case, with DVB's winter meeting cycle kicking off, that task would have to take a back seat to agendas, reports, workplans, BlueBooks, and so on.

TIME TO THINK

However, once the meetings of the Technical and Commercial Modules, and the Steering Board, were completed, it was finally time to dive into my chosen topic. It's one thing to have a clear idea of what you want to write; it's another to actually sit down and write it. I enjoyed this challenge of stepping back from the day-to-day rhythms and thinking more deeply about how broadcast and broadband technologies are evolving. I believed we needed more clarity on the direction we are taking and was determined that this paper would address a genuine need that we have, as a community.

And, now that it's written, well of course you *must* read it. ;-)

So, what is it that you need to know exactly? No matter which part of the industry you come from, whether you have a broadcast background or are part of DVB's newer recruits from the broadband and 3GPP worlds, you may have had a hard



Emily Dubs
Head of Technology, DVB Project

time understanding the other side of the story, including the current initiatives towards a claimed “convergence”. This BEIT Conference paper highlights why and how DTT standards embraced IP-based approaches on the one hand, also including mobile broadcasting in scope, while on the other hand 3GPP standards incorporated multicast and broadcast technologies, with 5G Broadcast being one significant outcome.

INTERWORKING, NOT CONVERGENCE

More importantly, the paper sheds light on the current initiatives from either ATSC, DVB or 3GPP that target *interworking* – rather than convergence – notably on the service layer with DVB-I over 5G, as well as efforts for coexistence on the radio frequency level. It gives some perspective on possible scenarios involving DVB-NIP and overall on how DTT broadcast and 3GPP systems can complement each other and eventually together enable a more resilient and sustainable media distribution landscape. It's all about our common future!

If by chance you plan to travel to Las Vegas for NAB 2024, you can attend the presentation on 15 April at 3:20 PT, and I will be delighted to meet you there!

To subscribe to DVB Scene free of charge visit: dvb.org/dvb-scene

dvb.org • member.dvb.org • dvb-i.tv • dvbworld.org • dvbservices.com



Noovo Technology Inc. offers an end-to-end solution that leverages the DVB-NIP (Native IP broadcasting) specification to target different applications (public and home entertainment, education and more). The company produces a family of gateways targeting different applications as well as a cloud-based management system for content and devices.

“We are thrilled to partner with the DVB Project to pioneer the revolutionary OTT satellite standard, DVB-NIP,” says Jean-Christian Martin-Garrin, CEO at Noovo. “Our turnkey solution is designed to cater to various applications in the field, empowering customers to seamlessly adopt and commercialize this cutting-edge standard, thereby enhancing the end-user experience.”

See: noovo.co



AnixeNet is a Greece-based company specializing in hybrid television solutions. While the company’s main focus has up to now been on interactive television based on HbbTV technologies, it is increasingly involved in projects related to DVB-I and 5G Broadcast (FeMBMS).

“We are excited to participate in the DVB Project,” said Emmanouil Lapidakis, CEO. “AnixeNet cooperates with large organizations and broadcasters. As a technology development company, we contribute through proofs-of-concept to advance technologies in video delivery and distribution, such as HbbTV, DVB-I and 5G Broadcast.”

See: anixe.net

NEW & UPDATED SPECIFICATIONS

Find the latest published version of every DVB specification in our library: dvb.org/specifications

DVB MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks (DVB-DASH)
September 2023 • TS 103 285 V1.4.1

Study Mission report on energy-aware service delivery and consumption
November 2023 • DVB BlueBook S100

Commercial Requirements for DVB-I – Enhanced DRM, Service & Service List Protection, Customization for Service Discovery, Accessibility Services and Application Support
November 2023 • DVB BlueBook C108

Broadcast and On-line Services: Search, select, and rightful use of content (“TV-Anytime”); Part 3: Metadata; Sub-part 1: Phase 1 – Metadata schemas
November 2023 • TS 102 822-3-1 V1.12.1

Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 2: Lower Layers for Satellite standard
January 2024 • EN 301 545-2 V1.4.1

Dynamic substitution of content in linear broadcast – Part 1: carriage and signalling of placement opportunity

information in DVB Transport Streams (DVB-TA)
January 2024 • TS 103 752-1 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)
February 2024 • DVB BlueBook A083-2r4 (Draft EN 302 307-2 V1.4.1)

Service Discovery and Programme Metadata for DVB-I
February 2024 • DVB BlueBook A177r6 (Interim draft TS 103 770 V1.2.1)

Implementation Guidelines for DVB-I
February 2024 • DVB BlueBook A184r1

Adaptive media streaming over IP multicast (DVB-MABR)
February 2024 • DVB BlueBook A176r5 (Interim draft TS 103 769 V1.2.1)

Study mission report on Volumetric Video
February 2024 • DVB BlueBook S101

Native IP Broadcasting (DVB-NIP)
March 2024 • DVB BlueBook A180r2



SUPPORTERS & EXHIBITORS



A word from the PCM chair

Elfed Howells (Huawei), Chair of the DVB Promotion & Communications Module



If you are a regular reader of my column, you may have noticed by now that I am – and always have been – very positive about the work of the PCM and about the continued relevance and renewed interest in the work of DVB from countries and regions around the world. It is truly inspiring to see enquiries and requests from all corners of the globe and new services using the latest DVB standards such as DVB-I and DVB-NIP popping up in many regions.

I would go as far as saying that I am lucky enough to chair the PCM during the third wave of DVB adoption, the first having been the initial roll-out of DVB-T/S/C, followed by the second generations of the terrestrial and satellite standards, and now the IP-centric solutions with DVB-I and DVB-NIP at the core.

Cause for celebrations then, you might think, and celebrate we did during our 30th anniversary year, and especially with our party at IBC last year. However, despite all this positive news, those of us who are DVB Project ‘insiders’ might be forgiven for not noticing the positivity. Indeed, despite the most successful year in specification deployment and industry engagement for a generation, within DVB’s working groups positivity has been somewhat lacking.

Could it be the weather? It has been cold, dark and wet in Europe recently. Or the political climate, which has by anyone’s measure been challenging? Or could it be that those of us who are active in working groups have been there too long, have lost the enthusiasm or even the skills needed for embracing the new, have too many pressures in our own companies to worry about creating brand new standards and updating existing ones?

SPACE TO INNOVATE

In the meantime, the entertainment industry never stops, and innovation abounds. The world needs a place to discuss and standardize solutions to allow innovative companies to bring new entertainment to mass audiences.

In the PCM, we are actively encouraging the next generation to join us and encouraging DVB Members to allow their junior staff to get involved. None of us are born experts and therefore we should nurture others who will carry the story forward.

DVB has and continues to be a great place to do that and I, for one, will continue to challenge those who say that our work is done, or who discourage rather than celebrate new work and ideas. As our current set of successful study missions on new topics draw to a conclusion, let me encourage all our Members and non-members to bring their ideas and wishes to us. Let us complement the wave of new launches in 2024 with a wave of new enthusiasm.



Meet our newest group chairs

The DVB Commercial Module (CM) has welcomed only the third chairperson in its history. Stepping into the shoes of Martyn Lee (ex-Sky), who held the role since 2018, and his predecessor Graham Mills (ex-BT) is David Peilow of the European Space Agency. Ralf Schaefer of InterDigital was re-elected as vice-chair of the CM.

David is a Telecom Systems Engineer and brings more than 15 years of experience within the DVB Project to his new role. He became chair of the commercial working group on return channel satellite while working at the start-up satellite operator Avanti Communications in 2008, overseeing the definition of the DVB-RCS2 standard. He contributed to the commercial requirements for DVB-S2X and later became vice-chair of CM-S, the commercial working group on satellite, when CM-RCS was folded it in 2017.

Based in the Netherlands, his work with ESA involves oversight of projects covering all aspects of satellite communications, from new antenna developments to the implementation of new infrastructure based on DVB technologies and occasionally interplanetary missions. A keen technology enthusiast, David follows consumer electronics developments across a range of topics with interest, while enjoying films, live music and exploring his newly adopted country.

CM-EE

The freshly formed Commercial Module working group on Energy Efficiency has begun its work, with the leaders of the study mission that led to its creation confirmed as its co-chairs. They are Julien Lemotheux, Senior Standardization Manager for TV & Video with Orange, and Erik Reinhard, Distinguished Scientist at InterDigital.

The group is tasked with improving energy efficiency in DVB services without placing unreasonable restrictions on functionality and ultimate technology choices. CM-EE will collaborate with other CM groups to develop and propose commercial requirements for new work items where energy efficiency is likely to be a factor in specification development. It will also monitor the work in other relevant organizations and contribute to the harmonization of the work on this subject across DVB groups.

CM-AVC

Jan Outters, Director of Technology & Standards with Ateme, has been elected as chair of the CM-AVC group, which deals with commercial aspects of DVB’s specification for audio and video coding. He was previously the vice-chair of this group, a role in which he has been replaced by Anand Meher Kotra, Senior Staff Engineer at Qualcomm.

TM-STREAM

Mohamad Raad, a consultant with Unified Streaming, is the new chair of the TM-STREAM group, which deals with technical aspects of DVB-DASH. Rufael Mekuria, who has moved to a new role as Principal Engineer at Huawei, becomes vice-chair of the group.

It comes down to DVB-I versus HbbTV OpApp, right? Wrong!

Peter MacAvock, Chair of the DVB Project

The emergence of DVB-I has prompted discussions regarding its compatibility with HbbTV. The latter is often regarded as DVB's interactive layer, in that it facilitates an app-like user experience combining DVB services with personalized broadband-delivered data on a connected TV. Since DVB-I first appeared, we have regularly stressed the fact that it complements HbbTV, with both systems working together to provide an enhanced, internet-centric approach to the connected TV user experience. Let's see how they are being implemented in different territories.

DIFFERENT APPROACHES

TV operators are today focused on seamlessly integrating a hybrid broadcast-broadband user experience in an appealing package for consumers. The German DVB-I pilot and the UK's recently announced next-generation hybrid free-to-air TV platform – branded Freely – illustrate different, but not necessarily incompatible approaches. While the German pilot is based on the DVB-I specification, Freely will use HbbTV's Operator Application (HbbTV OpApp). The former relies on a TV set's native user interface, while the latter is based on privileged access to the connected TV's user interface and other sub-systems.

First showcased as an operator user interface on some TV sets for the HD+ service from SES in Germany in 2019, the HbbTV OpApp has been around for a while. The specification itself has been heavily updated of late, with significant input from UK colleagues like BBC

and EveryoneTV (the entity formed by the free-to-air broadcasters, previously known as DigitalUK, and that is behind the launch of Freely). A recent HbbTV webinar on Freely revealed that the service's OpApp is launching with two TV-set vendors. HbbTV OpApps require bilateral agreements between operators/platforms and manufacturers, and some vendors are less willing than others to facilitate platform customization.

A plausible scenario combining DVB-I with a HbbTV OpApp envisions a TV set supporting both DVB-I service discovery and HbbTV OpApps. In such a scenario, DVB-I provides a list of channels and related applications (which could be HbbTV OpApps) with the consumer choosing whether to install them.

SOFT LAUNCH IN ITALY

Looking at Italy, DVB-I has moved directly to what is effectively a 'soft launch', with support from a prominent TV set vendor and support from the large commercial operator Mediaset. While there is still much to be worked out in terms of how the thorny issue of prominence is addressed in the Italian market, DVB-I is out there and working for those who wish to use it.

The choice between DVB-I and HbbTV OpApp is characterized not as an either/or comparison but as addressing separate functions required for a coherent user experience: service discovery, presentation of IP-delivered linear media, and linear channel user interface. Freely has chosen to stick with existing service-discovery mechanisms deployed in the UK, at least for now.



Importantly, DVB-I has partially adopted these same mechanisms.

One key element is how operators can access usage information related to their content to facilitate recommendation engines, etc. With the HbbTV OpApp, such information is part of the application environment. DVB-I includes some basic information, and more enhancements are in the pipeline, but this may not be seen as sufficient for some operators to finetune their personalization services.

In summary, television operators can have different approaches to deploying integrated hybrid TV user experiences using open systems like DVB-I and HbbTV OpApps. The decisions depend on various factors, including existing infrastructure, user experience goals, and agreements between operators and manufacturers. As the industry evolves, the balance between broadcast and broadband services on connected TVs continues to be a focal point for innovation and collaboration.

“TV operators can have different approaches to deploying integrated hybrid TV user experiences using open systems like DVB-I and HbbTV OpApps.”

Peter MacAvock is chair of the DVB Project. He has just left his position as Head of Distribution Platforms and Services at the European Broadcasting Union.

UHD hits the terrestrial airwaves in France, with more to come

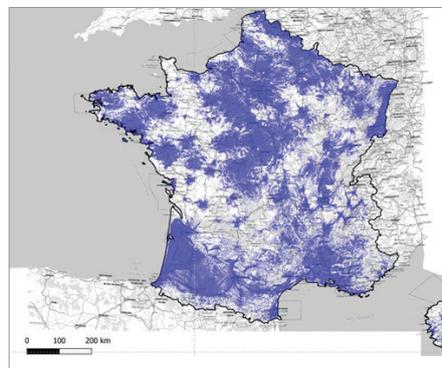
Gaëlle Kaminsky (TDF)

		Current DTT (6 multiplexes)	PARIS 2024 Olympic Games	New UHD multiplex Multi-town
VIDEO	Broadcast	DVB-T / MPEG-4 Bitrate 24,88 Mbps		DVB-T2 / HEVC 2 profiles DVB-T2 in 256QAM-3/5-1/32 : C'1 in mainland et C1 in Overseas Bitrate 34,27 Mbps and 34,90 Mbps
	Definition	HD 1920 x 1080 (pixels)		UHD 3840 x 2160 (pixels)
	Contrast / Colors	SDR Color depth:16 m colors (8 bit) Color Gamut BT.709		HDR10 Color depth:1 billion of colors (10 bit) Wide Color Gamut BT2020
	Frame rate	25 images/seconde Interlaced - 50 fps (Hz)		50 images/seconde (4Kp50) Progressive
Audio & Subtitles		E-AC3 Surround sound 2.0 or 5.1 Subtitles : DVB-SUB HD		AC3 & Next-Generation Audio (NGA): AC4 Sound objects: 3D, voice, comments, AD Multiple and customizable audio profiles Subtitles: DVB-SUB HD & DVB-TTML

Since its launch in 2005, and with the continuous support of TDF, the French digital terrestrial television (DTT) platform has constantly kept pace with latest technology developments in order to meet viewers' expectations in terms of image quality. Full HD (1080p) was gradually introduced on DTT in France from 2008 and the entire platform switched in April 2016, using DVB-T for transmission and MPEG-4 for video coding.

In France, DTT occupies an essential place for access to television. A recent study conducted for TDF by IFOP revealed that a substantial 62% of French people can use DTT in their home. The vast majority of French people's homes are connected to DTT for the main and/or the secondary TV set, either directly through DTT antenna or through IPTV set-top boxes that include a DTT input.

The DTT platform is the pillar of the French television landscape, bringing ubiquitous, free, anonymous, user-



The UHD multiplex will cover 70% of the population by June 2024

friendly and energy efficient access to television for the people, with coverage of 97%. Additionally, DTT serves as a crucial support for French audiovisual creation.

MODERNIZING DTT

From 2018, TDF has regularly carried

out technical tests of broadcast UHD, in collaboration with broadcasters and industry stakeholders. These tests aim to experiment with and showcase the performance of new broadcast formats and technologies, including higher resolution, more immersive sound, improved contrast ratio, and others – both in mainland France and overseas.

Looking ahead to the 2024 Paris Olympic Games, a new UHD multiplex was officially launched in January 2024 in France using DVB-T2 for transmission and HEVC for video coding. On 23 January, TDF initiated the broadcast from 22 sites, including the iconic Eiffel Tower, covering 16 million people. Thanks to the combination of DVB-T2 and HEVC, we can achieve a spectrum efficiency boost of up to around 2.7 times compared to the existing DVB-T/MPEG-4 configuration.

This UHD multiplex will gradually expand its coverage from January to June 2024, to ultimately cover 70% of the French population. For the Paris 2024 Olympic Games, it will allow the broadcast in UHD/4K of two public service channels, France 2 and France 3, belonging to France Télévisions.

The Paris Olympic Summer Games will be broadcast in 4K but also with high dynamic range (HDR10), 10-bit colour depth, wide colour gamut (based on BT.2020), higher frame rates (50 fps progressive) and Next Generation Audio.

SINGLE ILLUMINATION

The DVB-SIS (Single Illumination System) standard is also used, enabling the use of a single satellite beam to simultaneously serve the DTH (direct-to-home) satellite platform and to feed the terrestrial network.

This additional multi-town multiplex serves as a catalyst to promote the upgraded DTT platform to the public and increase household penetration of compatible TV sets. It also acts as a driving force to drive the DTT platform towards DVB-T2/HEVC and UHD. These are technological advances championed by TDF for several years. We firmly believe this event marks the beginning of the generalization of UHD on DTT.



Gaëlle Kaminsky is the Deputy Director of the Audiovisual Business Unit at TDF. She is also a member of the DVB Steering Board.



Pictured the launch of the RTVE UHD service are Cristina Morales (State Secretariat for Telecommunications, SETELECO); Antonio Fernández Paniagua (SETELECO); Rosana Romero (RTVE), Matías González Martín (SETELECO), Verónica Ollé (SETELECO), Ana Belén Roy (RTVE), Ángel García Castillejo (RTVE), Víctor Sánchez, (RTVE), and Ramón Salat Mardarás (Cellnex Telecom).

UHD now available for everyone in Spain, thanks to DTT

Ángel García Castillejo and Javier Sánchez (RTVE)

Spain laid the foundations of its regulatory framework for digital terrestrial television (DTT) in 1998. Back then, the DVB-T and MPEG-2 standards allowed television to take a significant leap forward compared to analogue PAL system broadcasts by offering digital audio and video. However, even though the technology was available, the launch of television in Spain proved to be a failure as it was mainly based on pay-per-view. We had to wait until 2005 for DTT to take off in Spain, thanks to the switch to a free-to-air (FTA) broadcasting model, coverage over 96% of the population, and a greater number of channels compared to terrestrial analogue television.

The next step for the public television operator in Spain, RTVE, was the start of transmitting in HD in June 2009, using DVB-T and H.264 in this case. However, it took quite some time for all RTVE channels to be available in SD and HD in simulcast. And so we arrived at 14 February 2024, where all DTT was in HD as all SD channels had been legally obliged to switch off. Coinciding with this process, a new phase of DTT began with the start of free-to-air broadcasts with a new RTVE channel.

NATIONAL COVERAGE

RTVE's La 1 is now available in UHD across the entire Spanish territory, with

population coverage of more than 99%. It is FTA and available to all citizens, providing the maximum audio and video quality that is technically possible in DTT currently.

The transmissions are in 4K with high dynamic range (HDR) and immersive Dolby Atmos audio. Compared to HD, the increased screen resolution along with enhanced dynamic range allows images to be shown with greater fidelity than reality. This, combined with immersive audio that directs channels and sounds above the head, provides a more intense sensory experience and takes full advantage of the progressive increase in the size of TV displays.

Viewing the service requires a TV set or DTT decoder compatible with DVB-T and HEVC. The use of DVB-T is in accordance with the current Spanish DTT Technical Plan. As a general rule, all TV sets sold from 2017 onwards are compatible with our UHD DTT broadcasts.

FUTURE EVOLUTION

This beginning of regular nationwide UHD broadcasts is the tangible proof that DTT is able to embrace technological evolution and continues to be the most suitable platform for the mass distribution of linear television content in Spain. Furthermore, it is the only existing alternative for RTVE to fulfil its legal obligation to serve the widest audience, providing the highest geographical and social coverage while contributing to the development of the information society by participating in the technological progress of Spain.

All of this reaffirms RTVE's commitment to providing the highest technically possible and economically viable quality in its content offer. This is especially the case for coverage of major global live events in UHD and immersive sound, as for the upcoming Olympic Games to be held this summer in Paris.

After finishing the migration process from SD to HD on DTT in Spain on 14 February, the next challenge for DTT in its natural evolution is the migration from HD to UHD using DVB-T2 and HEVC. This will consolidate its long-term future as the primary platform for the distribution of linear FTA television. Notably, nearly 80% of television consumption in Spain is on DTT.

Ángel García Castillejo is Director of Audiovisual Policies, Public Service and International at RTVE; **Javier Sánchez** is Head of Strategy at RTVE's Innovation Centre.



Building an open community around open-source media tools

May 2022 saw the birth of a new acronym. The term OSMART – standing for Open-Source Media Application Reference Tools – was initially used in the context of an online workshop that brought together five organizations that develop and promote open standards for media distribution. They were the Consumer Technology Association WAVE Project (CTA-WAVE), the DASH Industry Forum (DASH-IF), the DVB Project, the 5G Media Action Group (5G-MAG) and the HbbTV Association.

The main objective of that first workshop was to find synergies and potential collaboration opportunities around open-source projects run by the organizations represented. A follow-up workshop, where MPEG and the Streaming Video Technology Alliance (SVTA) also presented projects, took place in December 2023. The projects presented at the OSMART Workshop #2 are summarized on these pages.

One outcome of the second workshop, aside from it being another fruitful exchange on the projects covered, is now materialized in the OSMART Community, a common GitHub repository – <https://github.com/osmart-community/> – that will initially serve as a central point for gathering information and shortcuts to the open-source software projects. If sufficient momentum builds around this initiative, which is driven by the people involved in the projects rather than being ‘owned’ by any one organization, the repository could also serve as a launchpad for further activities and collaboration opportunities between the participants.

Don't hesitate to connect via GitHub if you'd like to get involved!



Streaming Media Test Suites

Owner: WAVE (Web Application Video Ecosystem)
Project hosted by the Consumer Technology Association (CTA)
Presenter: Louay Bassbouss (Fraunhofer FOKUS)
Scope: Test vectors and test suite
Used by: CTA WAVE, HbbTV, ATSC
Resources: github.com/cta-wave

CTA WAVE has developed several test suites for streaming media. At the OSMART Workshop #2, the focus was on the test suite for devices, which checks the playback capability of hardware. The suite comprises mezzanine content, test content encoded in different variations and profiles, a test runner for different devices, and an observation framework for determining pass or fail results from camera recordings. The test suite is validated at the regular HbbTV Plugfests.

Joint Content Conformance Project (JCCP)



Owner: DASH Industry Forum
Presenter: Romain Bouqueau (MotionSpell)
Scope: Conformance
Used by: DASH-IF, DVB, HbbTV, CMAF, CTA WAVE
Resources: conformance.dashif.org and github.com/Dash-Industry-Forum

Validates the conformance of DASH content to relevant media specifications. Launched by the DASH Industry Forum over ten years ago and continuously updated to test against relevant specifications from other bodies. Along with DASH (including DVB-DASH) content conformance, it has options to check for CMAF and WAVE requirements, and as well as for HLS.

livesim2

Owner: DASH Industry Forum
Presenter: Torbjörn Einarsson (Eyevinn Technology)
Scope: Test vectors
Used by: DASH-IF, HbbTV, DVB, 5G-MAG
Resources: github.com/Dash-Industry-Forum and live at livesim2.dashif.org (with request limits)

A reference tool and testbed for testing timing on live DASH streams. It allows the creation of live streams coming from VOD assets. Version 2 makes it easier to deploy locally and in the cloud. It is worth noting the possibility to generate streams with particular features, refragmentation to generate low-latency DASH, and also the interactive UI that makes configuration easy.

dash.js

Owner: DASH Industry Forum
Presenter: Daniel Silhavy, (Fraunhofer FOKUS)
Scope: Reference implementation
Used by: DASH-IF, DVB, HbbTV, CTA-WAVE, 5G-MAG
Resources: github.com/Dash-Industry-Forum

The official open-source DASH Reference Player. It is used as a reference client for standardization activities and can also be used as the foundation for production-grade video applications and research purposes. The player supports a wide set of features (ABR, DRM, CMCD, CMSD, Content Steering,...).

DASH-DRM Reference Application



Owner: HbbTV Association
Presenter: Bob Campbell (Resillion)
Scope: Reference implementation and test vectors
Used by: DVB, HbbTV
Resources: refapp.hbbtv.org/, github.com/HbbTV-Association and hbbtv.org/resource-library/#developer-support

Makes it possible showcase HbbTV technology together with MPEG-DASH and DRM (digital rights management). It includes a complete workflow with MPEG-DASH content-generation tools and includes an HbbTV client application with a video catalogue and a video player.

DVB-I Reference Application



Owner: DVB Project
Presenter: Juha Joki (Sofia Digital)
Scope: Reference implementation
Used by: DVB, HbbTV
Resources: github.com/DVBproject/

An implementation of the DVB-I service discovery and metadata specification that also aligns with the DVB-I implementation guidelines and DVB-DASH. Includes a backend for generating and editing DVB-I service lists and instances; and a frontend app with service-list navigation, selection of services, banner, EPG. The client is available as an HbbTV OpApp implementation or a progressive web application for Android devices. A skeleton CSR (central service list registry) implementation is also available.

MPEG Systems File Format Conformance Framework



Owner: MPEG
Presenter: Dimitri Podborski (Apple)
Scope: Conformance
Used by: MPEG
Resources: github.com/MPEGGroup/FileFormatConformance and mpeggroup.github.io/FileFormatConformance/

The aim of this initiative is to elevate the quality of standards developed by MPEG by identifying issues early enough. MPEG has adopted a policy whereby all incoming technologies need to be supported by conformance files together with metadata. The available files can be searched via a dashboard that allows developers to filter and find what they need.

Open Caching Testbed



Owner: Streaming Video Technology Alliance
Presenter: Jason Thibeault (SVTA)
Scope: Conformance
Used by: SVTA
Resources: Internal

Open caching aims at creating a single control plane that streaming operators can use to control all of their edge caches across multi-CDNs. A testbed initiative to improve interoperability between independent implementations has been created. For now this is available only to members but SVTA is investigating ways to make it available to non-member implementers of SVTA open caching.

Common Media Player Library

Owner: Streaming Video Technology Alliance
Presenter: Casey Occhialini (Paramount)
Scope: Repository of code libraries
Used by: SVTA, hls.js, dash.js, video.js, Shaka Player
Resources: github.com/streaming-video-technology-alliance/

A Javascript utility for media playback with a series of modules implementing features that can be imported as needed. The goal of the library is to reduce duplicated code across different media players and have a central place for reference implementations of standards-based features that end up in different players. For now covers CMCD, CMSD, ID3 tag parsing, common media request/response interfaces.

Reference Tools for 5G Media Streaming



Owner: 5G-MAG
Presenter: Richard Bradbury (BBC)
Scope: Reference implementation
Used by: 5G-MAG
Resources: developer.5g-mag.com and github.com/5G-MAG/

Reference implementation of 3GPP 5G Media Streaming components. Key features include content hosting, networks assistance (throughput estimation, delivery boost, ...) dynamic QoS policy, QoE metrics reporting, and consumption reporting. The implementation consists of a 5GMS application server (wrapping OpenResty (Nginx)), a 5GMS application function (built in the Open5GS framework), and a 5GMS client (Android, Exoplayer,...).

Reference Tools for 5G Broadcast

Owner: 5G-MAG
Presenter: Klaus Kühnhammer (Bitstem)
Scope: Reference implementation
Used by: 5G-MAG
Resources: developer.5g-mag.com and github.com/5G-MAG/

Reference implementation of 5G Broadcast components. Key features include 3GPP Rel-16 numerologies, receive-only mode, improved signaling performance, Rel-17 6/7/8 MHz bandwidths. Offers an end-to-end chain with FFmpeg as a streamer, FLUTE library, mbms-gw, transmitters, SDR-based middleware and modem, and Android-based middleware with a simple application.

Reference Tools for 3D and XR over 5G

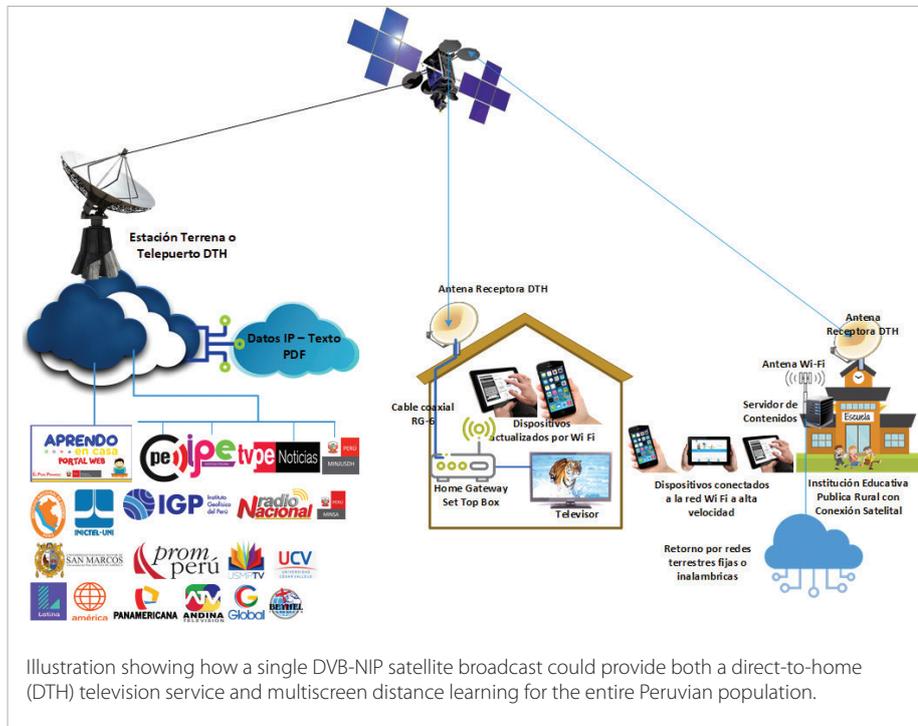
Owner: 5G-MAG
Presenter: Nils Duval, MotionSpell and Imed Bouazizi (Qualcomm)
Scope: Reference implementation
Used by: 5G-MAG, MPEG
Resources: developer.5g-mag.com and github.com/5G-MAG/

For testing the capabilities of 5G communication systems in the context of immersive streaming experiences for entertainment, gaming, etc. Initially focused on 3D scenes for XR and different components that need to be delivered, streamed, etc. Real-time communication between participants, avatars, in AR environments. Projects on content playback (XR Player, XR Web Player based on Unity and Unreal Engine 5), content creation (Blender with support for glTF).



Using DVB-NIP to close the connectivity gap in Peru

Wildfredo Baro Fanola Merino (Universidad Nacional Mayor de San Marcos)



During the COVID-19 pandemic, the Peruvian government realized that it had no effective means of communicating critical public health news to the entire population, nor could it ensure the provision of distance learning to the approximately 30% of the Peruvian population without connectivity.

STANDARDS-BASED

In 2022, a tender was issued by the National Institute of Radio and Television of Peru (IRTP) with the aim of addressing these connectivity gaps, taking advantage of satellite distribution to be able to reach the most remote corners of the country. Importantly, to avoid the risks of vendor lock-in and leverage the advantages a standards-

based approach, the tender specifically requested the use of the new DVB specification for Native IP Broadcasting, DVB-NIP.

Building on many different existing DVB standards, notably DVB-MABR for multicast adaptive bitrate streaming, DVB-NIP allows the delivery of live television channels, video-on-demand, and documents or other files, all receivable on a range of devices from smartphones up to big screen displays. This is especially relevant in countries, like Peru, where households may have multiple screens but no internet access.

The solution selected by IRTP comes from a consortium of companies under the SKYflow brand. The partners in this ecosystem are ST Engineering iDirect, EKT, Quadrille and EasyBroadcast.

Launched in early 2024, the project involves a multi-phased implementation, starting with live video, including public broadcasting. File-based delivery, including content from the Peruvian Ministry of Education to support distance learning, will follow later in the year. The project is being co-managed as a system integration by DIVICAM and ST Engineering iDirect. Eutelsat Group was chosen to deliver satellite capacity for the project.

DVB-S2X is used for the satellite transmission, in the Ku-band. The new set-top boxes – which function as DVB-NIP gateways – can provide return-channel connectivity via terrestrial networks, whether fibre optic, mobile, etc. This two-way broadcasting would expand the use cases available to the Peruvian government in the future. The service for schools would include sufficient storage capacity to allow the delivery of files and would take advantage of the return channel.

SOCIAL INCLUSION

The illustration here shows how every household in Peru, everywhere throughout the country, can have the same number of channels, the same HD signal quality, and above all access to content of all kinds. We can imagine offering distance education from any university in the most remote parts of Peru. I believe that this is how we can achieve true social inclusion and, of course, the digital transformation we have talked about so much, but which still does not involve households in remote places.

The efforts of the IRTP's Executive Presidents, initially by Dr. Joseph Dager and then by his successor Mag. Jesús Solari Díaz, have given viability to this new proposal to close the gap in broadcasting coverage and address a very important issue for Peru, access to content for all households regardless of geography, distance or accessibility.

Delivery of the complete vision, with an electronic programme guide that includes all actors who create content, will require a further political decision and the agreement of private parties to contribute to the expense of deploying the receiving terminals and to the expense of renting the satellite segment.



Wildfredo Baro Fanola Merino is a lecturer in the Faculty of Electronic and Electrical Engineering at the Universidad Nacional Mayor de San Marcos in Lima, Peru. He is also General Manager of Sociedad Tecnológica del Perú SAC and Director of Operations of American Telecom Company SAC.

DVB-I advancing in Italy, Germany and beyond

Italy and Germany remain the frontrunners when it comes to market deployment of DVB-I. The internet-centric solution for discovery of linear and on-demand television has been under test in both countries for the last few years. Most recently, in Italy a commercial trial was launched in late 2023, while in Germany the multi-partner pilot moved into its second phase last September. Read more about both below.

Test and trial activities have been undertaken in several other countries, some public and some behind closed doors. The highest profile activities outside Italy and Germany have taken place in Ireland, Spain, Greece, China and Iran, but the DVB Promotion & Communications Module has received requests for information or demonstrations from a number of other countries around the world.

The specification itself received its most recent update in February 2024 and is available from the DVB specification library as BlueBook A177r6. The accompanying implementation guidelines were also updated as BlueBook A184r1.

DVB-I Market Trial, Italy

Stefano Braghieri (Mediaset)

In Italy a real commercial trial was launched towards the end of 2023 targeting three main goals. The first is to test the complete end-to-end DVB-I chain in a real environment, where end users can buy a DVB-I compliant TV set off the shelf. This provides an acid test for all the building blocks: service and application providers, CDN providers, internet service providers, the central service list registry (CSR), and content guide servers, without any control over the user.

The second goal is to provide other entities with an opportunity to join the ecosystem. Currently the initiative has Mediaset as the unique service provider running the trial and relies on Telefunken as the unique DVB-I compliant terminal available on the market. Within the parallel DVB-I proof of concept (PoC), which is still running under the radar, other broadcasters and service providers have performed successful tests, and they are likely to join the trial soon. TV set manufacturers are also active in the PoC. Concrete statistics and analysis on the usage of DVB-I will need to wait until there is a higher number of DVB-I compliant terminals running in the market.

Last but not least, the trial demonstrates to AGCOM, the relevant regulatory body in Italy, that DVB-I is feasible and that it does not infringe the well-established broadcasting ecosystem. Based on this, AGCOM established a technical roundtable to discuss, among other topics, all aspects that must be addressed to create a sustainable ecosystem where different mediums (DVB-T/S/I) coexist, observing a well-defined set of rules.

Mediaset's primary goal in the short term is to provide DVB-I viewers with the same user experience they are used to having on traditional broadcast, embracing HbbTV 2.0.4.



German DVB-I Pilot

Remo Vogel (rbb/ARD)

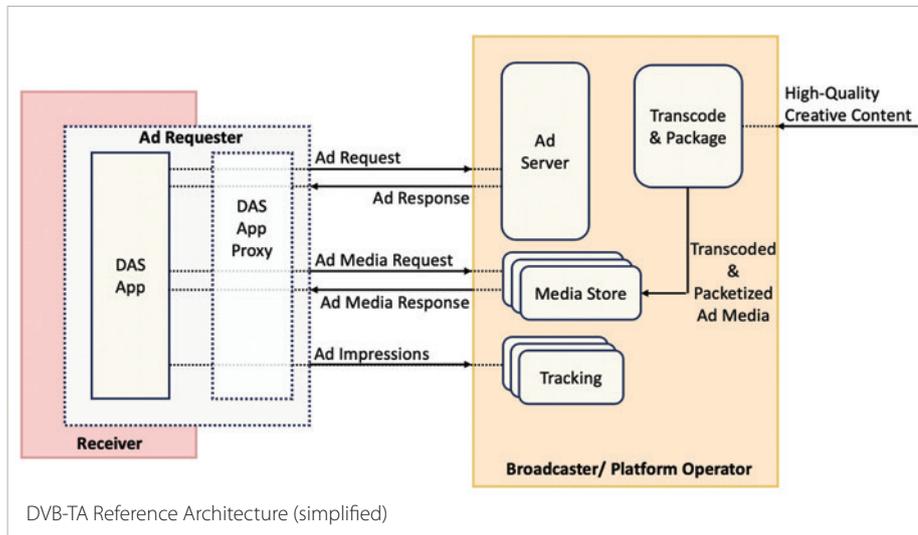
The German DVB-I Pilot group has realized a common view on the technical functions of the standard and the associated opportunities in Phase 1 of the initiative. The second phase, which began in September 2023, targets the aspects that would represent the foundations for a market launch of DVB-I in Germany. The next milestone is the creation of an organisational entity that neutrally reflects the interests of all market participants.

The key points of Phase 2 include the technical-organizational provision of the German DVB-I service list; implementation of the public value recommendation of the German state media authorities; server-side regionalization based on the postal codes; expansion of DRM (digital rights management) and subscription services; and the evaluation of new use cases for playlists, pop-up channels and media library deep links in content guides.

In addition to resolving challenges in the integration of legacy broadcast systems, the pilot is also focused on latest developments with the DVB-I specification, such as the recently added standardized signalling of accessibility services.

Implementing DVB Targeted Advertising in the UK

Martin Gold (YouView TV Ltd)



DVB's work on Targeted Advertising (TA) was very timely relative to YouView's own interest in the subject. Around the time that DVB commenced its TA activity, YouView had already started to collaborate with ITV and Channel 4, two major advertising-funded UK public service broadcasters, on a system design for TA on linear broadcast channels. Both YouView and ITV contributed to DVB's TA work.

YouView is a UK-based technology and services provider, specializing in client software and cloud services that power content discovery experiences on a wide range of consumer devices, including those from BT, TalkTalk and Sony. The majority of such devices are hybrid broadcast/IP, supporting linear channels via both DTT and IP multicast.

DVB's work on TA covers both HbbTV-based and other devices, the latter more prevalent for network operators' set-top boxes (STBs). In YouView's case, referring to the DVB-TA reference architecture shown above, the system follows the option for the client's "Ad Requester" function to be

"A client device performing ad substitution on a broadcast stream requires precise signalling for the frames at which to start and end the replacement."

split between a DAS (Dynamic Ad Substitution) app, which is implemented within YouView's middleware, and a DAS app proxy, which is built as cloud services. This approach has the advantage that the STB DAS functionality is simplified and common across different broadcasters, with the cloud services performing adaptations as needed.

A client device performing ad substitution on a broadcast stream requires precise signalling for the frames at which to start and end the replacement. SCTE 35 is a well-established specification for such signalling, but the specification has many options. DVB-TA profiled SCTE

35 to ease implementation and improve interoperability. To accommodate different client types, DVB-TA supports three different ways of conveying SCTE 35 data. YouView middleware can directly access MPEG-2 Transport Stream sections, so this method was adopted, as it was already supported in broadcast headend equipment.

TIMING CHALLENGES

A key challenge for TA on broadcast streams is that an individual ad decision (i.e. the selection of the replacement ad) is needed for each device for an ad spot that will occur at the same time across all the devices. Earlier implementations relied on the ad decision being performed in the client. However, server-based decisions, typically using ad responses to the IAB VAST specification, as recommended by DVB-TA, would allow more sophisticated targeting, decisions could be based on the current fulfilment status of ad campaigns, and more complex rules could be supported, such as avoiding competitors' campaigns being shown in the same ad break.

In the YouView TA implementation, the ad decisions for an ad break are spread over the time between one ad break and the next on a channel, such that the ads shown in one break can influence the decisions for the next break. The timing for the ad decisions is orchestrated by a cloud service that informs each client device when to request the next set of ad decisions. The maximum advance time for the ad decision can be tuned to be closer to the next ad break if the broadcaster's ad-decision server can handle the increased transaction rate.

The DVB-TA specification discusses different approaches according to the timing accuracy of splicing achievable in the client device. For the YouView devices, the accuracy is sufficient that individual ad spots can be replaced in any combination within ad breaks constructed as a sequence of immediately adjacent ads, and so is compatible with existing UK broadcast practice.

After an extended period of trialling, TA on the YouView platform launched in 2023. Since then, the service has been growing steadily, with further channels and device models being added.



Martin Gold is a Consultant Architect at YouView TV Ltd. He has been an active contributor to DVB for more than 25 years. He was editor of the DVB-TA signalling specification and led the drafting group for its creation.

Updating DVB's satellite toolbox to serve non-geostationary constellations

Avi Freedman (SatixFy)

NGSO (Non-Geostationary Orbit) satellites are taking an increasing role providing ubiquitous, low-latency broadband services, with new constellations planned and launched. Most enterprises initiating those constellations opted to use proprietary, non-standard air interfaces for their systems. However, the key to market growth and global acceptance of any telecommunication system is standardization. It allows the development of innovative services as well as lowering the cost of access to the market by opening it to competition.

DVB standards have been the leading standards for satellite communications for many years. Starting from DVB-S (1995), which focused on broadcast television, going through DVB-S2 (2005), enabling generic data streaming, and closing the loop by adding a return channel and higher layers with DVB-RCS (Return Channel Satellite, 2001) and DVB-RCS2 (2012).

DVB-S2 EXTENSIONS

With DVB-S2X (2013) the operation range of the air interface was enhanced. Higher order modulations were added for more efficient operation of applications that require high data rates and enjoy good signal-to-noise ratio. Furthermore, a set of modulation and coding schemes enabling the operation of small terminals at very low signal-to-noise ratios were added, enabling applications like Internet-of-Things to make use of the standard as well.

Other DVB specifications – DVB-GSE (Generic Stream Encapsulation) and DVB-SI (Service Information) – provide higher layer support and signalling to complete the picture.

Technically speaking, the DVB-S2/S2X air interface for the forward link is best suited for satellite communication:

- The air interface is based on single carrier APSK modulation* enabling the satellite power amplifier to operate at its most efficient working point.



NGSO satellite constellations are taking an increasing role providing ubiquitous, low-latency broadband services (Image: Copyright © Telesat)

- The forward error correction scheme provides spectral efficiency close to the theoretical limit. Furthermore, by adding a very small overhead it allows the satellite link to adapt to varying signal-to-noise conditions, including fading, for example due to rain.
- The single carrier waveform is also resilient to Doppler shift, which gives it yet another advantage for NGSO satellites.

BEAM HOPPING

In 2020, DVB published an amendment to the DVB-S2X standard to support beam hopping, and recently added related signalling support to the relevant specifications. Beam hopping is an important technology that enables a satellite to adjust its resources according to the actual demand it serves. While this technique provides better utilization of satellite assets for geosynchronous satellites, it is especially essential for NGSO satellites to adapt the transmitted signal to the coverage area of each satellite, and area that rapidly varies along its orbit.

The DVB-RCS2 specification for the

return link enjoys similar advantages to those described above for DVB-S2/S2X on the forward link. Still, DVB is currently working on an amendment to better adapt DVB-RCS2 to the requirements of an NGSO system.

This amendment includes a new format for informing the RCS2 terminal of the satellite trajectory, extending the supported bit rate and packet size, and introducing the option of using DVB-S2/S2X on the return link as well, for applications that are more symmetrical in terms of capacity required in both directions. This work item is expected to be concluded in June 2024.

To summarize, DVB continues to support its satellite communication standards, and adapts them according to the requirements of the market. Through those efforts it offers the industry the most effective standard solution for its evolving needs.

* Amplitude and phase-shift keying, APSK, is a digital modulation scheme that conveys data by modulating both the amplitude and the phase of a carrier wave.

Avi Freedman is a director of system engineering at SatixFy, involved in R&D for modems and smart antennas for satellite communications. He has been active in DVB standards development efforts over a decade. Vittoria Mignone (Rai), David Peilow (ESA) and Fernando Díaz Canales (Telesat) also contributed to this article.



New DVB report maps the landscape for volumetric video

Paul Higgs (Huawei)

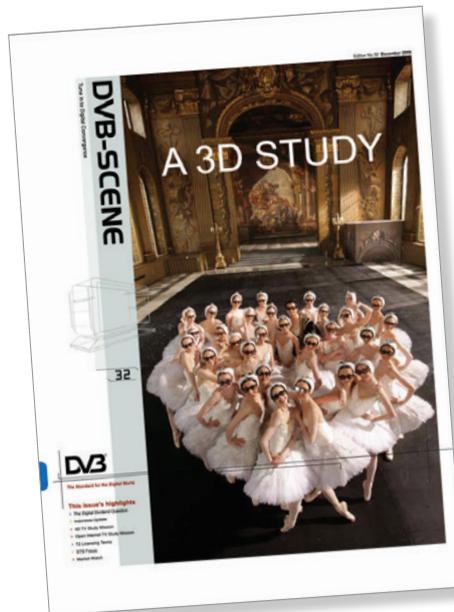
Television has long focused on programming presented in a two-dimensional format, targeted at devices with more and more capability in terms of size, colour and quality. While this has been the mainstay format, consumers have, through the use of touchscreen devices, become accustomed to having a more interactive visual experience, which has allowed computer-generated content and natural scenes to be experienced from a personalized viewpoint. Content and service providers are looking towards being able to offer volumetric content, where the consumer can select their preferred view and watch it on flat screens as well as using 3D displays or virtual reality headsets, leveraging sophisticated video processing algorithms and computational graphics models.

In 2015 and 2016 already, DVB carried out a study mission to consider the opportunities that VR (virtual reality) technology could bring to broadcast-led media services while also understanding the potential pitfalls. The timing of the study mission coincided with a maturing of VR technology after the peak of its hype in the early part of the decade. At that time, consumers had generally been given a disappointing solution for VR and it had thus quite quickly lost favour, with an isolating and poor-quality entertainment experience, especially when seen alongside the 2D UHD content that was becoming available for typical entertainment scenarios.

TECHNOLOGICAL ADVANCES

More than six years on from the DVB Study Mission on Virtual Reality, we can certainly see that technological innovation has improved the perceptual performance of head-mounted displays, and more content acquisition and media production for high-quality three degrees of freedom and above are now available. However, content or genres that could be successful in the immersive domain

This is not the first time DVB has looked beyond two-dimensional video – has the technology finally caught up with the aspirations?



largely remain elusive.

It was in this context that DVB initiated a study mission to look at what was now termed Volumetric Video, and to further understand the potential use cases alongside existing industry activity and technology developments.

The Study Mission on Volumetric Video kicked off in November 2022. Reporting to the DVB Commercial Module, the CM-SM-VV group would identify the potential service offerings while highlighting some key industry technologies and standards that could be used to realize commercial service scenarios in the future. As with all DVB study missions, the ultimate goal was to see where and how the DVB Project could potentially make a contribution to enabling standards-based approaches for those wishing to deploy services.

STUDY MISSION REPORT

The final report of the study mission was published on the DVB website in February 2024 as BlueBook S101.



It details some of the most recent developments and demonstrations of volumetric video technologies while also offering insights into an evolutionary path based on the service offerings of the last 30 years. Several use cases and exemplary service scenarios that have met with varying degrees of success in the industry are provided, along with an analysis of some of the current and evolving key technologies and standards that can be utilized in future large-scale service offerings.

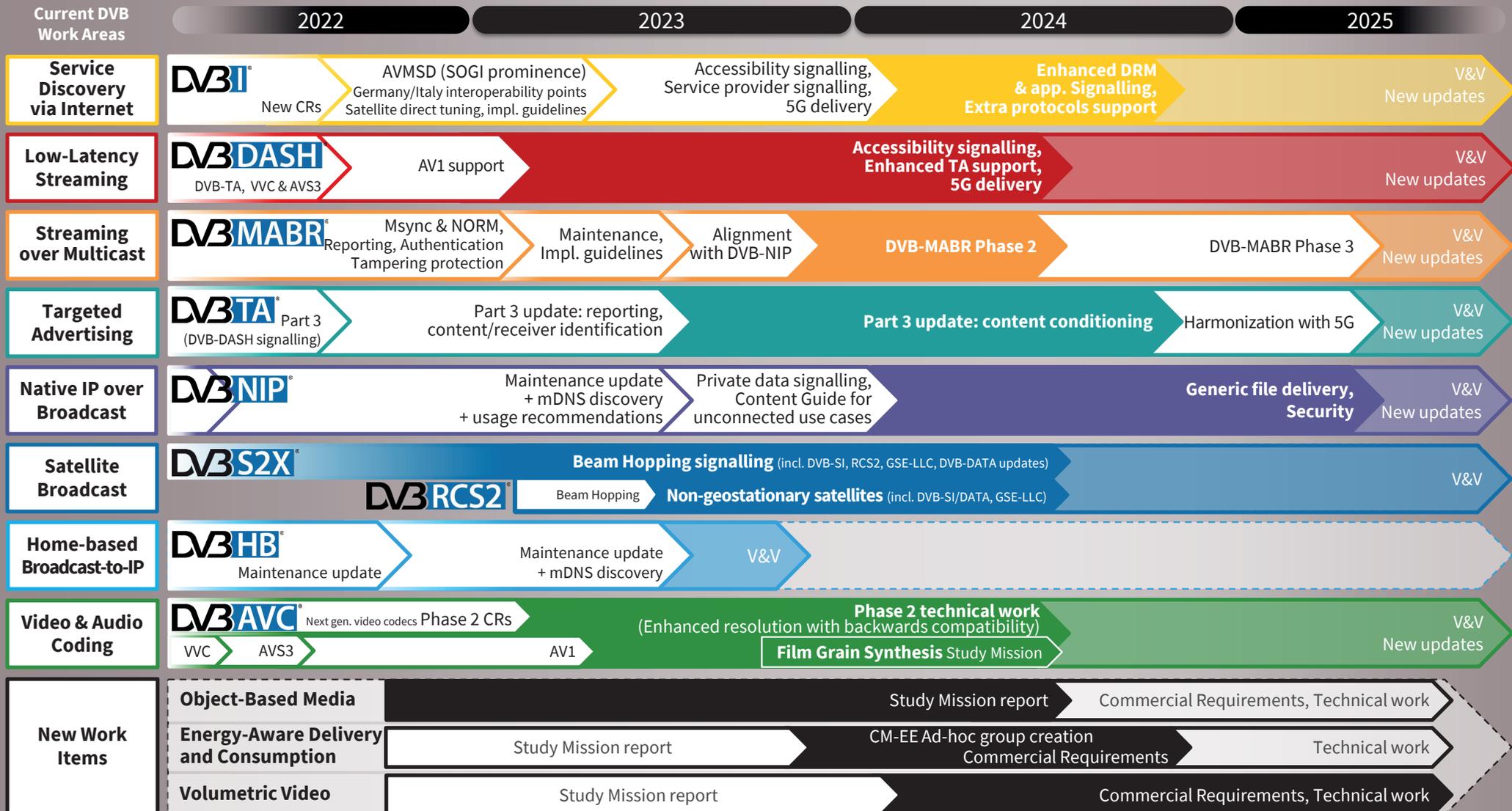
The study mission found that there exists a reasonable level of industry activity around volumetric video, especially in the sports and artistic entertainment domains, as well as the presence of technologies that can bring interactivity and immersiveness to the user experience.

While the study mission report does not recommend any immediate standardization work by DVB, the group concluded that the topic is worth exploring further. The report itself is publicly available and will serve as the basis for inputs to relevant upcoming industry events, including a proposed unconference session at DVB World 2024 and a subsequent workshop on volumetric video technology. A further step could involve an industry survey to understand whether support for specific immersive media use cases is strong enough to initiate work on commercial requirements within the DVB Project.



Paul Higgs is VP for Video Industry Development at Huawei. He chairs the DVB Technical Module group on DVB-I and also led the recent DVB Study Mission on Volumetric Video.

What we're working on, at a glance



V&V = Verification & Validation; CRs = Commercial Requirements; Updated February 2024 – for detailed information see dvb.org/workplan



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