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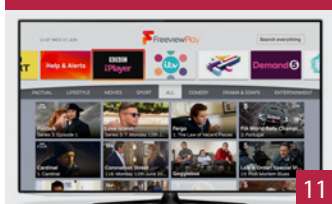
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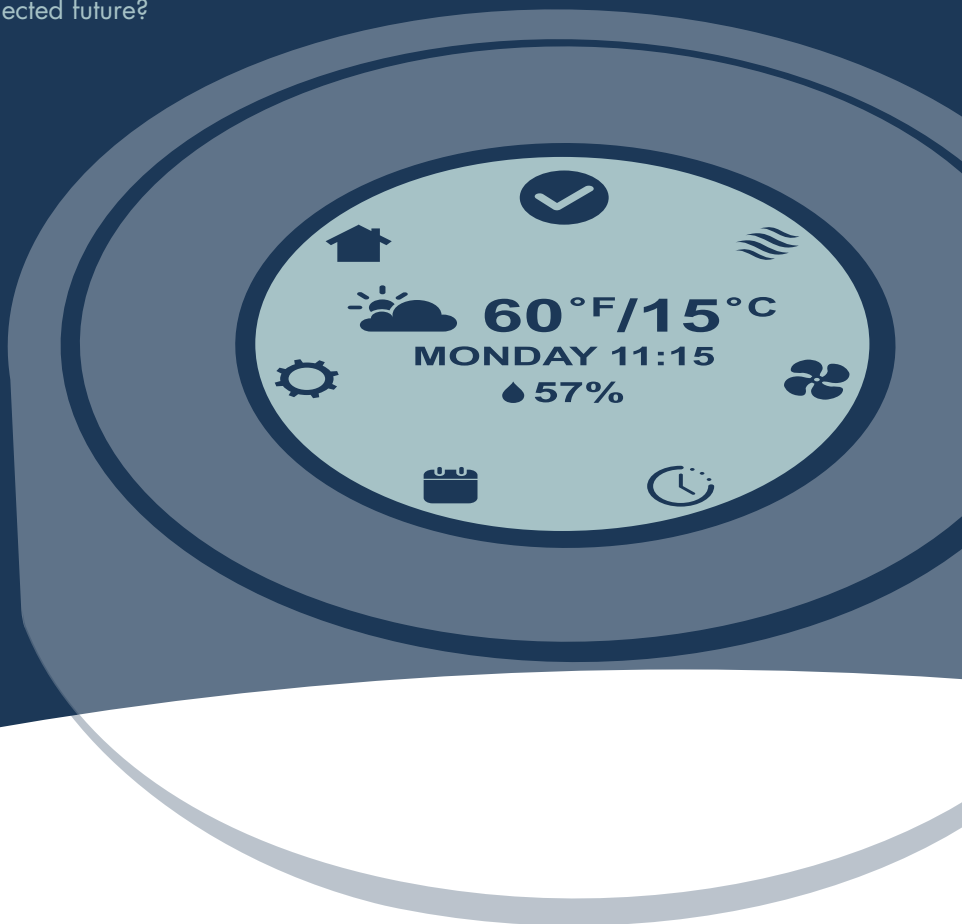
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# Steering the Course

## A Word From DVB

At the most recent DVB Steering Board (SB) meeting held in July, a number of important decisions were made and documents were approved for publication. One of these was the approval of the new Sat>IP DVB liaison.

The Sat>IP Alliance provided the specification for in-home distribution of broadcast content via the domestic IP network. Sat>IP also supports all other broadcast delivery mechanisms such as cable, terrestrial and IPTV. The technology is now supported by numerous manufacturers and has been successfully introduced in several markets. It allows the end-user to receive broadcast content on mobile devices such as tablets or smart phones as well as on TV sets equipped with the necessary receiver. With most Sat>IP Alliance members also being members of DVB, it was a logical step to maximize the synergies between the two organizations. In a common liaison statement approved at the SB, the organizations agreed that further development of Sat>IP technology will take place in DVB. This allows the

overall DVB community to contribute to next generation Sat>IP features and services. Sat>IP and DVB can now jointly promote the technology and as part of the marketing plan may introduce a more specifically accurate identity to reflect the technology's support for all broadcast delivery systems.

Another important move by the SB was the approval of the specification for Timed Text Mark Language (TTML) based subtitles. DVB initiated this activity because the current use of bitmap based subtitles require a data rate increase in line with resolution. Therefore, UHD broadcasts would require a high rate for bitmap subtitle delivery whereas in the case of TTML based subtitles the data rate is basically resolution independent. The new specification complements and completes the advanced UHD features (HDR, HFR and NGA) in DVB UHD-1 Phase 2. This new technology was developed by W3C and has been adopted by several standards bodies such as ARIB, ATSC, EBU, SMPTE,



**Peter Siebert**  
Executive Director

ISO/MPEG and many others including platform specifications such as HbbTV.

It is also worth mentioning that by using the W3C specification DVB has paved the way for a common TTML subtitle format for both broadcast and internet delivered services. This supports IP based delivery of DVB content in the home that is in line with DVB's overall strategy to transition to delivering seamless hybrid broadcast-broadband services. This also applies to DVB's work on Targeted Advertising and Adaptive Bitrate (ABR) Multicast. DVB is well on track in bringing together broadcast-broadband delivery.

## New Standards

**TS 101 154 Ver. 2.3.1:** Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream (Feb - '17)

**EN 300 472 Ver. 1.4.1:** Specification for Conveying ITU-R System B Teletext in DVB Bitstreams (Apr - '17)

**TS 102 809 Ver. 1.3.1:** Signalling and Carriage of Interactive Applications and Services in Hybrid Broadcast/Broadband Environments (Jun - '17)

**TS 103-286 Ver. 1.2.1:** Companion Screens and Streams; Part 2: Content Identification and Media Synchronization (Aug - '17)

## Expanding the Digital Opportunity

12-14 March  
Warsaw



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# IoT and AI

## New Challenges for DVB?

**David Wood, EBU**

Going to a party this evening? Between sips, slip in two fashionable terms. The first is 'AI', aka Artificial Intelligence. This 'IT-speak' translates roughly as "software that looks around and takes an action as a result". The second is IoT, aka the Internet of Things. This translates roughly as "connecting pieces of equipment by internet". These two, we are told, are going to change the world.

DVB is the world's most successful developer of pre-industry specifications; our business is media delivery, principally broadcast delivery, but also broadband internet. It would be short-sighted if we did not examine whether AI and IoT have a role to play in media delivery. If so, what it could be?

Adding AI and IoT only makes sense if the media experience that results is somehow better than we have today. We already have quality evolution licked with the UHD-1 specification, next generation audio on the way, DVB-T2 and S2, and much more. We also have hybrid-broadcast broadband from our sister organization HbbTV.

To be worthwhile, AI and IoT will need to make things better in other ways. The services will need to be made, say, more enjoyable, more convenient or more accessible. Maybe more personalized.

...just because we cannot see beyond the horizon, it doesn't mean there is nothing there.

If we take AI, the list of potential tasks could include big data analyses, image recognition to create metadata, speech recognition to transcribe or simplify language, sign language creation, and script mining generation. It could include media conversion to adapt to usage – broadcast, web, or hybrid. It may include drawing on services from the 'Cloud'.

If we take IoT, the list of potential tasks could include mobile-centric TV control, linking with, and controlling, IoT-enabled devices such as robots, power supply control, and lighting and appliances.

At the NHK 2017 Open House in Tokyo, there were some fascinating first sorties into these areas.

One was the 'TV-companion Robot'. The elderly can find themselves alone

watching television, and would love a companion to share the experience with. The companion available here was a 'robot' sitting next to them, and thanks to AI and IoT, it (?) was aware of the room, the people and things in it, and of course it had all the information about the program, what was interesting and what was being said and seen. It could conduct a conversation about the program, and cheer and shout when the viewer's team scored a goal.

Another demonstration had a robot companion for a 'keep fit' program. The robot knew exactly what exercises the on-screen presenter is asking you to do, and by doing them with you, helps and encourages you.

A further demonstration used AI and IoT in the services of a cookery program. The IoT system knows what supplies you have in the IoT-enabled fridge, and the AI compares this with the things you need for the TV prepared recipe. Your mobile phone tells you whether you can make the recipe with the things you have at home and, if not, which local market has them in stock, and at what price.

Another demo used the 'Cloud' to allow the viewer to seamlessly move his TV screen through the 360 degree image at a sports event.

These were some examples, so how could our AI and IoT serve the media delivery world?

As a first area, in the future, media will be delivered both by broadcast and by



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

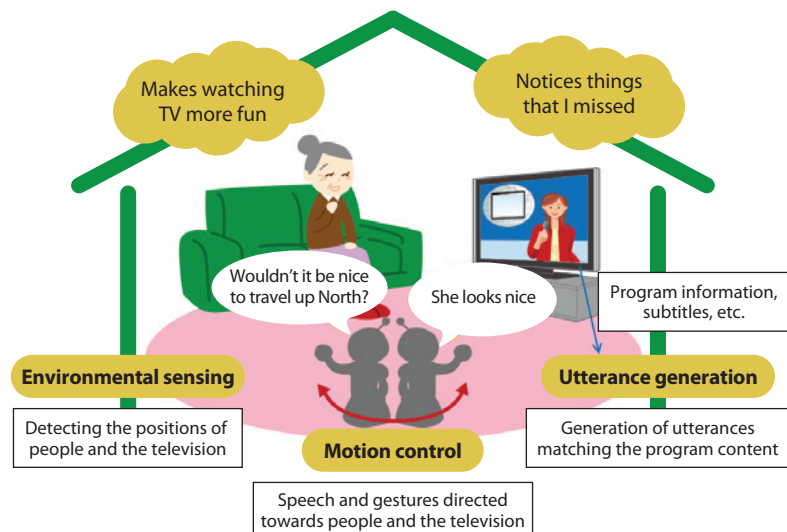
broadband (particularly if the claims made for 5G low costs are true) so we may imagine that there will eventually be simultaneous transmission of content on both. This may be the age of "Spontaneous Media Consumption". We will need new tools to achieve this.

The other general area will be to provide better media access services for those with disabilities, increase the value of the content experience by linking it to actions we can take at home, and providing companionship for media consumption.

DVB needs to look at such issues to future-proof itself. Which services could be successful and important? Do we need to make provision and allowance for them in some ways such as by standardizing metadata?

There is a saying that "just because we cannot see beyond the horizon, it doesn't mean there is nothing there". Do you think AI and IoT in the service of the media are over the horizon? After visiting the NHK Open House 2017, I think I can see them.

### Image of the TV-watching robot concept



# Targeted Advertising

## The Evolving Broadcast Ecosystem

**Thierry Fautier & Vincent Grivet** Co-Chairs, DVB CM-TA-SMG



Vincent Grivet, TDF



Thierry Fautier, Harmonic

Targeted Advertising (TA) is a necessary evolution within the TV broadcast ecosystem. In past years, targeted advertising models have been deployed in web, mobile and OTT environments, as well as in TV markets, including the U.S. pay TV space by cable and DTH operators and across the Sky media companies in the UK, Italy and Germany. More recently, LGI with Virgin in the UK announced a collaboration on TA with Sky AdSmart. Meanwhile, in the horizontal broadcast market only technical trials have been done in the DVB ecosystem. Further penetration can be expected, and some observers believe TA may eventually take a double digit percentage of the overall TV advertising spend.

This shift to targeted models is vital to ensure that advertising on broadcast TV is able to compete effectively with newer internet-based platforms, which have increased their advertising revenue at the expense of broadcasters. It is expected that targeted TV advertisements will command higher unit prices (estimated between 200 and 300 percent), enable better monetization of TV inventories and increase viewer satisfaction by serving more relevant advertisements to viewers.

Given the strong market rationale to adopt TA, broadcasters are generally keen to do so, and some deployments have already taken place. However, to date, these are limited to vertical TV environments where an operator has control over the full delivery chain, including end-user set-top boxes or clients.

When it comes to horizontal broadcasting, no complete solution currently exists that enables broadcasters to deploy and benefit from TA, which is a significant challenge.

HbbTV (2.0.1 version) includes some of the components that enable TA in the broadcast context, and some technical trials have been done, but it does not fully meet the requirements to implement TA in the broadcast environment. The lack of a clear and full deployment of the HbbTV specification (including some of its optional features) in all markets is also a constraint.

### DVB and TA

As DVB Members represent broadcasters, network operators and service providers using different types of networks (including the public internet), it was natural for DVB to look at how it can enable TA across every network from a holistic point of view. In February 2017, DVB established a study mission group (SMG) to reflect upon the relevance and the possibilities for DVB to generate some elements of standardization for TA. The preliminary findings of the study mission were presented to the DVB Commercial Module on June 28 together with a draft report that covers the following aspects: market outlook and business considerations; technology outlook and hurdles; summary of targeted advertising issues and required improvements; recommendations for DVB actions.

### Recommendations

Given the importance of widely enabling TA in the context of broadcast TV and the lack of a satisfactory solution,

the SMG has recommended that DVB develop an enabling TA framework, focusing on a horizontal broadcast business model at a minimum, whilst still open to pay TV operators, should they opt to use it as well. The TV manufacturers would have to decide whether or not to implement such a framework, and the TA signaling should not disturb any of the devices in the installed base.

As vertical TV operators have already started some proprietary implementations, it may appear that they have less of an incentive for the time being to contribute to the definition of a new standardized framework; however, it is quite likely that a DVB TA standardized framework would be attractive to vertical platforms as well, so their specific needs should not be ignored. One possibility could be that the STB or pay TV client would use HbbTV signaling to trigger the TA. Other techniques could be applied, but this would involve the active contribution of pay TV operators, especially as IP networks can offer other routes, such as unicast.

### Next steps

The DVB Commercial Module has advised in favor of the creation of a CM-TA group, which is to be formally decided by the Steering Board when the final report and findings of the SMG are released (in DVB). Once created, the DVB CM-TA group will have to define the commercial requirements for a TA system that can be used across all the DVB networks: FTA, pay TV, broadcast or IP (multicast and unicast in a managed or unmanaged way). It is clear that DVB will have to collaborate with other groups such as CableLabs, HbbTV, ATSC 3.0 and the Streaming Video Alliance, all of whom are also working on TA.





# VR over DVB Networks

## Commercial Aspects

**Ludovic Noblet**, Chair, DVB CM-VR

Following the conclusions of the DVB Virtual Reality Study Mission (CM-VR SMG), the formation of a new VR Commercial Module sub-group (CM-VR) has been announced. The formation of the group was officially approved by the DVB Commercial Module (DVB CM) at its meeting in June. The overall goal for the CM-VR is to deliver commercial requirements that will be passed to the relevant DVB Technical Module (TM) groups for them to work on developing technical specifications targeting the delivery of VR content over DVB networks, as mandated by the DVB CM.

CM-VR, created as a sub-group of the DVB CM, will receive guidance from, and report on all issues to the DVB CM. It is open to all DVB Members who express their wish to participate. As well, the CM-VR may form working groups to work on specific issues and to draft related documents. Taking into account that the delivery of VR content will require technologies that are addressed by other DVB CM and TM subgroups, the CM-VR will ensure to drive its action in close collaboration with the relevant DVB groups (CM-AVC in particular).

As the group is charged with developing commercial requirements for a VR delivery system for use over DVB networks, its first task will be to work on a system which will:

- target DVB Integrated Receivers/Decoders, such as TVs and STBs where the conventional TV display, a connected VR headset, or a new

- “panning” display technology is expected to be the consumption device
- target next generation, IP connected devices such as smartphones, tablets, game consoles, PCs
- make use of DVB broadband and broadcast networks for delivering VR content from broadcasters
- aim to deliver an audiovisual experience up to “panoramic/3DoF+<sup>1</sup>” considering available technologies and realistic deployment scenarios. Any quality requirements remain to be decided by the group, but the option should be available for delivering VR contents via broadband or broadcast, within a channel of adequate capacity.

The following are the expected deliverables and timeline for the module. The primary objective for the CM-VR is to deliver commercial requirements by December 2017, for approval by the DVB Commercial Module and Steering Board in January 2018. The secondary objective is to continue the work initiated by the CM-VR-SMG with a view to maintaining the commercial development of VR in the market. This is to ensure the CM-VR is up-to-date with technological developments, and to investigate whether DVB action is needed for more evolved technology to prepare any future phase, especially with regards to 6DoF VR and associated distribution paradigms. This activity should have no influence over delivering short term 3DoF/3DoF+ requirements. DVB and the VRIF (Virtual Reality Industry Forum) are already



**Ludovic Noblet**,  
Director of Hypermedia at b<>com

working closely to organize a dedicated workshop. This is expected to take place in Q1-2018 and focus on VR/6DoF. As it is going to be a long road to VR/6DoF from a standardization perspective, the industry would be invited to showcase “hands-on” demos rather than presentations, in a kind of “VR garage” spirit. This would be so that everyone could better understand the state of technology at this point in time. This workshop will be the first of its kind at a pan-industry scale.

In all instances, DVB will take into account the work being done by other VR standardization and industry organizations, in particular MPEG, the VRIF and 3GPP. Where appropriate, and without prejudice to the process of defining commercial requirements, the CM-VR will produce its best efforts in order to contribute to the harmonization of work across these different organizations.

Following the first CM-VR meeting, held in London on June 20 - 21, and following approval by the DVB CM held on June 28, I was pleased to be confirmed as chair of the CM-VR group with Ralf Schaefer (Technicolor) as co-chair.

VR is a complex topic. It is important that broadcasters who have plans to deliver VR contents pay attention to the CM-VR and, whenever possible, contribute to the CM-VR efforts so that we can ensure that viable commercial requirements will be delivered. The next CM-VR meeting will be held immediately after IBC on September 20 - 21. Its main objective will be to focus on delivering a first strawman document for the group to work on.

<sup>1</sup> 3DoF+: as per the MPEG definition documented into w16603. “Immersive video adds over classical video an immersive experience to the user, surrounding them with a large field of view video (up to 360 degrees) through Virtual Reality goggles or large 3D video walls. The user is presented different viewpoints to their surroundings, corresponding to rotational head movements only (so-called Three Degrees of Freedom, 3DoF), possibly augmented with a virtual or physical translational body/head movement in a limited volume around a central position (referred to as 3DoF+).

Photo courtesy: b<>com

**Pictured below is the HTC Vive VR headset which works at 90fps and is connected to Leap Motion's hand tracking device. The wristband is used for detection of user comfort.**



# Exploring WiB

## A possible new approach?

**Chris Nokes**, Chair, DVB TM SMG WiB

Wideband frequency re-use 1, or 'WiB' for short, is an idea for a possible new approach to terrestrial broadcast network planning that was presented by Erik Stare and co-authors at the 2016 International Broadcasting Convention<sup>1</sup>. In summary, the basic idea proposes to change the approach for digital terrestrial TV network planning from one which uses high-order modulation to achieve high capacity per channel, to an approach using a much wider bandwidth together with a low-order modulation, to achieve similar capacity. This will inevitably mean that instead of planning transmissions from neighboring transmitters to work on separate channels, the same (much wider) channel will need to be re-used; but the robust low-order modulation, combined with interference cancellation techniques, could mitigate the impact of the resulting network self-interference. A significant benefit from this approach is a dramatic reduction in the overall power that would be required to operate the network (e.g., a typical reduction of around 90% should be possible). The wider bandwidth may also bring advantages from increased frequency diversity, and this could be enhanced by combining WiB with frequency-hopping techniques, such as the Time-Frequency Slicing (TFS) already defined in an annex to the DVB-T2 specification.

Because of the requirement to use interference-cancellation techniques in receivers, it is also possible to operate a layered modulation system. The broadcast layer would operate as normal, but in areas where the received signal strength provides

a significant reception margin, receivers could decode additional information added to the main signal at reduced power - a 'lower layer'. Since the capacity available varies with the margin, this lower layer could be most suited to the provision of additional unicast data, i.e., separate data targeted individually at each receiver. This approach could be applied with highly sectorized broadcast antennas targeting primarily roof-top receivers, or might equally be applicable to a cellular network targeting mobile receivers, where the combined provision of both a broadcast layer and additional unicast data (in effect additional mobile broadband capacity) could be potentially very attractive.

### DVB Study Missions

Following the publication of the IBC 2016 paper, DVB decided to initiate two study missions, one a technical study mission, the other a commercial one, to analyze the proposals made in the paper in more detail.

The technical study mission (TM-WiB) began its work in February, and has two broad objectives. The first is to evaluate the technical opportunities which WiB might offer in the future – in other words to assess the theoretical limits of what should be possible with WiB – as well as studying the application to practical network design to determine how close a practical implementation might come to these theoretical limits.

The second objective for TM-WiB is to consider the feasibility of introducing such technology. This includes the impact both



**Chris Nokes** is Head of the Distribution Core Technologies Section at BBC Research & Development.

to and from conventional terrestrial TV network signals, as well as the potential impact on existing secondary users of terrestrial channels – in particular the program production community that makes use of the interleaved nature of existing planning to re-use UHF channels for equipment such as radio microphones.

The commercial study mission (CM-WiB) has only just started its work, but will consider the potential business cases for the commercial implementation of WiB, as well as considering the viability of transition scenarios that could allow for its introduction.

Inevitably there will be a need for a close cooperation between CM-WiB and TM-WiB, for example to allow CM-WiB to ask TM-WiB for detailed evaluations of specific aspects of the technology.

### Initial approach within TM-WiB

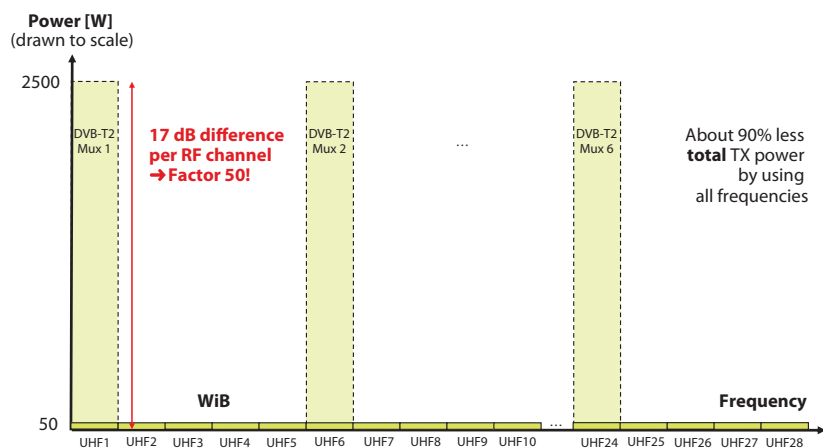
TM-WiB has started its work with some initial analysis of the potential for WiB technology, as well as by defining a variety of scenarios that could be considered for the use of WiB. These scenarios start with TV broadcasting to directional roof-top antennas using DVB-T2 as it is, with frequency reuse-1, then add additional WiB tools (e.g., interference cancellation, channel aggregation), before considering more complex scenarios (e.g., adding mobile reception and using LDM for unicast services). TM-WiB has also started defining common approaches to network simulations to allow results from different organizations to be readily compared.

### Outlook to future steps in study missions

Both TM-WiB and CM-WiB will produce reports on their findings for DVB Members early next year, and these reports will guide DVB in deciding upon any future work it may decide to undertake in this area.

<sup>1</sup> WiB – A new system concept for Digital Terrestrial Television (DTT), E. Stare, J.J. Gimenez, P. Klenner. International Broadcasting Convention, Amsterdam, September 2016. This paper has also been published, in an extended version, as an EBU Technical Review paper and is available at: <https://tech.ebu.ch/publications/wib---a-new-system-concept-for-dtt>.

### WiB - Spreading the power equally over all frequencies (Single wideband WiB signal from all sites, reuse-1)





# The IP Challenge

## Internet delivery for Broadcasters

Dr.ir. Egon Verharen, Nederlandse Publieke Omroep



With the enormous success of the internet and its protocol suite, and the universal support in end-user devices, most broadcasters embrace the internet to reach and engage viewers as well as employing online delivery of their services. These services comprise linear services and catch-up or VOD services as well as new interactive services. Many broadcasters are facing a digital transformation from traditional channel based programming, playout and broadcasting to becoming a primarily digital multiscreen delivery content provider. By creating a flexible IP delivery chain, broadcasters are able to play a bigger part in direct to customer distribution. They have to compete with companies that grew up in that space and helped form it. As Chuck Meyer, chief technology officer for Grass Valley, noted “broadcasters are really no longer in control of the TV.” CE manufacturers and technology companies like Apple and Google are now driving the technology, and companies such as Netflix are taking advantage of this and are utilizing IP technology for the direct delivery of services ranging from small screens to UHD.

One of the biggest challenges for ‘traditional’ broadcasters is understanding the standards, protocols and formats that are used in IP delivery. This difficulty in understanding is compounded by the fact that these do not arise from the traditional broadcast bodies - the ITU and SMPTE. It is the IETF and W3C that we should be looking to for guidance in this area. Educating our broadcast engineers is key to making a successful transformation.

IP delivery is not new. Most viewers in industrialized countries are watching some form of IP-based video delivery chain whether they are viewing cable, satellite or OTT video streams. The challenge lies with the best-effort delivery of the

internet and the inherent problems of variable delivery time depending on user traffic.

On the technical side, the biggest challenge in my view is scale. In most places the internet would break down if a similar size audience watching prime time television switched to watching online. The challenges are not so much in the last mile, except maybe in rural areas where broadband connections are poor or non-existent. It is the interconnections and the peering and exchange points where

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**...to provide the best quality delivery, a new collaboration should be forged between broadcasters as content providers and internet access providers running their own CDN, or smart caching infrastructure.**

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the massive data streams generated by too many concurrent video requests from viewers cause a problem. The capacity of the access routers between the exchange points and the internet access provider’s (IAP) backbone is often where the bottleneck arises, as are the peering arrangements between the content provider and the IAPs.

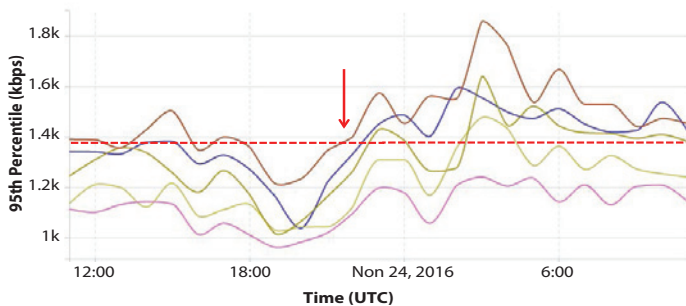
This scalability problem not only applies to linear services, but for on-demand services as well. Where the internet gave us the possibility to provide one-to-one interactive and personalized services and the



opportunity to set up niche channels for smaller groups, instead of the traditional one-to-many broadcasts, it is still not good enough if everyone attempts to watch a program of their choice at the same time. This is largely due to the protocols (HTTP and TCP) used for audio and video delivery on the internet today. Where the 'old' internet technique of one-to-many multicast is used successfully in closed Quality-of-Service-controlled networks, such as IPTV networks, it was never successfully deployed in the open internet, mainly because of a lack of business models and support in end-user devices (a chicken and egg scenario).

The use of Content Delivery Networks (CDN) is an intermediate step in solving this challenge. For broadcasters moving their streaming out of their premises and onto the cloud, whether it be with commercial CDN or cloud providers, they can save on Capex and gain the advantages of flexibility, and so can better respond to short term demand spikes, e.g., around major sporting events or popular shows. Furthermore, by using a multi-CDN strategy that is

### Improving the end-user experience with multi-CDN



### Switching platform automatically selects the best performing CDN of that moment for the targeted location

Illustration of the real time monitored throughput performance of different CDNs. The red dotted line represents a minimal performance for a specific video to play without interruption. At peak time (red arrow) EBU Flow would switch traffic to the brown CDN to avoid service interruption.

switching traffic between different CDNs based on real-time performance data and business parameters, including bandwidth costs, it improves redundancy and increases availability and capacity while driving down costs.

A better solution is to have stream splitting and local content serving as close as possible to the end-user and therefore close to the edges of the network of the IAP and use operator CDNs. To provide the best quality delivery, a new collaboration should be forged between broadcasters as content providers and internet access providers running their own CDN, or smart caching infrastructure. The European Broadcasting Union (EBU) is running the EBU Flow multi-CDN pilot to test whether all promises come true and viable multi-CDN services can be provided to its membership.

IP delivery comes at a price. Although prices for bandwidth usage are still coming down, they are still too high to provide broadcast services to the same size audiences. In this respect, hybrid broadcasting, the combination of 'traditional' digital broadcasting and IP broadband delivery of additional and personalized content and services is a viable way to control costs.

Delivery costs make up the largest part of the total costs. However, one should not forget the licensing costs for the codec used, e.g., HEVC. There is also DRM licensing costs when protecting the content and of course the development and deployment costs of the broadcaster apps for the end-user devices.

An associated challenge that should not be forgotten is regulation. In providing services to the general public, we have to be sure that they can find these services on the platforms and devices they use and get access to the broadcaster's services. Issues such as due prominence (in EPGs, app shops, UI placement) and net neutrality are essential in this respect.

Broadcasters have to decide which part of the IP delivery chain they want to provide themselves and which part to outsource. On-premise (pre)encoding and distribution to a cloud-based origin streaming server, connecting to a multiprotocol multi-CDN deep into the network (as close as possible to the end-user), seems the right approach these days.

As said before, broadcast delivery cannot be replaced by IP delivery, but it can be enhanced. It can both extend the reach and provide opportunities for niche broadcasting, interactivity and new services like object based broadcasting. It provides the means to start delivering that new UHD service (be it a linear channel or simply on-demand programming) where the playout systems and the main distributors' cable and IPTV set-top boxes are not yet ready.

To be able to compete and make IP delivery a viable option for broadcasters we need more involvement from the broadcasters in the development of the relevant standards in IETF and W3C. You can still do DVB-IP, but if you have never heard of ABR streaming over HTTP/2 and QUIC you are running behind and you better get up to speed.



**Dr. ir. Egon Verharen** is manager of R&D at Nederlandse Publieke Omroep (Netherlands Public Broadcasting) overseeing projects on new broadcast playout and distribution technologies, and the development of new media services. He directed the audio and video streaming platform for live and on-demand services, available on web, mobile, digital cable, and IPTV, and co-led the introduction of HDTV broadcasting in the Netherlands. He is a member of the EBU Technical Committee since 2010 and serves as its chair since 2014. Egon received his MSC in computer science at University of Twente and his PhD in Artificial Intelligence at Tilburg University.

# Keeping Up to Date

## DVB MPEG-DASH

**Jeff Goldberg**, Former Chair, DVB TM-IPI

The MPEG DASH specification was developed to provide a standardized solution for video streaming over the open internet where there is no Quality-of-Service guarantee, resulting in variable data rates. The basic principle of Dynamic Adaptive Streaming over HTTP (DASH) is depicted in Figure 1. On the HTTP server, several representations of the same content are stored as segments supporting various data rates. The server informs the DASH clients about the available segments by sending out Media Presentation Description (MPD) information. Depending on the data rate available, the client can request the corresponding segment from the server by using the HTTP protocol.

Two years after the first delivery of the DVB MPEG-DASH profile, we've seen it become mature and be incorporated into other standards such as HbbTV 2.0.

### The Next Version of the DVB MPEG-DASH Profile

While the initial version of the DVB MPEG-DASH profile specification has been successful, it needed to be updated as new technologies for delivering more immersive audio and video have been released since the original specification. Whilst the changes from the previous version will seem small, the additional capabilities are significant. The three main updates are linked with an earlier update to TS 101 154 for broadcast TV: High Dynamic Range (HDR); Higher Frame Rate (HFR); and Next Generation Audio (NGA).

High Dynamic Range in the DVB MPEG-DASH profile supports both HLG10 and PQ10, whilst not precluding other HDR variants that may be added at a later stage. This led to two issues: HLG10 is backwards compatible but PQ10 isn't, so how do you prevent original version players from playing PQ10, and secondly how do you tell which HDR scheme you are using?

The first issue led us to produce a new "2017" variant of the DVB MPEG-DASH profile with associated and updated player requirements to go along with the original "2014" variant. The second issue is solved by using two different property descriptors in the Manifest (MPD) file which enables existing players to be able to understand HLG10 presenting it in Standard Dynamic Range, whilst allowing 2017 players to be able to present the content in High Dynamic Range using either method.

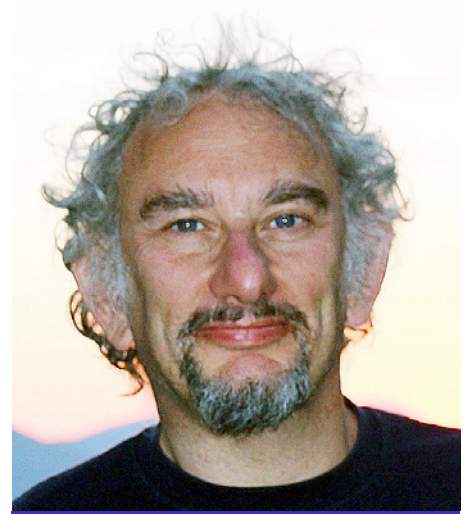
The DVB MPEG-DASH profile has always been able to be flexible in the frame

rate of the content. It has a collection of frame rate families that the content must seamlessly switch within not just at the frame rates within the family but also at half and a quarter of the frame rate. For example, if you have a frame rate family of 25 and 50 fps, then the player must support 25/2 and 25/4 frames per second. It is therefore relatively straightforward to support new frame rates of 100 and 120 fps.

However, an addition was needed when there is content shot directly with a 100Hz camera but without making any separate 50Hz footage using either a separate camera or some video processing, yet still being able to deliver the content via MPEG-DASH to 50Hz TVs. This is done with self-contained representations with temporal layers enabled. The lower frame rate representation made by taking only the lower temporal layers of the high frame rate encoding, whilst the high frame rate representation contains all temporal layers of the high frame rate encoding. The highest Temporal ID is signaled in the manifest to allow clients to use this when processing the VPS and SPS.

The final update is around next generation audio (NGA), which provides an unparalleled level of flexibility in audio centered around objects rather than channels. In MPEG-DASH you need upfront knowledge in the manifest to choose the right audio stream so you need to describe the flexibility in the manifest, which is why NGA requires a new method for advanced use cases known as 'Preselections' and a significant number of new player requirements.

In addition to the three new features, a number of bugs raised through



**Jeff Goldberg** was a Technical Leader within the Service Provider division of Cisco Systems. He has been working on leading edge transport of video over IP since 1999 and was part of the founding group of DVB TM-IPI in 2000. He was the chair of the DVB TM-IPI group specifying DVB's MPEG-DASH profile until May 2017. He now works for ARM.

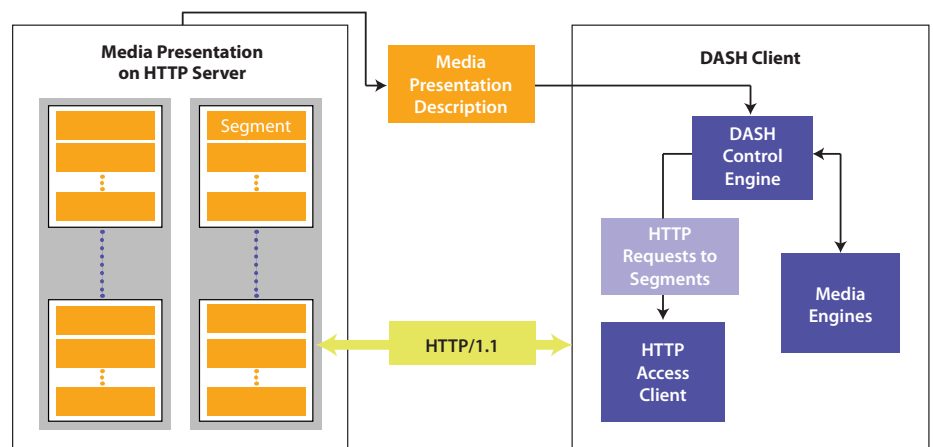
interoperability testing, liaisons from other organizations and DVB Members' testing have been fixed. The DVB TM-IPI group is aiming to deliver this version of the specification by the end of 2017.

### Using IP Multicast to Deliver the DVB MPEG-DASH Profile

A more ambitious update, however, is the ability to use IP Multicast to deliver the DVB MPEG-DASH profile content rather than the unicast used today. This is driven by the efficiency gains when you deliver live TV to a large audience via a single stream replicated in the IP network, rather than a huge collection of separate streams. The aim is that the player remains the DVB MPEG-DASH profile Player but with a multicast to unicast translator placed somewhere between the Player and the multicast stream.

The ABR Multicast Taskforce started its work in January 2017 with weekly WebEx meetings and a face-to-face workshop in early June. A reference architecture has been agreed by the participants and it is hoped to deliver an initial technical specification to DVB TM in early 2018.

**Fig. 1 - The principle of Dynamic Adaptive Streaming over HTTP (DASH)**





# Hybrid Viewing

## Playtime at Freeview

**James Jackson, Digital UK**

Freeview Play is making it easier for everyone in the UK to enjoy the benefits of connected TV. With most major manufacturers now building Freeview Play into their products, more consumers than ever have access to a range of free catch-up and on-demand content.

From the outset, HbbTV has been at the heart of Freeview Play. It has enabled our partners to innovate and our viewers to find and enjoy content in new ways. We pioneered deployment of HbbTV 2.0 making use of standardized HTML5 VOD player apps combined with new technologies such as DVB MPEG-DASH and advanced dynamic ad insertion. Freeview Play also brings together enhanced metadata from all major free-to-air broadcasters. This supports a scroll-back EPG, search and recommendations functionality - allowing viewers to navigate seamlessly between live broadcast and catch-up content. Freeview Play products meet DVB-T2 standards which underpin an expanding lineup of HD content.

This hybrid approach fits with evolving viewer behavior. While watching linear TV still accounts for the most viewing in the UK, the public's appetite for video on-demand is growing. Latest official figures for the UK indicate that catch-up and on-demand accounts for 12 per cent of viewing, increasing to one-third for the

16 - 34 age group. Our intention with Freeview Play is to reflect this increasingly hybrid viewing behavior and provide advantages for both consumers and manufacturers. For example, it used to be something of a lottery when buying a new TV as to which catch-up players would be installed. Today, Freeview Play is available in almost all new TVs from Panasonic, LG, Vestel, Humax, UMC and TPV, ensuring access to the full suite of catch-up players from the BBC, ITV, Channel 4, Channel 5 and UKTV. The Freeview Play badge also carries the assurance of a robust interoperability testing regime.

...the hybrid approach fits with evolving viewer behavior.

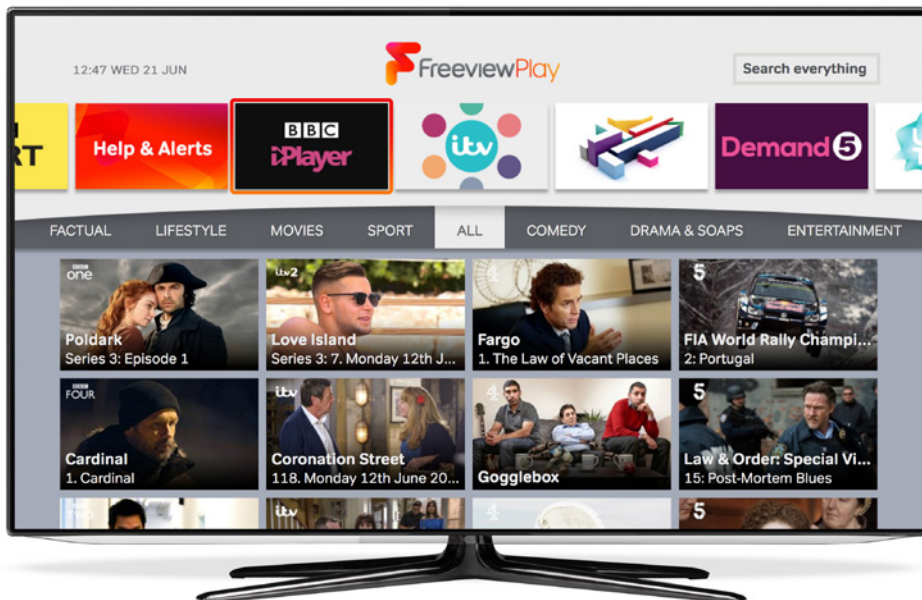
For manufacturers, Freeview Play has been designed with light-touch user interface guidelines that provide a degree of consistency but also room to innovate. An example of this is Panasonic's Quick Look Guide which uses Freeview Play's rich metadata feed to create an easy-to-use guide to live and catch-up programming, with options to search on-demand content and viewing recommendations.



**James Jackson** joined Digital UK as Director of Technology in 2015 to lead development of Freeview Play. Previously, James held a range of senior roles within the BBC's strategy and distribution teams.

These advantages have helped take Freeview Play from new entrant in the hybrid market to the most widely adopted system in the UK among manufacturers. At least 1.5 million products have already been sold with Freeview Play accounting for more than one-third of all smart TV sales in the UK. We have been quick to adopt the latest HbbTV 2.0.1 specification in Freeview Play 2017 devices, adding better support for subtitling of catch-up programs and EME-ClearKey content protection. We are also now able to support 4K and High Dynamic Range (HDR) over broadband. It's perhaps no surprise that the UK consumer magazine Which? listed Freeview Play as one of the five TV technology trends for 2017.

A new search and recommendations feature provides viewers with a new route to discovering catch-up content



### Fact file: Freeview Play



**Developed by:** Digital UK

**Launched:** October 2015

**Technical standards:**  
HbbTV 2.0.1, DVB-T2,  
DVB MPEG-DASH

**Linear TV:** 70 standard  
channels; 15 HD channels

**Catch-up:** BBC iPlayer,  
ITV Hub, All 4, Demand Five,  
UKTV Player

# Long Term Vision

## Satellite Video Broadcasting

**Thomas Wrede**, Chair, DVB CM-S

For decades hundreds of millions of consumers worldwide have been watching live linear television and listening to radio programs being broadcast via cable, terrestrial and satellite network infrastructures. Whilst the picture and audio quality has been steadily improving, in particular since the introduction of digital broadcast technology in the mid-90s with the successful DVB standards of DVB-C, -S and -T (first and second generations), the basic principle of broadcasting has not actually changed.

Broadcasting continues to be very successful, with consumers in European markets watching 232 minutes of TV every day (on average in 2015). Nevertheless the viewing habits of, in particular, the younger generations have started to change with the advent of internet delivered content and in particular with what we now refer to as Over-the-Top (OTT) services. The acceleration of new technology developments such as 5G, higher internet access speeds and ever more capable mobile devices may in the long term have an impact on broadcasting technology.

DVB needs to anticipate and analyze such future developments in order to take the right strategic decisions about which specification work items to focus on. Following the successful delivery of a long term vision study for terrestrial broadcast by the CM-T group, the DVB Commercial Module, at its 76th meeting in November 2016, endorsed the CM-S group's intention to pursue a similar study for satellite broadcasting.

For terrestrial broadcast, the potential game changers in the future could be a ubiquitous high-speed, low latency 5G network, and the increasing

pressure on large parts of the terrestrial frequency spectrum. Whilst for satellite broadcasting, these may be geostationary High Throughput Satellites (HTS) and, if successful, future Low Earth Orbit (LEO) HTS constellations together with a next generation of consumer terminals that ultimately may have phased-array antenna technology.

With the results of a long term study for satellite broadcasting, the DVB will get very concrete directions for future specification requirements in the area of satellite communications. The CM-S group started its work in spring 2017 by drafting the so-called terms of reference, along the following points and which will guide its work progress:

- Clear focus on unidirectional satellite delivery of audiovisual content as well as considering aspects of satellite internet content dissemination.
- Anticipation of further changes in consumer habits with regard to video consumption during the considered timeline, based on sound market research data.
- The study will take into account technology evolution, including its acceleration, and the shorter life cycles of hardware devices.
- The Study Mission will explicitly look beyond classic geostationary satellite constellations, anticipating the successful introduction of the use of non-geostationary satellite constellations.

An interesting question will be how far our industry will be moving towards an end-to-end IP delivery and eventually one day abandoning transport stream-based delivery technologies. The first discussions regarding this point resulted in the (preliminary) conclusion that the CM-S shall not anticipate such a move as a starting point, but shall refer to the findings in the "Beyond the Transport Stream" study mission report to the DVB SB (document CM-BTS0011r5).

Ultimately, the study mission will provide recommendations and a concrete action plan to DVB regarding satellite video and data delivery mechanisms and the (new) technology standards required for a time period of 2022 and beyond.

More specifically the study mission will provide a comprehensive report outlining:



**Thomas Wrede** is Vice President, New Technology & Standards in the Video business unit at SES. He represents SES in the DVB Commercial Module as chair of the CM-S subgroup.

- the current existing satellite video broadcasting market and technology environment;
- any expected shifts in consumer video consumption behavioral patterns;
- the near and long term satellite payload – and constellation developments;
- developments concerning RF communications technology evolution ("Moore's Law", phased-array and wideband technology...);
- examples of anticipated long term use cases for satellite video delivery;
- a possible integration of satellite networks with non-satellite networks;
- specific recommendations for new specification work that DVB will engage in the short to mid term.

...analyze future developments so that the right strategic decisions are made on which work items to focus on.

CM-S has drafted a first outline for the table of contents of such a report and as a next step will engage with the contributing DVB Members to provide the necessary market and technology information that will support the discussion. Furthermore, DVB is planning to let non-DVB Members participate in this activity and to solicit, in particular, the views from various broadcasters and operators. Such engagement could take place via a workshop that would be open to all interested parties.

Please contact the author if you would like to participate in any of these activities and want to contribute to shaping the future of DVB satellite broadcasting specifications.





# In My Opinion

## Addressable Advertising Will Make TV More Competitive

**John Moulding, Videonet**



**John Moulding** is Editor-in-Chief at Videonet, where he has been reporting on strategic trends in TV and television advertising for seven years. With Videonet he is focused on the unstoppable march towards connected, multiscreen entertainment experiences and what this means for key stakeholders including pay TV operators, broadcasters, advertisers and the CE industry. Videonet also tracks strategic developments in TV advertising and innovative ad-tech. For more information on Videonet visit their website at: [www.v-net.tv](http://www.v-net.tv).

Mediatel Events, publishers of Videonet, produce the Future TV Advertising Forum 2017. This year's event considers how to get the whole TV industry onboard to deliver the scale of advanced TV advertising inventory that buyers want, and how to give access to it with minimum complexity and cost. Among other things, it will consider the role of standards, and free-to-air platforms, in addressable advertising. The two-day event takes place in London on December 6 – 7. The event website can be found at: [www.futuretvads.com](http://www.futuretvads.com).

Advertising-supported television faces multiple threats, including the migration of audiences from measured to non-measured devices, growing content budgets at Netflix and Amazon, and the long term drift in ad-spend towards finely targeted media like search and social media. Recent advertiser concerns about brand safety, viewability and fraud in the digital advertising environment have helped the 'traditional' TV industry, but to secure its long term advertising future, TV must overcome its measurement weaknesses, become more data-driven, and provide advertisers with better audience profiling and targeting.

The good news is that advertisers want TV to succeed. They need its cost-effective mass reach and its unparalleled ability to build new brands, introduce new products, change perceptions and change behavior quickly. That gives television time to adjust. And there is no evidence that all brands need targeting: fast moving consumer goods (FMCG) manufacturers may be happy to advertise to everyone (and pay only for women if the product is aimed at women). Standard TV advertising is unlikely to disappear.

Targeting is a precision tool and must be used wisely. There is an acknowledgement that brands who over-target and do not maintain awareness among potential future customers will lose market share. But advertisers want TV targeting in their toolbox and addressable ads work well for specialist products and services. There is a classic case study from America showing how ride-on lawn mowers were targeted only at homes with more than an acre of land,

so avoiding 'wasted' impressions talking to people who will only ever need a push-along mower.

GroupM, which is influential because of the amount of money it spends on media on behalf of its clients, has made it clear that it wants television to hurry up and deliver addressable TV advertising at scale, with as little extra complexity and cost as possible. It wants platform operators and channel owners to put aside any differences they have and collaborate for the greater good.

There is the promise of new money for television advertising thanks to addressable, and not just from regional advertisers using postcode-level targeting. TV can start to compete for direct marketing budget once it can differentiate individual homes on the basis of their income, their cars, their social attitudes, the types of holiday they take and whether they own a cat. The biggest prize is the vast budget currently assigned to trade promotion, which covers things like taste-testing and special displays at supermarkets. Some of this money could come to TV, it is predicted.

More broadcasters are making it possible to target ads within their streaming services, including for live content. While advertisers welcome this, they still want the much bigger broadcast audiences to be addressable. Addressable TV on broadcast infrastructure has been proven to work. The challenge now is to increase scale, with more channels making their inventory available on more pay TV platforms, and with free-to-air platforms joining the party.

We are reaching the point where some rationalization of technologies and

processes will help, which explains why the DVB is assessing the need for standards relating to ad delivery, insertion and back office systems. And the search for new (and lower-cost) delivery solutions is underway – thus the interest in the idea of inserting IP-delivered ads into broadcast (e.g., DVB-T) streams.

Data-driven TV advertising is a continuum. It starts with the ability to eliminate unjustified zero-ratings for smaller channels, using set-top box reporting. It also helps advertisers find channels, shows and dayparts that

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...advertisers want  
TV targeting in their  
toolbox and addressable  
ads work well  
for specialist products  
and services.

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'over-index' against the kind of consumer they seek, then buy spots on standard linear TV. Addressable represents the pinnacle of this movement.

If the television industry gets addressable advertising right, it can monetize content more effectively and so become more competitive. All channels would benefit, even if they are funded by subscriptions or license fee. Despite what some people think, we still need aggregators but if their bouquets are weakened by the decline of commercial broadcasting, everyone is weakened.

# Intellectual Property Rights

## Fostering Patent Pools

**Carter Eltzroth**, Legal Director, DVB

The intellectual property rights (IPR) policy of the DVB has several unique elements. Like many other bodies developing technical specifications, DVB has a FRAND (fair, reasonable and non-discriminatory) obligation. But DVB imposes no requirement on its members to declare essential patents. The IPR policy also calls for arbitration of IPR disputes and, notably, the fostering of patent pools covering its specifications. DVB's IPR policy is successful: during its 20 plus years, there has never been an IPR dispute between DVB Members that has been subject to a judicial proceeding. And, more importantly, devices and services implementing DVB specifications are widely used worldwide.

One key for successful implementation is market certainty – early on – of royalty costs. Implementers don't want to be surprised, significantly after market launch and after their pricing of devices and services, by a royalty burden markedly higher than their assumptions. DVB reduces this problem by fostering the early formation of licensing programs (patent pools) covering its specifications. This has worked well across DVB's core specifications, such as DVB-T2.

There are other benefits that accrue to a specifications developer like DVB (and more generally to any specifying body) when it fosters pools covering its specifications. By fostering, it provides a life cycle service in support of its specification. This encourages greater adoption of its specifications. For implementers of the specifications, the activities leading to pool formation would create a mechanism for convenient licensing of essential patents at presumably a lower aggregate royalty. Fostering would speed overall pool formation, thus providing to the market an earlier view of licensing terms. Holders of essential patents would also find that a pool offers administrative convenience and the lower overall royalty encourages greater market take-up.

A jointly administered patent licensing program is by now a well-recognized structure for the licensing of patents, held by multiple licensors, essential to a standardized technology, for example telecommunications and audiovisual standards. A pool has two phases: its facilitation, when patent holders come together to agree terms for a licensing program of essential patents and for distribution of program royalties; and administration, when a third party administrator manages the licensing program,

signing licensees, collecting and distributing royalties, and other tasks.

To this two-step process DVB has added a prior, pre-commercial phase: pool fostering. Fostering is the process of encouraging patent holders to consider the formation of a pool covering a specification. Over the past twenty years DVB has experimented with a number of tools to foster the formation of patent pools. Today DVB's typical process has several steps:

- In the initial call for technologies, DVB asks each contributor to confirm that, if its technology is chosen for the DVB specification, it will participate in a meeting to consider pooling as DVB completes its technical development work.
- Shortly after the specification is completed, DVB calls a meeting of those who have made such a confirmation and makes a broader call for participants, including those outside DVB. Each participant must have a well-founded belief that it holds one or more patents essential to the DVB specification. The meetings are subject to confidentiality and to compliance with competition/antitrust rules.
- At the meetings, DVB leads the discussion with holders on whether the time is right to begin a pooling effort; whether the right companies are participating in the holders' process; and whether DVB's continued activity is useful for the pool's progress. It leads the process for determining the criteria for the choice of a commercial pool facilitator. In this phase, DVB's fostering is finished when the participants select a facilitator.



Carter Eltzroth

At the end of facilitation, when the pool program is ready to be commercialized, DVB can provide a forum for exchange of views on the licensing terms, bringing together the licensing administrator (and pool members) and potential implementers. This model has been successfully applied in the fostering of the DVB-T2 and other recent licensing programs.

Similar bodies, such as IEEE, have undertaken pilot fostering efforts. Recently DVB has considered encouraging pool fostering by other bodies, notably those that author materials normatively referenced in DVB specifications. Thanks to early pooling, the broadcaster or device manufacturer may know the costs of DVB specifications, but the costs of other key standardized technologies may not be known until years later. This has recently been the case, for example, of HEVC and DASH. Standards bodies should consider DVB's model. This could provide earlier market certainty of the total royalty burden when a device implements multiple standards.





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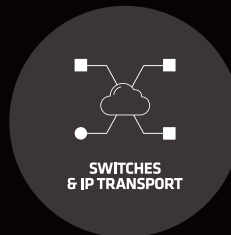
**Targeted Ad Insertion**

The **AdsEdge** is ENENSYS' targeted Ad insertion server and splicer to enable broadcasters to more effectively monetize their content with the insertion of advertisements on a regional basis. Relying on SCTE35 cue messages, the **AdsEdge** offers an elegant means to generate additional revenue through the insertion of local content, such as adverts, news and weather forecasts, at the final stage of DTT delivery – at the transmitter site – within a DTT Single Frequency Network (SFN) or MFN environment.



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## Redundancy Systems 1:1/N:1



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