



Targeted Advertising

Study Mission Report

September 2017

DVB Document Reference: **CM-TA-SMG0012**

1. EXECUTIVE SUMMARY

Disclaimer

The findings and statements found in the report are to be considered as constituting in many instances “opinions” rather than supposedly certain and proven facts, as the SMG wanted to communicate and share in the report its findings and thoughts on Targeted Advertising, without pretending that these findings and thoughts constitute a fully accurate and definitive description of the targeted advertising landscape which could not be challenged by alternative visions.

Targeted Advertising is a highly likely and necessary evolution of the TV and Broadcast ecosystem

In a few years, it is extremely likely that Targeted Advertising (TA) models will have been deployed in most TV markets, attracting from 10% to 40% of the complete TV advertising value.

While TV advertising is still growing in some markets, a shift to targeted models is vital in order to slow down, and ideally stop or even reverse, the on-going shift of advertising euros away from traditional medias (print, TV) to digital/mobile, which also involves a shift of value from broadcasters to new pure-play digital market players; it can be expected that targeted TV ads will command higher unit prices (from +15% to a multiple of 2x to 4x), enable a better monetization of TV inventories and also increase viewer satisfaction by serving more acceptable ads to viewers.

No satisfactory workable enabling technology framework to allow TA in the context of Horizontal Broadcast TV

Given the strong market rationale, whether defensive or offensive to adopt TA, broadcasters are generally keen to do so, and some deployments have already taken place. However to date, these are limited to the vertical TV environment (Pay TV, IPTV, Cable TV) where an operator has control over the full delivery chain, including the end-user set top box or client software. The most prominent examples of TA deployments include US Pay TV operators (cable and DTH) and Sky properties in the UK, Italy and Germany.

When it comes to the traditional horizontal broadcast TV sector, no commercial deployment exists at the moment. Some technical trials have been conducted in the DVB/HbbTV ecosystem, while ATSC 3.0, which may open some possibilities for TA in a Horizontal context, is only at the very early days of a deployment (in Korea) targeting UHD distribution.

In fact, no suitable TA solution currently exists to enable horizontal broadcasters and other stakeholders to deploy and benefit from TA. This is a significant issue and challenge for them.

HbbTV (2.0.1 version) seems to include some of the components which could enable TA in the broadcast context, and some technical trials use it already, but it does not fully meet the requirements identified by the SMG to implement TA. The lack of a clear and complete deployment of the HbbTV specification (including some of its optional features) in all markets is also a potential issue.

The need for DVB to develop a framework to enable Targeted Advertising, focussing on horizontal broadcast business model as a minimum.

Given the high importance to broadcasters and advertisers of widely enabling TA in the context of Broadcast TV and the lack of an existing satisfactory solution to do so, the SMG recommends that DVB should develop an enabling TA framework, focussing on horizontal broadcast business models as a minimum.

As vertical TV operators have started some proprietary implementations, it may appear that they have less incentive for the time being to adhere to a new standardized framework; however, it is quite likely that a DVB TA standardized framework – if created- would be attractive to vertical platforms as well, so their specific needs should not be ignored if DVB takes up the challenge for a TA specification.

A future DVB TA framework should address a limited set of precise and important goals

The following points need to be addressed in a future DVB TA technology framework to efficiently enable TA in the context of broadcast TV;

1. **End to End in-band signalling**, (e.g. SCTE 35) so that existing play-out signalling can be correctly propagated through a standardized translation mechanism to all TV receivers in order to correctly trigger the ad substitution
2. **“Seamless” switching or substitution in the receiver**, as perceived by the end user, so that the user experience would be consistent with the quality associated with broadcast TV, providing a better result than current web execution of ad insertion / substitution.
3. A limited but reliable **receiver buffering / pre-load capability** (e.g. 30 seconds storage) seems to be necessary to achieve this, given the wide dispersion of streaming performance and the need for a broadcast TA model to reach to mass audiences, independently of their streaming abilities.
4. **Reliable and accurate reporting**, so that the advertising management platforms and trading stakeholders can rely on trustworthy measurements avoiding the doubts and distrust that, in many instances, taint the digital advertising chains;
5. Leave ample **control and management capabilities to the broadcasters** over the TA operations, so that they can correctly manage end user experience and also legitimately benefit from the value generated by TA
6. Offer **standardized interfaces with the prevailing existing digital advertising systems** so that broadcast TA could be easily integrated in holistic advertising and audience planning strategies; this will for instance include the **exposure in real-time** (or close to real-time) of **the inventory of addressable TV receivers**
7. The end to end chain of command and reporting should be organized in a way that allows for **last minute ad insertion decisions**
8. **Reach**, so that a vast majority of broadcast TV receivers would be eligible, with due consideration for legacy devices (for instance, applicable to connectable devices delivered in the last 3-5 years)
9. The DVB TA should be **cognizant of privacy regulation** so that it will facilitate the compliance with the new and demanding privacy regulations (e.g. GDPR) which will have a very high impact on the overall future structuring and operations of TA. However, a future DVB TA will not be aiming at fulfilling (and will not fulfil) the compliance with the diverse privacy regulations, for which compliance will remain the responsibility of each market participant.

DVB should form a dedicated CM-TA group, tasked with generating detailed TA CRs, and also liaising with relevant external bodies

Given the business importance of the TA case to the Broadcasters, one of DVB’s core constituents, it seems highly appropriate that DVB should form a dedicated CM-TA group, building on the momentum created in the SMG, to develop the commercial requirements for a future DVB TA specification (or set of specifications).

This subgroup should also carefully liaise with existing external constituents so that any pre-existing relevant base can be widely used, even if it not fully sufficient for the time being.

This should include at least;

- Liaising with the **HbbTV** forum to explore if HbbTV (and/or DVB) can expand the existing assets towards a fully functional TA platform
- Exploring the exact remit of the TA –oriented features of **ATSC 3.0**, and to the extent relevant, seek to reference or port the relevant elements into DVB
- Opening a liaison with the **Streaming Video Alliance**, which is initiating some work to enable TA in the OTT environment

- Reaching out to internet digital advertising institutions, in particular the **IAB**, with the aim of generating the appropriate interfaces between the broadcast chain and the existing digital systems.

Given the magnitude of the task, the SMG estimates that the CR generation will require [6-12] months and then the specification development another [9-15] months; this will make the DVB TA framework available during the period from late 2018 to mid 2019.

The need for creating new commercial agreement with CE Manufacturers

Finally, the SMG wants to emphasize that a TA specification by DVB, although relevant from the point of view of enabling and simplifying the complex technical mechanisms behind TA, will probably not be sufficient on its own, and that certain specific commercial agreements between ecosystem stakeholders may be required to fully enable the DVB TA framework.

Specifically, certain specific capabilities (e.g. buffering / storage) need to be made available in the TA enabled TV receivers and this requires cooperation from the manufacturers of these receivers; at this stage, the SMG reports a perceived lack of interest from CE manufacturers to devise and agree to implement a future TA specification without such commercial agreements being established which establish incentives for them to do so. These agreements will need to be negotiated outside of DVB at the national level.

2. INTRODUCTION – SCOPE OF THE REPORT

The overall advertising market is rapidly evolving towards digital, programmatic and addressable models. TV advertising, which is an important segment of the overall advertising space, will also be influenced by this evolution.

In this document, the terms “addressable advertising” and “targeted advertising” are used indifferently and refer to a function or process by means of which a decision is made as to whether or not to replace an advertisement. If a replacement takes place, the process also has to select an appropriate replacement advertisement and report on the outcome. This process operates on generally broadcasted advertisements in linear (live) television on an individual screen by screen basis.

Initial solutions for addressable TV advertising being introduced are predominantly proprietary. These proprietary solutions cannot be applied to horizontal platforms in their current form and an alternative approach is needed to service horizontal markets. For this reason DVB, the home of most European digital TV standards, decided to establish a study mission to evaluate if it would be appropriate to create a new standard which would facilitate the actual implementation of TA for television, focusing on classical linear broadcast television on horizontal platforms.

The Study Mission was established in February 2017 with the mandate “*to advise DVB on the relevance, feasibility and possible scope of a –potential- DVB standard (or any other DVB actions) needed to facilitate the execution of targeted advertising in the context of TV viewing, especially when TV content is delivered using one or more of the main DVB standards (e.g. Terrestrial Broadcast – DVB-T/T2, DVB-C/C2, DVB-S/S2/S2X, DVB DASH)*”, as stated in the SMG’s Terms of Reference¹.

This report is the result of the work conducted in the CM-TA-SM group, as required by the Terms of Reference, between March 2017 and July 2017.

The group aimed to provide the CM and DVB Steering Board with practical and actionable recommendations on the relevant next steps for DVB on Targeted Advertising.

Firstly, in order to gather relevant information about market dynamics, reference use cases, overview of current technologies as well as interest of different stakeholders for a DVB standard, the SM group prepared and submitted a questionnaire to DVB Members and key stakeholders from different backgrounds (advertisers, agencies, ...). Questionnaire results were then analysed and further discussed during a 2 day workshop organised in April in Cologne. Subsequently, the activities needed to summarize the collected results and to prepare this report were carried out through a number of weekly online meetings.

The questionnaire and a summary of the answers can be found in an Appendix to this report. The answers obtained in the questionnaire have been widely used by the SMG to come to the findings and proposals contained in the report, although the SMG participants have also brought their own points of view and opinions in the formation of the report.

The DVB Steering Board, at its meeting on 15 November 2017, decided to make the current report publicly available on the DVB website.

¹ Document CM-TA-SMG0003r1 ; https://www.dvb.org/resources/restricted/members/documents/CM-TA-SMG/CM-TA-SMG0003r1_Terms-of-Reference--PDF-version.pdf

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3. MARKET OUTLOOK & BUSINESS CONSIDERATIONS

Lots of research, papers, blogs and discussion exists on Targeted Advertising (TA). From this body of information it emerges that, although addressable TV has been in the works for decades, only recently has the technology enabling TA on TV sets to gather momentum and be implemented in a growing number of markets and platforms. In the following clauses we offer an overview of the market and its foreseeable evolution in terms of advertising developments.

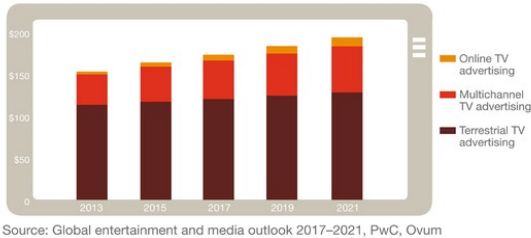
3.1 The Advertising Market

The global advertising market is evolving. It is not only the growing advertising spend share on internet, but something more important that could design a new ad funded media system. The key points are:

- The advertising market will be worth around \$630 billion in 2020 with a 4% CAGR (2016-2020); the growth predicted is mainly due to online advertising and minimally to TV advertising, noting that the reduction in printed media advertising revenue has not transferred to TV (source: e-Media Institute elaboration on Zenith Optimedia data);
- Online advertising will be worth around 45% of the global advertisement investments in 2020; 2017 will see the global online ad market overtaking the global TV ad spending (source: e-Media Institute elaboration on Zenith Optimedia and Magna Global data);
- Alphabet (Google) and Facebook, the two major online players, have a strong, and still growing, aggregate share of the US online advertising market that reached around 70% in 2016; this combined market share is 59% (will be 61% by end 2017) of the global online advertising market and 20% (will be 22% by end 2017) of the global advertising market (source: e-Media Institute elaboration on Zenith Optimedia and IAB PWC data);
- By 2020, around 65% of the online advertising spend will be on search engines and social media; this will be exclusively based on real time automated bidding systems (also known, in the advertising or marketing context, as programmatic). Overall, programmatic advertising which takes account of search, social, display, video and mobile, will be 82% of the total online advertising (source: e-Media Institute elaboration on Zenith Optimedia and Magna Global data).
- According to PwC, terrestrial TV advertising continues to dominate. However, the ongoing global growth of pay-TV penetration and online TV advertising is slowly eating into its dominance – with emerging markets becoming digitized and audiences starting to fragment, driven by growing smartphone and tablet penetration. Terrestrial TV advertising revenue is expected to smoothly grow to US\$128.1 billion by 2021, still accounting for approximately two-thirds of the global total TV advertising revenue (source: Global entertainment and media outlook 2017-2021, PwC, Ovum, figure 1) .
- Economic growth in many emerging Asia Pacific markets is creating a new generation of consumers for advertisers to target. Companies continue to leverage new tools to advertise to these vast TV markets. Indonesia for example, is expected to grow at 10.4% CAGR by 2021 to become the fourth-largest TV advertising market in the world (source: Global entertainment and media outlook 2017-2021, PwC, Ovum, figure 2).

Terrestrial channels continue to dominate TV advertising despite multichannel growth

Global TV advertising revenue by source (US\$bn), 2012–2021

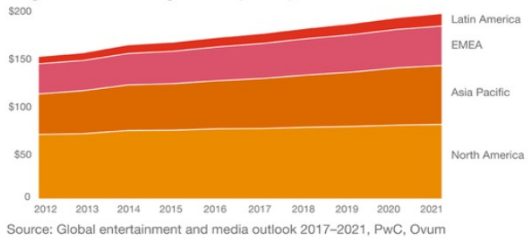


Source: Global entertainment and media outlook 2017–2021, PwC, Ovum

Figure 1

Strong growth in Asia Pacific will see it reduce North America's TV advertising lead

Regional TV advertising revenue (US\$bn), 2012–2021



Source: Global entertainment and media outlook 2017–2021, PwC, Ovum

Figure 2

Considering that real time bidding systems are based on consumption data, allowing bidding up to a target price, those platforms able to gather data from their viewers will see better growth. This seems to present the biggest challenge to advertising revenue for the overall TV industry.

3.2 Targeted Advertising Market

The US market is the most advanced market for targeted advertising. Cadent Technology is reporting the following 2016 US TV advertising market landscape:

- Traditional Linear TV, with a very limited ad insertion granularity, – i.e. traditional programme and day part based media plans, schedule based ad insertion and non real-time data/optimization – at around \$71 billion; a flat market;
- Audience Indexed, with a limited ad insertion granularity, – i.e. use of data to optimize media plans to hit indexed audiences, schedule based ad insertion and non real-time data/optimization – as a market with a potential growth of 20-30%;
- Addressable (DAI, Dynamic Ad Insertion), with robust ad insertion granularity, – i.e. true household/device targeting, dynamic real-time ad serving, real-time data, unicast delivery to STBs and devices via managed network – at around \$890 million, with 120%+ growth YoY according to eMarketer;
- Online Video via OTT, with robust ad insertion granularity, – i.e. true household/device targeting, dynamic real-time ad serving, real-time data, unicast delivery to STBs and devices via unmanaged network – at around \$5 billion with a growth of 20-30%.

Big players, in US and Europe, are already involved in selling addressable advertising:

- in North America, Charter Spectrum (including TWC and Brighthouse), Comcast, Cox, Altice, DISH, ATT/DirecTV, Verizon in US and Rogers in Canada;
- in Europe, Sky AdSmart launched in UK, Ireland and Italy (1/2017) and Liberty Global in UK/Ireland (Virgin) and Belgium (Telenet) (12/2016). In Germany major private broadcasters already use HbbTV for targeted advertising (ad banners, micro sites, no spot full screen replacement yet). Mediengruppe RTL Deutschland's in-house marketer "IP Deutschland" is already selling addressable TV products to agencies and ad buyers (http://www.ip.de/addressable_tv.cfm) that are HbbTV-based. SBS in the Netherlands launched addressable TV advertising early in June 2017.

But it is not just a tech players business:

- Agencies:
 - Group M/Modi pioneered addressable campaigns across multiple MVPD footprints;
 - WPP took a stake in addressable linear company Invidi together with AT&T and DISH;
- Marketplace:
 - One2One Media is selling across 60m+ addressable homes in the US;
 - Sky has a total customer base of 22.4 m households, although not all are currently enabled for TA.

- Data Management Platforms:
 - MVPDs integrating first party brand information, third party demographic data and MVPD CRM data

In terms of US addressable households a Starcom MediaVest survey indicated that 49.8 million US homes, or half of all pay-TV homes, can today be reached with addressable TV ads. Despite this, the addressable TV ad spending only reached \$890 million in 2016, just 1.3% of total television advertising spending.

3.3 New Value Creation

The market appetite for Targeted Advertising could add new value to the TV advertising market. Indeed, TA is forecast to grow to take a much larger share of TV advertising – eMarketer predicts addressable TV ad spend will double year on year to top \$2 billion by 2018. Although this is just 2.9% of total TV ad budgets, bringing better perceived value to TV advertising will help to stop its erosion, although it remains to be seen if this growth rate will materialise⁹. For example, for traditional linear TV advertising, ITV's guidance for H1 2017 TV Net Advertising Revenue (NAR) is 8-9% down YoY, according to Enders Analysis "ITV et al. facing the NAR squeeze", May 2017.

Despite the uncertainty, TA is seen by broadcasters as a significant opportunity to increase value and counter the continued loss of revenue to the global digital OTT players such as Google, Apple, Facebook and Amazon (GAFA). Broadcasters and advertisers believe TA has a strong potential to increase viewer engagement and satisfaction compared to traditional advertising. However, advertising is by its nature, intrusive and repetitive, and there is a risk that TA is more intrusive due to the specificity of the message itself. The potential consumer annoyance can be mitigated in part, at least, by using techniques such as a "frequency cap" whereby the number of times a specific advert is repeated, within a certain time period, can be limited. It is expected that this kind of management of the service could help in making TA more engaging and satisfactory for the end viewer.

From around the globe, markets and stakeholders are envisioning advertising revenue growth thanks to TA; selected data is summarized below:

- In the US, ATSC 3.0 will offer tools for targeted advertising. The additional advertising revenue is estimated at between \$2 billion and \$4.5 billion (source: FTI Consulting 2015); TA has started in Korea in May '17, showing it is now a reality for the horizontal market;
- The German net TV ad market will see a growth of at least €125 million due to addressable TV only, from 2015 to 2020 (source: Magna Global and SevenOne Media on June 2016);
- In 2016, ProSiebenSat.1 implemented around 100 addressable campaigns for 50 customers. The potential to grow is significant and 2017 will see double figures (source: ProSiebenSat.1 Media SE, 2016 financial report);
- In France, SNPTV, the "Syndicat National de la Publicité Télévisée", foresees TV advertising revenue growth due to TA of about €200 million with geo-localization versus about €80 million without geo-localization, by 2022, out of a €3.3 billion, meaning respectively a ratio of 6% or 2.4%;
- Mediaset, in Italy, foresees a targeted advertisement price that is around 10-15% higher than a traditional advert price; by 2020 the company will be able to target around 15 million addressable TV households with added 1.2-1.4% on total revenues (source: Mid-term guidelines and financial targets, London, January 18th, 2017; [http://www.mediaset.it/gruppomediaset/bin/53.\\$split/Mediaset_London%20Jan18.pdf](http://www.mediaset.it/gruppomediaset/bin/53.$split/Mediaset_London%20Jan18.pdf));
- In the UK, Sky aims to use AdSmart to boost its sales, handled by Sky's media sales house, to £1 billion by 2020 from under £800 million of total advertising revenue last year (source: The Telegraph, April 2017, <http://www.telegraph.co.uk/business/2017/04/17/sky-virgin-media-talks-targeted-tv-advertising-tie-up/>).

3.4 Positioning the Study Mission scope in the Market Context

The main task of the CM-TA-SMG is in point 2 of ToR; it is the following:

2. *The overall objective of the CM-TA-SM is to advise DVB on the relevance, feasibility and possible scope of a – potential – DVB standard (or any other DVB actions) needed to facilitate the execution of targeted advertising in the context of TV viewing, especially when TV content is delivered using one or more of the main DVB standards (e.g. Terrestrial Broadcast – DVB-T/T2, DVB-C/C2, DVB-S/S2/S2X, DVB DASH).*

As depicted in the following high level diagram, delivering TA involves a lot of interested stakeholders; it is a complex process where content providers, distributors, marketers – agencies and brands – and companies have implemented solutions which are mainly proprietary albeit using standardised technology as part of those solutions. Plenty of standardised technology is already available – see the following chapters – and exploited in certain distribution environment (e.g. cable) or used partially in the value chain.

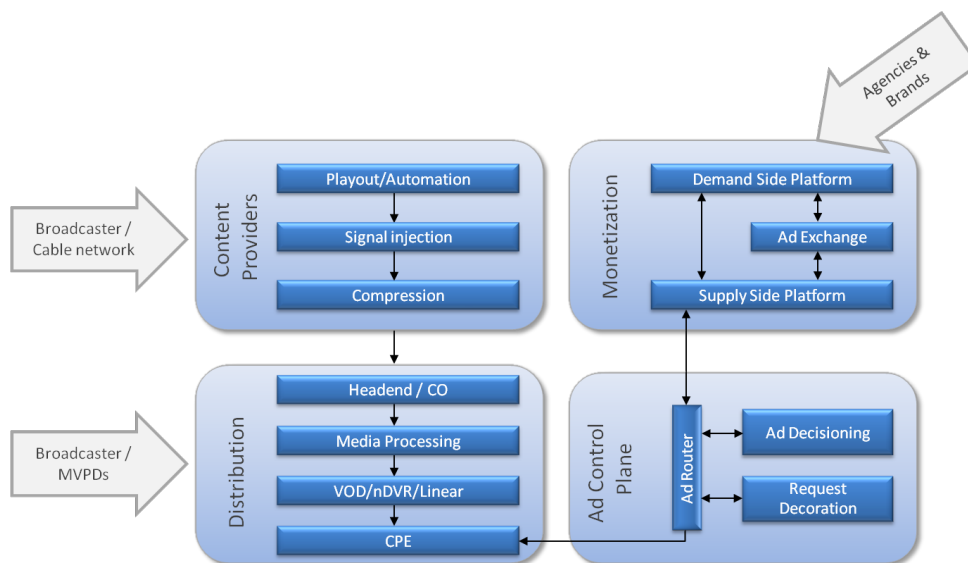


Diagram 1 - Involved parties in TA delivering

Again from the ToR:

3. *The scope of the scenarios to be covered by the Study Mission shall include:*
 - *Live TV delivered over a typical broadcast / DVB mechanism (e.g. Transport Stream in a DVB-T or T2 physical channel or DVB-S, DVB-C or DVB IPI)*
 - *Non-live TV or live TV delivered over an IP mechanism (e.g. DVB-DASH)*
4. *The Study Mission shall especially, but not exclusively, take into account the “horizontal” receiving devices (eg. : TV sets) where it is the least convenient to deploy vertical technologies*

3.5 Key Business Requirements from the Market

There are key identified business elements to be taken into account when talking about TA. The SMG has discussed the following:

- high quality and reliability with faultless end-user experience;
- accurate and reliable measurements to build trust of advertisers (trusted reporting);
- transparent and fair handling of privacy in light of the new UE General Data Protection Regulation;
- low execution costs.

Generally speaking, a commercially attractive TA ecosystem, taking into account the differences between horizontal and vertical markets with their respective commercial needs, should rely on the confidence that a win-win proposition between the ecosystem members is achievable, which leads to the following suggestions:

- Market reach is crucial; advertising is based on high numbers and it is a necessity to address a suitable number of deployed TV clients;
- There must be consistency with what is already in use; i.e. systems and algorithms to determine and control the audience data, audience attributes, audience profiling, selection and serving of targeted ads, ad tracking and reporting, billing, and so on seem essential considerations to maintain past investments. This means the reuse of existing ad-tech systems from both worlds, the broadcasting and the internet, to the largest extent (see details on chapter 4.1 "Technology Outlook" and on 5.2 "Key requirements to a new TA system; Integration with Existing Ad-Tech Systems");
- TV devices should offer, in terms of TA features, a better end-user experience than the existing web-solutions over the internet through web and mobile in terms of, for instance, smoothness, transition timing, picture quality;
- Ad skipping could be a concern for broadcasters and their ad investors; mechanisms to block ad skipping, once playing back a block of ads, could be considered as an investment safeguard;
- Maintain the established brand trustworthy of the TV industry stakeholders; a controlled environment should be provided to offer a reliable and safe user experience without fraud as major players in the internet domain are experiencing (see <https://digiday.com/marketing/youtube-handled-brand-safety-crisis/>);
- Identification of devices with certainty all the time is necessary; operators and advertisers need to gather accurate consumer usage information, counting devices that return to services and to address personalized ads to cluster of devices; this functionality must however be managed in compliance with local privacy regulation. The legal and regulatory regimes are evolving (consider, for instance, the new EU GDPR framework on data protection described in the following clause), with a growing international consensus on the core rules and principles for data privacy. It is critical to pay attention to the voice of the viewers in the design of products and services. Designers and developers of TA systems must adopt a viewer-centric view where design of appropriate privacy controls and practices are built into services from the outset. This will ensure that services comply with relevant regulations and will help build and maintain trust with viewers and other stakeholders.

3.6 Commercial Hurdles

As presented in the earlier sections of this report, there is a strong motivation for advertisers, broadcasters and operators to implement a TA system. When working in the confines of a vertical market, there are far fewer constraints, commercial or technical; this is arguably most pertinent when it comes to the provision of consumer hardware. In a vertical market the operator can specify the STB themselves and decide on the business model for procurement and distribution. In the horizontal market broadcasters/operators do not develop the consumer hardware themselves rather they rely on CE manufacturers who will make their own implementations based on their view of market needs and what will be profitable for them (see 6.6 "Commercial Arrangement Statements" further down in the document and Digital Europe statement on "Policy Statement on Connected TV within the Global Media Value Chain" here

http://www.digitaleurope.org/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=2213&language=en-US&PortalId=0&TabId=353). Currently this does not include the development of TA functionality which appears likely to come with both hardware and software requirements. Potentially this could be overcome by commercial arrangements outside the scope of DVB which are seen as mutually beneficial.

There is however an additional element of concern relating to a need from advertisers for the system to be able to address devices individually. This raises a number of important privacy and reputational issues for manufacturers. There is, for example, a high chance that consumers (and commentators) will not understand which organization is collecting their data and for what purpose and may blame the CE manufacturer leading to a number of adverse effects, but also for the consumer to decide not enable the TA service.

It is therefore vital that individual service providers invest in educating their viewers about the TA service they are enabling, what the benefit is to all sides and what will be done with their personal data and for which purposes/time period etc.... as required by GDPR which is described in the section below.

3.7 Privacy Regulation

One important consideration within the Euro-zone is the requirements placed on organisations by a new harmonised EU regulation called the **General Data Protection Regulation (GDPR)**².

The EU had a Data Protection Directive³ already in place however the new GDPR extends the scope over the previous Directive and gives significantly greater rights and protection to Data Subjects. The GDPR was adopted in April 2016 and will be fully enforceable from 25th May 2018 following a 2-year grace period. GDPR is relevant for any organisation based in or delivering services to the EU and handling personal data. This report document does not seek to explain the full extent of the GDPR. Information from the European Commission can be found at http://ec.europa.eu/justice/data-protection/index_en.htm⁴.

The Article 29 Working Party is tasked with overseeing how the GDPR is implemented across the EU and issues guidance documents on topics in the area of privacy⁵.

One of the most challenging areas is called “data protection by design and by default”, which calls for the adequate incorporation of data protection principles when designing and setting up systems and processes handling personal data, as well as during the actual data processing itself:

“The controller shall... implement appropriate technical and organisational measures... in an effective way... in order to meet the requirements of this Regulation and protect the rights of data subjects’ (Article 25 1.). Article 25 2. calls for controllers to hold and process only the data necessary for the completion of its duties (data minimisation), and to limit the access to personal data to those needing to carry out the processing. When contracting out the processing of data, the controller has to ensure through appropriate contractual obligations that the processor fulfils the necessary data protection requirements (Art. 28)”.

TA will, by definition, be using data from Data subjects. Data controllers will need to be identified at each step of the chain and to ensure that they take and hold only the minimum amount of data needed. Data

² Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) available at <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R0679>

³ Directive 95/46/EC on the protection of individuals with regard to the processing of personal data and on the free movement of such data

⁴ An unofficial overview over topics in the GDPR can be found at www.eugdpr.org

⁵ http://ec.europa.eu/newsroom/just/item-detail.cfm?item_id=50083

subjects will have the right to access their stored data and to be “forgotten”. Organisations will have to ensure they have adequate steps in place to protect data; any breaches could be very expensive if failures are found.

NOTE: This report has only focused on the EU Regulation, others may exist elsewhere in the world. There are reports that many countries and regional organizations outside Europe are looking to the GDPR as model for their legislation.

3.8 Guidance for Future DVB work

One clear message is that, if it is agreed that DVB should develop new standards then work should be commenced sooner rather than later. The development of a DVB TA standard is urgent, at least for certain scenarios/use cases, and the following should be taken into account;

- DVB should quickly define a framework based on existing standards, noting that initially, at least, this means it may not be suitable for vertical markets.;
- The majority of respondents stated that they are (at least) considering to participate and to contribute to the standard for horizontal and vertical broadcast TV markets, not for OTT where DVB might have to partner with another SDO;
- Further, most of the companies who took part in the survey would “very likely” support a DVB TA standard in their products, subject to its acceptance by the relevant market players;
- When asked in which market a DVB TA standard could be deployed, respondents name applications on horizontal platforms (for example certain DTT and DTH) as well as, given sufficient incentive to do so, on vertical platforms in some markets with a variety of distribution technologies including cable, managed IPTV and OTT. All TA standardization activities are siloed so far: US cable MSOs TA initiative is completely independent of ATSC 3.0 and vice versa. HbbTV 2.0 TA refers to DVB TS 101 154 specification and we would anticipate that also for TA on vertical and OTT markets. Creating something more universally deployable is the unique value that DVB could bring as an SDO to the market.

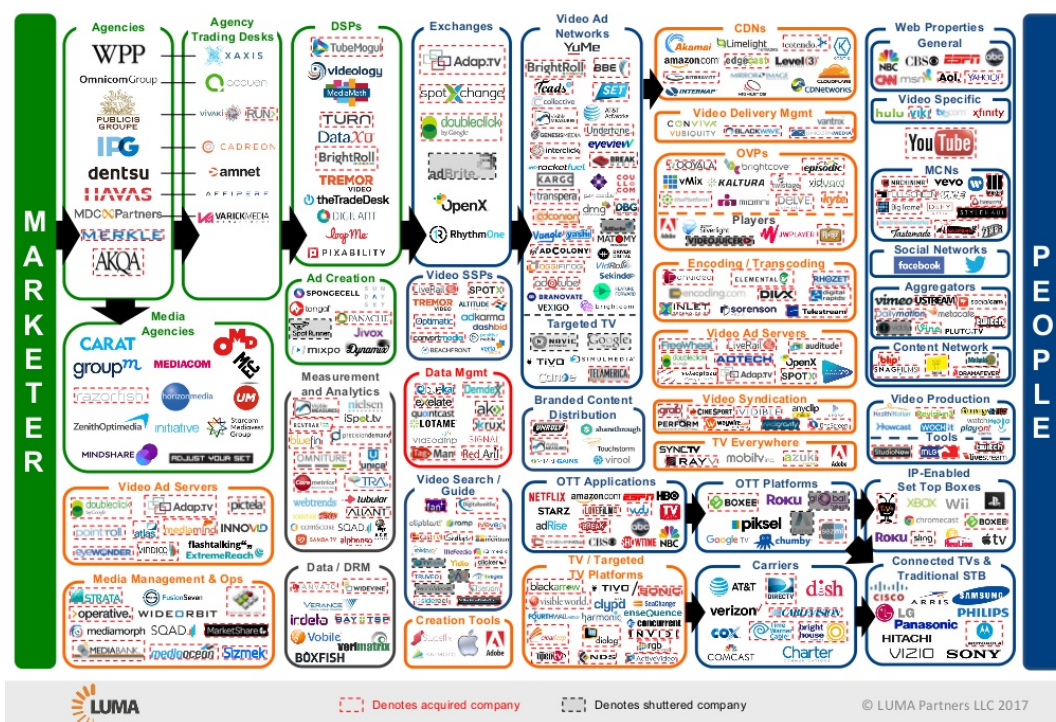
4. TECHNOLOGY OUTLOOK & HURDLES

4.1 Technology Outlook

There are many advertising technologies, services and solutions implemented in broadcast and broadband systems. Since these come from different environments, they have different realities to cope with, with different assets, specialized elements and complexities. Once we are facing addressable advertising in Television, a mix of the 2 implementations is needed to enable the capabilities, balancing benefits and requirements from both worlds.

At the same time, the Media groups and Agencies are unifying the platforms for managing the addressable advertising on any type of distribution and device to deal with the seller's inventory and the buyer's needs. The scope of this study is to analyze addressable advertising on classical broadcast platforms (terrestrial, satellite and cable) taking into account DVB's understanding of the existing trends and possibilities.

The combination of the technologies and services that connect advertisers with publishers/broadcasters can be a complex process with many parties and technological components involved. (See Figure below)



In order to deal with this entanglement we propose a generic overview of a TA system focused on “Linear broadcast to stationary devices” as a reference base to cover 2 relevant scenarios for the Study Mission:

1. Linear broadcast to a stationary device – horizontal scenario
2. Linear broadcast to a stationary device – vertical scenario

Variations of these two master scenarios can exist. For instance, a third scenario could be to include the introduction of a mix of the two previous scenarios on a typical CI+ oriented case, covering vertical services to a horizontal platform/TV.

However it is recommended that this mixed scenario should be analyzed in detail, along with nonlinear and other possible variations, when drafting commercial requirements.

4.2 Reference Architecture Scenarios for TA

The following figures help to identify technology hurdles by naming the relevant system components, which may or may not require standardization. Thus, these figures are intended as a basis for the technical analysis in the DVB TA SMG report. However, the scenarios have been simplified and are intended only as a reference for the Study. The scenarios are illustrated in Figure 1 and Figure 2, which each provide a high level system overview.

The first figure represents a generic broadcaster oriented approach, on an horizontal scenario, where the typical device is a TV set not controlled by the publisher (the broadcaster)

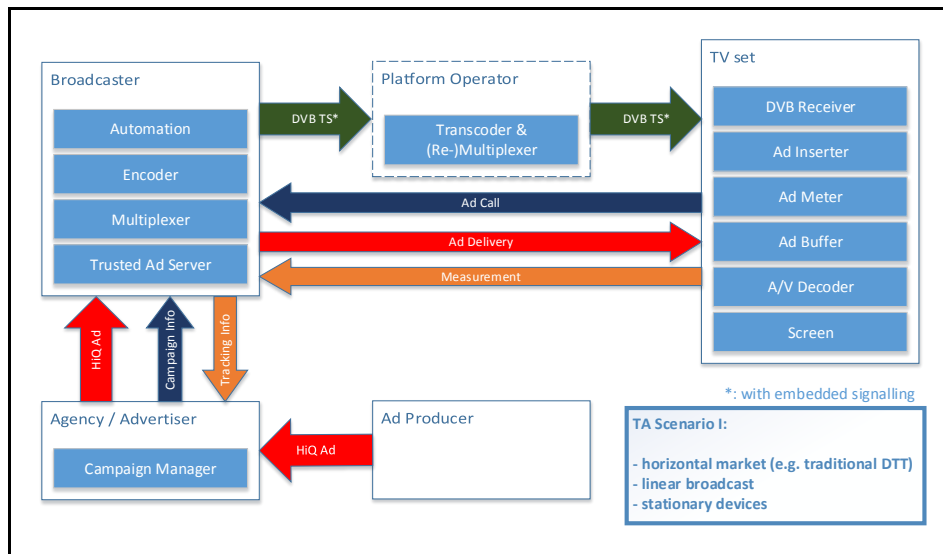


Figure 1: TA reference scenario 1: Horizontal Platforms

The Second figure represents a generic cable operator oriented approach, in a **vertical scenario**, where the typical device used is a STB, normally controlled and specified by the Operator.

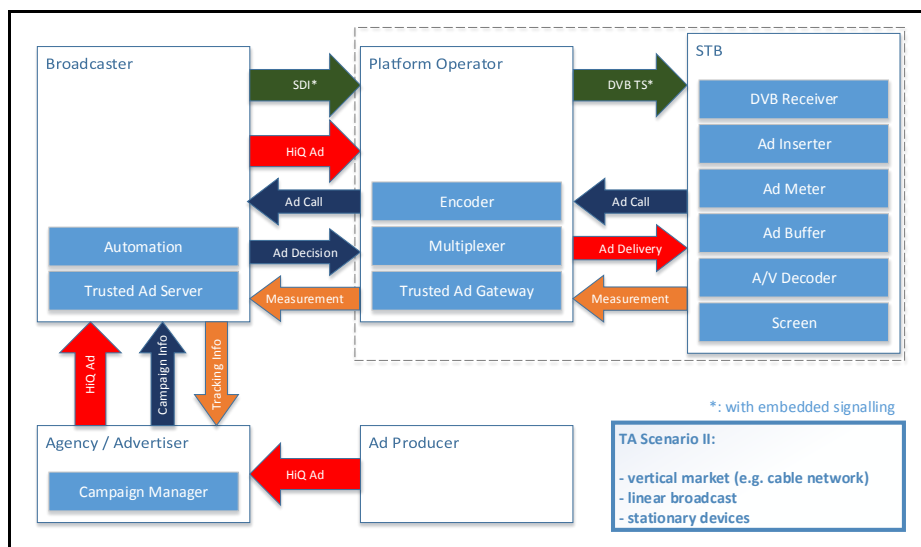


Figure 2: TA reference scenario 2: Vertical Platforms

4.3 Reference Architecture Components for TA Scenarios

The components are defined as follows:

Components Common to both Scenarios:

The common components are related to the broadcaster (or content provider), to agencies (or advertisers) and to the devices. In any case, the devices entity differs from each scenario in terms of the capacity to be specified and controlled by platform operators .

Automation (Broadcaster):

- Must be capable of generating & inserting ad signaling information (e.g. to mark beginning and end of avails) into a SDI signal

Trusted Ad Server (Broadcaster):

- I/O:
 - o Information regarding ad campaigns are provided as input from agencies
 - o Ad files of high A/V quality (e.g. mezzanine files) are provided as input from agencies
 - o Receives measurement reports as input from targeted ad clients
 - o Provides tracking information (reporting) as output to agencies
 - o Delivers ads to targeted ad clients and/or provides ad decisions as output to one (or many) trusted ad gateway(s)
- Provides a defined/common set of ad features
- Makes ad decisions based on static or dynamic decision rules
- Processes measurements reports (for providing tracking information)

Campaign Manager (Agency/Advertiser):

- I/O:
 - o Provides campaign information as output
 - o Receives tracking information as input
 - o Receives High Quality Adverts (from Ad Producer)
- System for planning and control of ad campaigns

DVB Receiver (Device):

- Does not provide any special functionality with TA

Ad Inserter (Device):

- Inserts targeted ads into signaled ad slots (avails)
- Is responsible for timing and synchronization
- Performs the switch between broadcast and ad(s)

Ad Meter (Device):

- Serves the measurement of ad impressions
- Gathers and processes real-time measurement data
- Provides measurement reports

Ad Buffer (device):

- Allows pre-fetching and pre-buffering of ads (i.e. current and next ad or even more to increase TA possibilities)

A/V Decoder (device):

- Can be accessed by DVB receiver and Ad Inserter

- Enables seamless playback of broadcast content and ads

Screen (device):

- Does not provide any special functionality with TA

Components required for Horizontal Scenario (1) :

(Re-)Multiplexer (Platform operator):

- Ad signaling information must be forwarded and kept synchronous

Components required for Vertical Scenario (2)

Encoder (Platform operator):

- The same A/V codecs (and the same setting of encoding parameters) used for broadcast must also be used for encoding the ads
- Must be capable of converting the ad signaling formats (e.g. from SDI-embedded to DVB-TS-embedded)

Multiplexer (Platform operator):

- Must be capable of forwarding (and if necessary also of inserting additional) ad signaling information

Trusted Ad Gateway (Platform operator):

- I/O:
 - o Receives ad calls (possibly in a proprietary format) as input
 - o Receives measurement reports (possibly in a proprietary format) as input
 - o Forwards ad calls to an ad server
 - o Receives ad decisions from an ad server as input
 - o Delivers ads to targeted ad clients
- Serves as proxy for ad calls and measurement reports
- Provides a standardized interface and is capable of converting ad calls and measurement reports from proprietary formats

4.4 Standardization

There are several standardization bodies with elements that could help the implementation of TA in Television. Some of those entities come from cable operators or internet associations providing standards or guidelines to their industry members. For instance; CableLabs, ANSI/SCTE, ISBR, IAB and ISO/IEC; Other proprietary(*) implementations are also available in vertical telco environments such as ROVI, TMS, TVA which can provide some insights to the Study.

Some identified ones are the following:

Metadata			Signaling & Signal Processing	Ad Decision Process	Delivery
Asset Metadata	Schedule Metadata	Event Description	SCTE 104	SCTE 130	MPEG2 TS
CableLabs ADI	TVA	SCTE 224	SCTE 35	(notably part 3,4,5 & 6)	HLS

1.1 CableLabs ADI 3.0	Rovi* Tribune Services*	Media	CableLabs ESNI	CableLabs ESAM DVB CSS (Event triggering)	IAB VMAP IAB VAST	HSS MPEG-DASH
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Currently, for **horizontal scenario** (1), there is not an identified addressable advertising standard for broadcast television on connected TV's, or even any implementation guidelines or a satisfactory industry agreed technical structure for such a topic . There is an urgent need for the coordination of the industry to boost the opportunity and remove the main technological hurdles(see para 4.3 below).

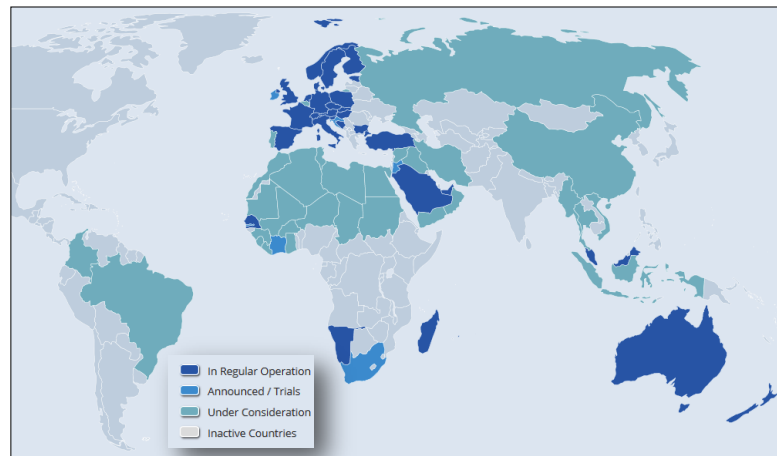
On the OTT environment (linear and non-linear) several vendors are implementing different TA mechanisms . The Streaming Video Alliance, with which DVB has already initiated a liaison, has a specific task of providing guidelines to the online environment. For DVB, it would be productive to help document the TA OTT Live workflow to align it with broadcast scenarios .

The case of the **vertical scenario** (2) is different, since the Platform Operator can control the end to end of the TA solution, using already standardized elements along with missing proprietary mechanisms and adhoc developments. DVB could bring value, by documenting TA in a vertical scenario and analyzing the result for opportunities.

4.5 HbbTV Potential for Targeted Advertising

Availability of HbbTV Devices – TA Applications

According to the HbbTV Association, HbbTV is in regular operation in 32 countries, announced and in trial in 6 countries and under consideration in 30 countries. Over 300 applications are deployed and are powering 43 million TVs and STBs.



Most TV set delivered in Europe are HbbTV compliant.

TA workflow for broadcast, linear, and nonlinear broadband TV service can be design using the very flexible HbbTV toolbox.

Existing TA over HbbTV Applications?

In Europe a few examples of TA over HbbTV have been deployed or announced as being launched soon:

- Major private broadcasters in Germany are doing TA with overlay, split screen, microsite, but no ad replacement.

- SBS in the Netherlands launch of TA over HbbTV together with Chio, 24i, Isobar and Carat.
- R2B2 in the Czech Republic is using HbbTV to sell ad banners in a programmatic way over 12 TV channels with 1 million viewers creating 30 million impressions per month.

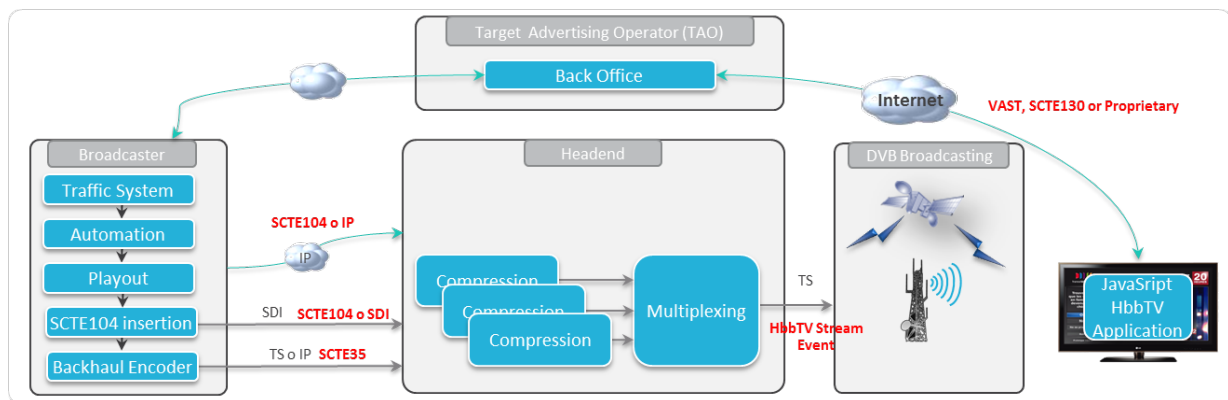
HbbTV Based Workflow for TA over Broadcast DVB

The workflow involves the **Targeted Advertising Operator (TAO)**, which can be part of a single broadcaster or drive multiple broadcasters, the headend that generates the broadcast signals and the TV set and STB. The TV services can be free to air, free to view or PayTV.

The TAO and the broadcasters agree on the ad inventory available for TA. The content delivered by the broadcaster's playout contains SCTE signaling to delineate the ad slots. SCTE standards have been used for a long time for that purpose; we recommend keeping it in the TA workflow.

The TV receivers are not able to react to SCTE signaling but HbbTV TV can react to HbbTV trigger events. The headend therefore has to convert SCTE signaling into HbbTV trigger events.

The HbbTV devices interface by IP to the TAO back office and separately via the broadcast, react to the HbbTV trigger event.



Ad spot signaling by the Broadcaster

The content delivered by the Broadcaster contains programmes and ads. Some of the ads must be broadcasted to all households, some are eligible to be selectively replaced by targeted ads.

The Broadcaster signals the ad slots eligible for TA based on the traditional ad insertion workflows that use the SCTE-104 standard over SDI or over IP. In case of compression of SDI for backhaul to the headend the SCTE104 signal is converted into SCTE35 tables.

The headend converts the SCTE triggers into HbbTV trigger events, which are DSM-CC events.

Triggering ad clip pre-load and switching

The TAO delivers:

- 1) Information to the playout to be included as the payload of SCTE triggers then converted into DSM-CC stream events, and
- 2) A JavaScript (JS) file to be included in/referenced from a broadcaster's HbbTV app which listens for DSM-CC stream events and processes them when received.

The stream events may be two types, "prepare / pre-load" and "insert."

- When a "prepare / pre load" stream event is received, the JS file executes whatever business logic is needed to decide which ad to insert (e.g. constructs a VAST request using information from the stream event, sends it and processes the response). The JS file preloads the ad as far as possible on the device.

- When a "insert" stream event is received, the JS file stops broadcast video and plays the ad (see below about timing in HbbTV 1.5/2.0).
- If multiple ads are being played, the JS file will make the decision about the next ad while one is playing
- At the end of the last ad, the JS file will restart broadcast video presentation
- The JS file is also responsible for whatever reporting is needed back to the "targeted advertising provider" or anyone else.
- The TAO can update the information delivered to the playout /headend and the JS file as necessary for evolving business and regulatory requirements without needing software updates by the device manufacturer.

This can be done to some extent with HbbTV 1.5 today although it will not be frame accurate. HbbTV 2.0 will be able to remove one source of inaccuracy - the signaling carrying the private section moving relative to the video and audio as the signal passes through re-multiplexers and similar equipment. HbbTV 2.0 will however still not be frame accurate and practical experiments are needed to understand how much inaccuracy would remain. 100% frame accuracy (if necessary) would require the HbbTV spec to be extended which would postpone the deployment of TA with HbbTV receivers

One specific issue concerns security of payloads of DSM-CC stream events. Broadcasts can be hacked. The TAO should be able to sign the payload of a stream event before passing it to the playout or the headend and the JS file be able to authenticate it. The web API for this is widely implemented in browsers but not formally required by HbbTV, even in 2.0.1.

Interface Between the JS HbbTV Application and the TAO Backoffice

This interface is used to receive the status of the TV (channel tuned on, etc.), to send from the TV opportunities of ad replacement, to receive from the back office instructions on ad replacement and ad clips to download.

It could be based on **VAST** from the IAB. The Digital Video Ad Serving Template (VAST) specification is a universal XML schema for serving ads to digital video players, and describes expected video player behavior when executing VAST--formatted ad responses. It enables ad servers to use a single ad response format across multiple publishers/video players.

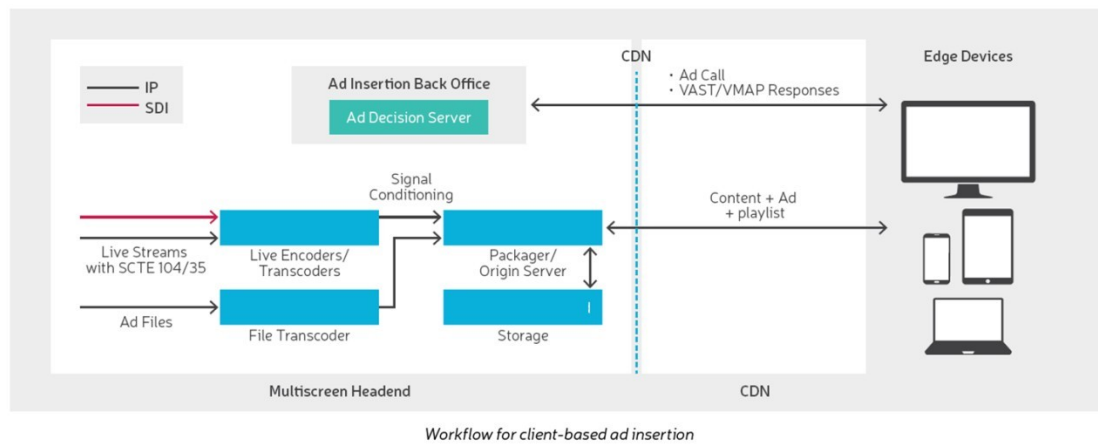
It could be based on the **SCTE130** protocol suite that breaks the dynamic ad insertion into 5 logical blocs, aiming to build a unified platform for addressable advertising. SCTE130 has been used for a while, for both linear and nonlinear applications.

It could also be completely proprietary.

HbbTV / DASH Based Workflow for TA over Broadband

An HbbTV TV can receive linear and nonlinear services, which means additional opportunities for targeted advertising. MPEG-DASH has been referenced in HbbTV since version 1.5.

DASH has enough native tools to implement interoperable ad insertion. It should be easy to integrate with existing back-end systems. DASH IF specification IOP on Ad Insertion should be considered. It includes detailed description of server-based and app-based ad insertion.



Conclusions: What does HbbTV bring to TA?

HbbTV is well positioned to be a solution offering a standardized framework to execute TA on hybrid, connectable TV devices in linear and non-linear broadband and in linear broadcast environments.

The growing penetration rate of HbbTV TV sets in the European markets, mainly due to the joint efforts by the broadcasters, operators and manufacturers – all working together in the HbbTV Association to maintain and update the specification and the related test suites - is providing real value for the market. Complementing the work of the HbbTV association, most of the European countries have in place entities which manage the local “conformance regime” – i.e. the device tests for HbbTV specification compliancy, mainly based on the HbbTV test suites, and the certification label programs for the HbbTV devices – that eventually guarantee a well working HbbTV installed base.

There are multiple commercial examples of TA via dynamic insertion and substitution in the broadband stream through HbbTV technology, as already mentioned elsewhere in this report; Mediengroup RTL in Germany and ITV in UK, just to name a couple of them.

The other use case, the linear broadcast stream TA dynamic insertion/substitution is not yet exploited commercially although IRT made a successful demonstration of the technical feasibility as long ago as IBC 2016. This important use case is under investigation by multiple broadcasters and operators and a few of them have already announced their intention to undertake a commercial launch in the near future (e.g. Mediaset, ProSiebensat1). Recently, Mediengruppe RTL Deutschland announced that HbbTV-based ad replacement in linear TV has been implemented successfully for an “on air” trial⁶

HbbTV brings also high flexibility and the possibility to evolve thanks to Javascript programming. To the extent that TA business logic and processes can be expressed in JavaScript as part of an application, updates to these are easy without needing a software update by the device manufacturer.

The support for web standards enables some re-use of existing tools and systems for TA in the Web.

What are the limitations of HbbTV for TA?

- Frame accuracy is not achievable with the current HbbTV specifications. Most demonstrations are trying to create an acceptable seamless experience with a certain amount of black frames between two ads, but

⁶ Mediengruppe RTL Deutschland. (2017, August 24). Pressemitteilung: Mediengruppe RTL und Ferrero feiern mit Spotaustausch im linearen TV Deutschlandpremiere [Online]. Available: <https://kommunikation.mediengruppe-rtl.de/pressemitteilung/Mediengruppe-RTL-und-Ferrero-feiern-mit-Spotaustausch-im-linearen-TV-Deutschlandpremiere/>

it remains to be seen how this will perform in real life conditions; good implementations and testing should improve the transition experience;

- The HbbTV stream event offers a container to trigger an ad replacement event, but it is up to the broadcaster and the TAO to agree on the data structure and relative actions inside this container.
- Any (existing) HbbTV-based TA solution relies on stream events for triggering the ad-insertion process. However, if the signal is carried through the specific infrastructure of a platform operator (eg; remux, STB) stream events need to be forwarded synchronously, so that they can be received by TV sets and STBs.
- Preload of ad content via broadband is not guaranteed and this could reduce the number of targetable devices; buffering instead is possible and needed to achieve a smooth insertion;
- The security of payloads of DSM-CC stream events is a concern. The payload should be signed in order to allow the device to authenticate it. The web API for this is widely implemented in browsers but not formally required by HbbTV
- SCTE triggers need to be translated into DSM-CC stream events. A cost/benefit analysis should be done about enabling future HbbTV receivers with better support for TA to receive SCTE35 messages directly.

4.6 Main technical hurdles to be resolved

In addressable advertising for “Linear TV broadcast scenarios”, it should be possible to seamlessly switch and substitute content on existing, and ideally legacy devices, and be prepared to deal with different formats, codecs or delivery networks repeatedly.

The following key technical problems have been identified based on the questionnaire responses and on existing SMG members’ feedback.

1. **There is no standardized way to synchronously provide the required signaling to all the elements of the TA chain; starting from the play out systems, through the distribution chain and down to the end user devices.** Technical alignment is needed to agree on some sort of SCTE based “broadcaster profile implementation” in order to standardize the interface between play-out systems and the *automation components* for the insertion of synchronized trigger information in the broadcast transport stream. There are different methods and implementations available which today, require different integration work and which do not all provide the required accuracy. Furthermore, a triggering event may be inserted precisely but due to additional delays introduced along the distribution chain, it will not necessarily be received by the devices in sync as scheduled.

2. **There are different device behaviors that affect the TA Implementations:**

Currently, it can be observed that different devices (TV sets and STB) behave differently with respect to :

- a. Execution of applications (HbbTV or others)
- b. Support for formats and codecs
- c. Interoperability

Such different device behaviors will affect any TA solution, due to varying delays and other performance elements of the implementations. These differences, can even cause a malfunction in the service. Transitions between linear broadcasted content and targeted ads are device dependent due to firmware and hardware performance. This means that existing devices are not optimized to seamlessly substitute and switch between content using different delivery networks and content conditioning.

3. **The possible instability and dependence on the IP bandwidth available to the end user to deliver targeted ads can cause the TA implementation not to behave as intended.** It is very difficult to play the targeted ads directly from the internet if there is not enough buffer to manage those instabilities.

A fully compliant HTML5 support in the device could help improve this behavior but probably will not be enough to give a seamless result.

4. **There is no existing TA solution for horizontal markets providing frame accuracy:**

The replacement or splicing of ads, which requires switching between different delivery networks (broadcast, broadband), can currently not be performed with frame accuracy. Further, adequate handling of edge cases, (i.e. guaranteeing the right user experience in scenarios such as a user leaving channel during TA, and coming to the channel again after a few seconds, etc.) is challenging.

5. **The existing Linear Broadcast TA Solutions have a lack of “just in time” optimized Ad decision mechanisms:** Ad decisions can yield greater value if made close in time to the ad slot. Enabling just-in-time ad decisions through the TA chain is a technical challenge for targeted advertising on broadcast services, that could help optimize costs and resources to the all ecosystem.

6. **There is no reliable “trusted reporting” mechanism in the TA ecosystem:** Advertisers and broadcasters wish to have a trustworthy ad tracking system to ensure that the measurements are correct for the different types of ads. It is very important to guarantee that the ads are really delivered and to be able to measure ad impressions. This applies to horizontal and also to vertical scenarios.

This topic is quite crucial for the consolidation of the ecosystem and must ensure the veracity of the measurements in front of buyers and sellers. This should be an important differentiator of addressable advertising in TV.

There is also a need to standardize the data sets and data interfaces between the different entities (Platform Providers, Broadcasters, Agencies/Advertisers), to enable trusted components like *trusted ad server*, or *trusted ad gateways*.

7. **There is an important concern among broadcasters about the legacy devices impact :** It is important to maintain compatibility with the existing device population. Broadcast services typically operate across a heterogeneous population of devices using different platform specifications.

For TA to be possible, any modification to the broadcast signal must be compatible with all the heterogeneous device population (so that TA signaling can simply be ignored by legacy devices).

8. **The security deployment in the whole chain is also important** to guarantee the TA Model can't be hacked.

9. **Reliable and stable device identification fully compliant with the European GDPR regulations** is mandatory to do advanced addressable advertising on devices compared with Internet targeting.

10. **Interfaces** between broadcasters, content providers, agency/brands and media buyers **need to be standardized** to get as much automated as possible.

It has to be noted for vertical markets in an IP distribution scenarios, other techniques could be used for TA such as use of unicast to deliver TA ads, this will have to be investigated once IPTV operators join the discussion, only high level discussions took place during the SM work.

5. SUMMARY OF TA ISSUES FOR DVB TO CONSIDER

5.1 TA: current situation and issues

The main current issue is that there is no deployable TA solution for classical linear broadcast applicable to horizontal markets. If anyone wants to enable TA for this use case in future it has to be considered that a majority of the questionnaire respondents stated that seamless ad replacement / ad insertion is a must. However, representatives of manufacturers taking part in the SMG stated that achieving a seamless user experience might be an issue on low-end devices. In this respect, it is not clear whether “the right user experience” can be achieved by existing technologies (like e.g. HbbTV 2.0). Further, the Study Mission, based on questionnaire responses, is of the opinion that the actual deployment and commercial success of TA would be seriously compromised if advertisers and broadcasters cannot take it for granted that a vast majority of TV receivers (and STB as the case may be) will be able to correctly execute a standardized TA when it is signaled. Variations between manufacturers and product ranges can reasonably be expected but should be minimized and lie within a defined tolerance range. Given that devices in different price segments have different hardware characteristics and thus e.g. the availability of a local buffer (which would allow for prefetching ads) cannot be assumed generally, it would otherwise remain unclear whether a critical mass of devices will be targetable in any given market. Further, it is a minimum requirement that the ads are of the same audio-visual quality as the TV content. In today’s existing TA solutions, especially for online video, this isn’t always the case.

TA solutions for vertical markets do exist and have already been deployed. However, as these solutions are all proprietary each provides different sets of campaign features. Standardized interfaces e.g. between broadcasters and platform operators do not exist. This leads to the situation that the reach of a campaign is mostly limited to the size of a single platform, which could result in a limited interest of ad buyers. Thus, currently new sell-side partnerships are formed in order to increase reach of existing targeted advertising platforms.⁷ From the perspective of ad buyers, another unfulfilled requirement is the availability of “trusted mechanisms” for measuring and reporting of ad impressions.

5.2 Key considerations for a new TA system

Six key themes emerged from the responses to the questionnaire and in subsequent discussion within the TA working groups: 1) Signalling 2) Seamless Ad Splicing at the Connected Device 3) Measurement & Reporting 4) Integration with Existing Ad-tech Systems 5) Data Privacy & Security 6) Compatibility with Existing Broadcast Systems. Each of these are discussed further below.

1. Signalling

This is concerned with how the existence and content of a targeted ad and ad breaks are signalled to the delivery platform. This defines the interfaces between a broadcast traffic/scheduling system, the playout automation system and how that signalling passes through the platform coding & multiplexing layer.

This area is covered by existing standards (as detailed in Section 4 of this report).

⁷ Video Ad News, “The rise of the TV alliances,” *Addressable TV Guide 2018*, Köln (dmexco), p. 9, Sep-2017.

One of the problems for broadcast systems is that the broadcast receivers do not natively decode the signalling and therefore some form of translation is needed at the headend to the relevant hybrid TV broadcast standard (HbbTV2.x). This translation appears to be bespoke, depending on the target delivery platform, and so a standardised translation would be helpful for achieving consistent signalling to connected devices.

2. Seamless Ad Splicing at the Connected Device

This area received a lot of focus in the questionnaire and the working group. It is the crux of the challenge for DAI on traditional broadcast platforms (but not the only one). This is focused on the mechanics of ad-insertion on the Connected TV device: the need for a seamless viewer experience (however that may be achieved), consistency/predictability across the device population, the need for viewing and other user data and the need for reporting data to prove the successful insertion of targeted ads.

In the broadcast domain several Hybrid TV standards exist which can facilitate DAI (including MHP, MHEG-IC, HbbTV1.x and HbbTV2.x). These standards in turn rely on well-defined existing file/stream delivery standards

It is clear that the majority of respondents believe that HbbTV (2.x) should be capable of providing the majority of functionality required for DAI in terms of ad-splicing. Several tests with HbbTV 1.x and 2.x claim to provide a seamless viewing experience for DAI – but a definitive reference case still seems to be missing or was, at least, not available to the SMG.

There is a requirement for guidance or definitive reference use case(s) for streamed vs cached splicing of targeted ads as, despite there being existing HbbTV 2.x systems (such as that demonstrated by IRT in Germany), there does not seem to be any published data as to the quality (in terms of timing and reliability) achievable from streamed delivery, at scale, across variable broadband connections. Thus, it needs to be investigated to which extent pre-buffering of ads is necessary in order to achieve a quality level acceptable for broadcast.

3. Secure Measurement and Reporting

Regardless of the delivery platform there is a need for advertisers and agencies to be able to profile their audiences and to measure the delivery and effectiveness of any given ad-campaign.

As ad-tech already exists there must be a common set of information required for audience profiling and ad measurement required that could be standardised across delivery platforms. This data would be delivered from the Connected TV back to the Trusted Ad Server and/or the Campaign Manager. For example, this could include:

Audience Data

- Device unique identifier (mandatory)⁸
- IP address and/or postcode (optional)
- Viewing statistics (optional)
- Subscriber information (optional)

Measurement Data

- Ad viewing (complete, partial etc.)

⁸

It needs to be investigated whether a specific hardware ID is required or whether for example some information stored in a cookie with a well-defined lifecycle would also work well for TA.

- Aborted ads (e.g. due to quality issues or viewers tuning away)
- Ads not played

4. Integration with Existing Ad-Tech Systems

It is clear that there is a plethora of technology and standards already deployed on OTT, Satellite and Cable systems which can broadly be described as “Ad-Tech”. These are the systems and algorithms which determine and control the audience data, audience attributes, audience profiling, selection & serving of targeted ads, ad tracking & reporting, billing etc.

There are a number of existing and de facto standards in use for ad decision making, ad metadata, schedule metadata and event description.

The Ad-Tech system is trying to achieve the same outcome regardless of delivery platform and therefore it would benefit if the interface to each delivery platform was more or less the same. As these Ad-Tech systems already exist, then the key question to answer is this: “Is there a common set of interfaces required between Ad-Tech systems and the various delivery platforms in order to reduce complexity and facilitate a more seamless approach?”

5. Data Privacy and Security

This is a key consideration for any DAI platform. The EU General Data Protection Regulation (GDPR), which will come into force on the 25th May 2018, was referenced by several respondents.

Under this topic there was also a need expressed to ensure that any DAI system was secure and reliable in terms of handling of ads and their delivery and that verification was potentially independent of operators.

Any standard should be cognisant of the above requirements but should not define the policies themselves. For example, it would not be appropriate for a standard to define how a platform achieves compliance with GDPR. However, adopting a DVB TA standard will, by itself, not guarantee achieving GDPR compliance.

It should be noted that any deployment of a Unique Device ID (as suggested above) for targeted advertising would be subject to compliance with Data Protection legislation. For example, it is understood that a Unique Device ID goes further than what is provided for advertising on Apple and Android (and by HbbTV whose solution is modelled on Apple and Android). For more details of Apple and Android, see

POSSIBLE Mobile: "The Developer's Guide to Unique Identifiers".
<https://possiblemobile.com/2013/04/unique-identifiers/>.

And

Marketing Land: "Google Replacing "Android ID" With "Advertising ID" Similar To Apple's IDFA".
<http://marketingland.com/google-replacing-android-id-with-advertising-id-similar-toapples-idfa-63636>.

It is also worth noting that German data protection regulators have explicitly indicated that the unique device ID that HbbTV could have inherited from the Open IPTV Forum specifications would not be acceptable.

6. Compatibility with Existing Broadcast Systems

It is very clear that any Targeted Advertising system considered, must be implemented in a way which prevents disturbances and loss of functionality for the underlying TV services. Systems that represent a compromise to the existing user experience, or which compromise the content being delivered (TV program or ad) are unlikely to be considered acceptable. The TA system must also be designed in a

way which ensures that existing broadcast and content delivery regulations and guidelines can be observed.

In Europe, the USA and other regions, there are regulations that aim to prevent excessive fluctuations in audio loudness within, and between programs. In Europe broadcasters observe “EBU R128”, and in the US this is governed by the “Commercial Advertisement Loudness Mitigation (CALM) Act”. These specifications and recommendations are designed to prevent the user being faced with overly loud or quiet advertisements, and to prevent loudness fluctuations when changing channels.

It is therefore important for DVB to ensure that any targeted advertisement system that is considered provides the mechanisms needed to allow broadcasters to conform with both the letter and the spirit of these regulations. This would ensure that spliced advertisements do not create audio loudness issues which annoy listeners.

Similarly, in many countries there are regulations and guidelines which govern the provision of accessibility features across the content being delivered. It will therefore be important to ensure that the targeted advertisement system maintains the ability to deliver accessibility services such as subtitling and audio description within the spliced advertisements, and that the system does not disturb the provision of accessibility services for the underlying programs.

5.3 Relevant TA scenarios

A variety of TA use cases have been mentioned by the respondents of the questionnaire ranging from classical linear FTA broadcast to VoD as an OTT service. Considering DVB’s traditional field of work two relevant TA scenarios have been identified by the SMG. Figure 3 provides a high level system overview of reference scenario I whereas reference scenario II is illustrated in Figure 4. Both reference scenarios reflect a use case where a linear TV service is offered to stationary devices using broadcast. The difference between the scenarios lies in the assumed market structure: Reference scenario I targets horizontal markets (e.g. traditional DTT) whereas reference scenario II is for vertical markets where FTA TV services are delivered by a platform operator (e.g. over a cable network).

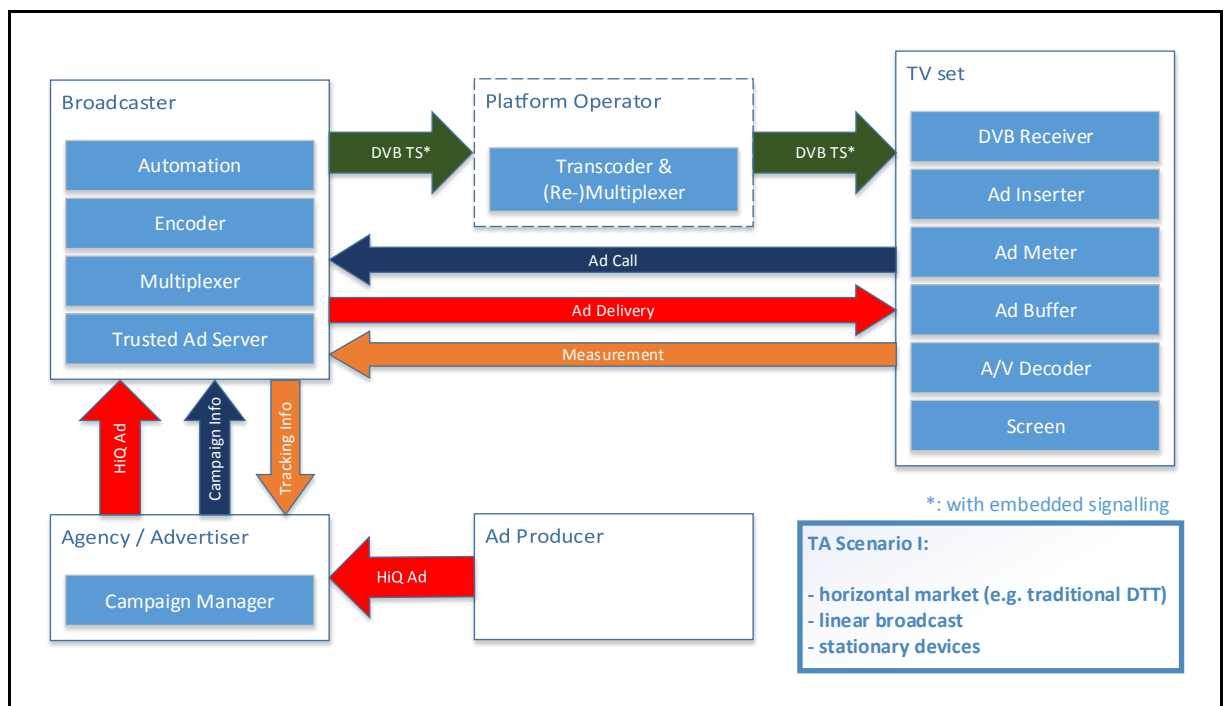


Figure 3: TA reference scenario I: TA in horizontal markets

In the following the functionalities required of the several system components shown in Figure 3 and Figure 4 for implementing targeted advertising are described. Thereby, the vision of the TA system is outlined.

“Ad Producer” & “Agency / Advertiser”: At the very beginning an ad is produced by an Ad Producer. Even at this early stage it has to be taken into account that the ad will be displayed on TV screens later on. So, there must be minimum requirements with respect to the audio-visual quality of the ad content. I.e. that HiQ Ads (digital master files) that are provided by the Ad Producer to the Agency / Advertiser must be of broadcast quality (e.g. common frame rates like p50 and/or i25 must be supported and compliance with audio loudness regulations is required). A “Campaign Manager” is used by the Agency / Advertiser for planning and control of ad campaigns. The Campaign Manager provides campaign information as output to broadcasters and receives tracking information regarding the current status of running campaigns in return.

“Broadcaster” & “Platform Operator”: Automation (and playout) systems of the Broadcaster must be capable of generating & inserting ad signaling information (e.g. to mark beginning and end of avails) into a SDI signal. At the “Encoder” it must be ensured that the same A/V codecs (and the same setting of encoding parameters) used for broadcast are also used for encoding the ads. Further, the Encoder must be capable of converting ad signaling formats (e.g. from SDI-embedded to DVB-TS-embedded). Any (Re-) Multiplexer in the distribution chain forwards embedded ad signaling information and keep it synchronous. Multiplexers should also be capable of inserting additional ad signaling information. On the Broadcaster’s site a “Trusted Ad Server” needs to be installed, which provides a defined/common set of ad features. Its main function is to make ad decisions based on static or dynamic decision rules. So, ads can be delivered to targeted ad clients (i.e. TV sets & STBs) and/or ad decisions can be provided as output to one (or many) “Trusted Ad Gateway(s)”. For this purpose the campaign information as well as ad files of high A/V quality (i.e. the HiQ Ad or mezzanine files) are provided to the Trusted Ad Server as input from an Agency / Advertiser. Further, a Trusted Ad Server processes measurement reports received as input from targeted ad clients, so that it can provide tracking information (reporting) as output to Agencies / Advertisers. In order to be able to meet the need of vertical markets, a Trusted Ad Gateway can be installed on site of a Platform Operator, which mainly serves as a proxy for ad calls and measurement reports and thus provides a standardized interface, which is capable of converting ad calls and measurement reports from proprietary formats. I.e. that a Trusted Ad Gateway receives ad calls and measurement reports (possibly in a proprietary format) as input and forwards ad calls to a Trusted Ad Server from which it then receives ad decisions. Based on those ad decisions it delivers ads to targeted ad clients.

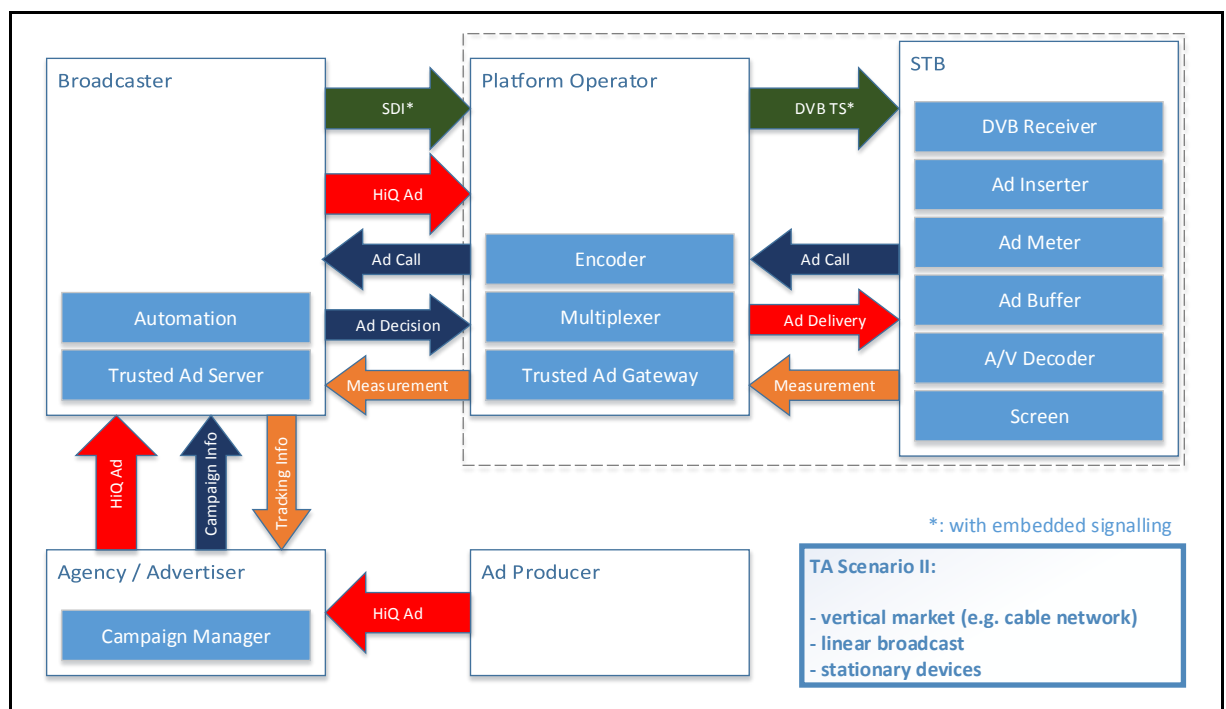


Figure 4: TA reference scenario II: TA in vertical markets

“TV sets” & “STBs”: With respect to TA four relevant system components need to be provided by TV sets and STBs. First, there is the need for an “Ad Inserter” for inserting targeted ads into signaled avails (i.e. ad slots). After an avail has been signaled the Ad Inserter sends an ad call to a Trusted Ad Server or Trusted Ad Gateway and thus receives an ad in return. The Ad Inserter performs the switch between broadcast and ad(s) and is responsible for timing and synchronization. Second, an “Ad Meter” serves the measurement of ad impressions. For this purpose it gathers and processes real-time measurement data and can thus provide

measurement reports to a Trusted Ad Server (or Trusted Ad Gateway). The Ad Inserter and the Ad Meter share the same ID used for uniquely identifying a TV set or STB. If further audience data are acquired this task will be performed by the Ad Meter. In order to allow for seamless playback the “A/V Decoder” must be accessible by the integrated DVB Receiver and the Ad Inserter. Further, guaranteeing a seamless viewing experience requires an “Ad Buffer”, so that at least the current and next ad can be pre-fetched.

5.4 DVB’s options for action

In this section we consider where the DVB could act to facilitate TA in the two reference scenarios described in Section 5.3.

Signaling

Signaling mechanisms do exist (e.g. SCTE) but the translation to a format recognized by receiving devices (e.g. HbbTV) needs to be reviewed and potentially standardized. To complement this, it needs to be specified how that signaling passes from playout through coding and multiplexing layers. Further, recommendations need to be made about how to achieve transparent pass-through of the signaling in the presence of vertical market structures.

Seamless Ad Splicing at the Connected Device

For reference scenario 1 (horizontal platforms) many respondents see HbbTV2.0 as a promising starting point. However, as it is not clear what level of user experience is possible, meaning that further investigation is required. Even in reference scenario 2 it may still be useful to deploy receivers which have common standards such as HbbTV2.0 in order to facilitate TA workflows more easily. Further work may also be needed to specify/recommend the minimum amount of cache memory available to pre-buffer ads in order to guarantee a certain QoS.

Measurement & Reporting

Common data sets and interfaces are required such that each delivery platform looks the same for the ad-tech systems in terms of ad campaigns and reporting. This would require the broadcaster/agency to specify the data sets.

Integration with Existing Ad-Tech Systems

Various ad-tech systems already exist and there is no need to standardize these. What is required is an understanding and potential standardization of the interfaces between the ad-tech systems and the target broadcast platforms. This requires the extension of the two reference use cases defined in this DVB report to create a common understanding of the reference system architectures and workflows to identify gaps that DVB could assist in closing.

Data Privacy & Security

This does not need standardization work, rather an awareness of the requirements such that any standards that are developed allow for compliance with the relevant legislation.

6. RECOMMENDATIONS FOR DVB ACTION

6.1 Summary

Based on the work (including the responses to the SMG questionnaire as summarized in the Appendix) and on the discussions within the SMG, the SMG has formulated the following recommendations with respect to the possible actions by DVB to facilitate the implementation of Targeted Advertising within the TV, and especially horizontal Broadcast, ecosystems.

1. Given the lack of a suitable standard or any other satisfactory technical solution to operate TA in the context of horizontal broadcast TV, the SMG recommends that **DVB should develop a TA enabling technical framework**, focussing on horizontal broadcast business models as a minimum.
2. Such DVB TA framework should aim at **standardizing a number of key components** covering (1) Delivery system architecture and inventory (2) Ad delivery and signaling (3) Secure measurement & reporting, and (4) Interfaces to digital advertisement systems.
3. On the other hand, the SMG **does not see the need for DVB to engage in** standardization activities directly pertaining to (i) specific ad-tech systems (eg ; ad decision making, DSPs , DMPs, ...) , (ii) management and compliance with privacy regulations or (iii) user profiling and segmentation.
4. When developing the recommended TA technical framework or specification, it is advisable that DVB **leverages to the greatest possible extent the existing HbbTV assets** which seem quite well equipped to serve as a starting base, through a tight liaison with the HbbTV organization.
5. It is also advised that the DVB will open **liaisons with relevant main digital advertising bodies**, such as the IAB, in order to facilitate the integration of TA operations by broadcasters (built along the DVB TA specification) with the prevailing digital advertising technical chain and operating processes.
6. Finally, and although this cannot be handled by or in the DVB organisation, it must be pointed out that the actual implementation of a future DVB TA technical framework is very likely to **require the inception and conclusion of commercial agreements**, for instance between platform bodies and the CE manufacturers, in order to secure their support to such DVB TA.

6.2 Relevant DVB Standardization Work to enable TA

DVB's standardization work should focus on providing the technical basis for making TA commercially viable. Considering the answers given in the questionnaire as well as internal discussion in the SMG the successful adoption of any future DVB TA standard will depend on whether the following requirements can be fulfilled:

- Seamless playback of TV content and ads must be guaranteed.
- A trusted environment must be created for all market players.
- Cross-platform compatibility must be ensured with respect to signaling and delivery of ads as well as for measurement and reporting.

Three potential fields of standardization have been identified for DVB's future activities in the area of TA. Ranked in order according to priority these are:

I. Delivery System Architecture and Inventory

Very fundamental work needs to be done at this stage of the standardization process including, but not limited to, the development of a common system architecture, the definition of use cases and the specification of quality requirements. Approximately six to nine months will be required to develop this part of a potential DVB TA standard (DVB TA part 1).

II. Ad Delivery & Signaling

Here the main focus lies on enabling synchronous signaling of ad avails throughout the whole distribution chain. Further, formats and protocols for ad delivery are covered. This part of a potential DVB TA standard (DVB TA part 2) also targets issues of signaling and distributing ads in the presence of vertical market structures. Nine to twelve months of work will be required for its development.

III. Secure Measurement & Reporting

This part of a potential DVB TA standard (DVB TA part 3) covers the measurement of ad impressions inside TV sets and STBs. For this purpose, metrics and data sets need to be defined as inputs/outputs. Even though, measurements shall be accurate (tolerances may have to be defined) it is not necessary to specify how the TV set/STB must operate to provide for such data sets. Further, it needs to be specified, which tracking information are obtained from processing measurement data and how these are provided to agencies / advertisers. It needs to be discussed separately whether any audience data will be contained. Nine to twelve months of work can be scheduled for this purpose in parallel to the development of DVB TA part 2.

IV. Interfaces to digital advertisement systems

The fourth part of a potential DVB TA standard (DVB TA part 4) addresses the issue of not having available standardized interfaces to advertising agencies. As any aspects related to tracking information are already covered by DVB TA part 3 and as quality constraints for the inventory will be included in DVB TA part 1, part 4 will mainly focus on the exchange of campaign related information (i.e. targeted households/viewership, frequency capping settings etc.). Standardization work may begin as soon as DVB TA part 1 is finished and will take up to six months.

In the following the several subjects of standardization⁹ as well as the relevant system components will be named by referring to Figure 3: TA reference scenario I: TA in horizontal markets and Figure 4: TA reference scenario II: TA in vertical markets (see subsection 5.3).

I. Delivery System Architecture and Inventory

- a. Subject of standardization
 - Common system architecture
 - Use case description / scope of application
 - Minimum quality constraints for *HiQ Ad* (i.e. mezzanine file)
 - Quality guidelines for *Ad Delivery*
 - Ad format
 - Avail duration(s)
- b. Relevant system components
 - all

II. Ad Delivery & Signaling

- a. Subject of standardization
 - Formats and protocols for *Ad Delivery*¹
 - Formats and protocols for *Ad Call*¹
 - Formats and protocols for *Ad Decision*¹
 - Signaling of ad avails in a *DVB TS*¹
 - Signaling of ad avails in a *SDI* signal¹
- b. Relevant system components

⁹ In some cases possibly no new standard is required but rather an implementation guideline on how to use existing specifications will help to establish standardized workflows and procedures.

- Automation
- Encoder
- Multiplexer
- (Re-)Multiplexer
- Trusted Ad Server
- Trusted Ad Gateway
- Ad Inserter

III. Secure Measurement & Reporting

- a. Subject of standardization
 - Metrics and data sets for *Measurement*¹
 - Metrics and data sets for *Tracking Info*¹
 - Formats and protocols for *Measurement*¹
 - Formats and protocols for *Tracking Info*¹
- b. Relevant system components
 - Trusted Ad Server
 - Trusted Ad Gateway
 - Ad Meter

IV. Interfaces to digital advertisement systems

- a. Subject of standardization
 - Formats and protocols for *Campaign Info*
- b. Relevant system components
 - Trusted Ad Server
 - Campaign Manager

It is recognized that the above analysis does not attempt to split the DVB standardization work into matters for the Commercial Module or Technical Module to investigate further and that this allocation of work will need to take place in due course.

6.3 Non DVB-Relevant standardization matters

Referring to section 5.4, where DVB's options for action are explained, it can be stated that all relevant fields of standardization are well covered by the standardization work proposed in section 6.2. The following aspects are seen as out of DVB's scope.

There is a vast variety of proprietary TA solutions available in the markets. Integration with all these existing ad-tech systems will not be achievable. However, the proposed specification activities (see section 6.2) will allow for the development of interfaces between the ad-tech systems and the target broadcast platforms, so that upgrading existing implementations may be possible.

In the area of privacy management and data security no standardization work is required but the developed technical solutions must facilitate where appropriate, and in any event not prevent, compliance with data privacy rules when designing products and services."

Further, the SMG is of the opinion that a future DVB TA standard should not cover big data processing methods such as for user profiling and segmentation. The same applies to algorithms for ad decision making.

6.4 Liaison with HbbTV

We recommend using HbbTV as a the key technology to support targeted advertising unless an explicit « red flag » from HbbTV or another constituent emerges in the course of future DVB work on TA.

We recommend liaising with the HbbTV organisation in order a) to share our vision of TA, b) to get from them descriptions of field experience and any advice coming from this work, c) to discuss the limitations we identified in the current version of the standard and d) to come to an agreement for an extended specification (or a set of technical guidelines) which would fully meet the needs identified by the SMG (and the future DVB

TA work). Such new specification could be generated either as an HbbTV specification, as a DVB specification or as a jointly developed and cross-referenced specification.

Under this assumption, DVB and HbbTV should also discuss joint actions to promote the use of HbbTV for TA.

6.5 Liaison with Advertising Bodies

As introduced above, the overall TA efficiency in the broadcast TV environment will also depend on a set of suitable and standardized interfaces between the broadcaster systems and universe on one side, and the ad-tech systems on the other side (Trading desks, DMPs, SSP, DSPs,) .

DVB should engage with the organizations which may represent these players and systems (e.g. IAB) to propose to them to define the relevant standardized interfaces; this engagement may be more effective if DVB first generates a high level, candid, draft list of such proposed interfaces, to expedite adaption as required during the dialogue with ad-tech players.

This process will be greatly facilitated if the ad technology specialists of certain DVB members in the broadcaster category actively contribute and participate in the work process. Most broadcasters operate OTT / digital offers in parallel to their classical broadcast operations, and because of this, they are highly likely to interact with the systems when monetizing their digital/OTT inventories.

6.6 Commercial Arrangement Statements

Many of the commercial arrangements needed to deploy targeted advertising in DVB markets are typically already in place.

One significant exception is between broadcasters or operators and the manufacturers of retail TV receivers.

In their “Policy Statement on Connected TV within the Global Media Value Chain”¹⁰ Digital Europe indicated that *“Where advanced features are being used to generate additional revenues on top of the core DTV offering, then fair and appropriate on-going remuneration will be due.”*

Targeted advertising would be considered an advanced feature by most manufacturers of retail TV sets and set-top boxes. Some countries like the UK have broadcaster-controlled entities (Freeview, Digital UK) that have a commercial relationship with device manufacturers but many countries do not have such an entity and there could be scalability issues if each broadcaster needs to have a commercial relationship with each device manufacturer. Even where these entities exist, their focus is device certification and trademark licensing and not revenue sharing as envisaged in the Digital Europe policy statement.

A second likely exception is between broadcasters and operators in those markets where commercial relationships between the two are poor, difficult or tense. For either party to deploy targeted advertising without some agreement with the other is likely to be complex from technical and/or legal and/or regulatory angles.

¹⁰ http://www.digitaleurope.org/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=2213&PortalId=0&TabId=353

Dealing with the service provider requirements

Partly because of limited service provider participation in aspects of the work of the SMG (with the notable exceptions of Sky and Mediaset) ,. the need within DVB for any TA work specifically for OTT systems was not established by the SMG.

First we need to discuss the case of operators who do not have a return path such as some DTH or Cable broadcast. Will they all transmit ads by the DVB-S / DVB-C channel like Sky, DirecTV and DISH do, or will we also have to consider an IP path to deliver ads?

For wired operators like Cable IP and IPTV operators, we have to assess if the operator will use a classical ad replacement in the network (already deployed in the US for regional ad insertion) or move to a more targeted scheme, client based. The other option is to do the splice at the STB level, this has so far not been planned by any operator. Another approach for IP operators is to use the HbbTV signalling to trigger the TA. Last option is to use a unicast scheme as used in OTT.

DVB has competence in its members either on the vendor side : Cisco, Ericsson, Harmonic, Cadent (non DVB) and on the service provider side (BT, Orange, Canal+, Sky) to deal with this use case. We have to encourage all those companies to work together in the CM and start to work on those important delivery aspects. The general feeling is broadcast is evolving to include IP delivery and that we have to build a solution that is future proof, meaning integrating IP delivery of ads and possibly IP delivery of Video (in Unicast or Multicast way).

Dealing with OTT

The SMG has not at this time considered the case of a pure Live OTT player such as Zattoo, Molotov TV or Magine TV, however we acknowledge that these players could technically develop a TA product for their OTT service, though such product could widely build on a future DVB TA framework, making it simpler for advertising brands to use inventory across these different platforms.

In the OTT ecosystem, we have to look at the different techniques being used (server vs client) as well as the reporting of the ad replacement execution as well the QoS for the ad delivery. All those questions are being studied inside the targeted Advertisement group new formed by the Streaming Video Alliance and it is therefore propose to create a liaison between the two groups.

ATSC 3.0

Some members of the SMG expressed the view that enabling TA was a principal business objective of the new ATSC 3.0 terrestrial broadcast specification, which will be deployed shortly in Korea and then in the USA.

Unfortunately, the SMG did not had a chance to spend sufficient time on this matter, and it will certainly be beneficial for the future TA group to make sure it develops a strong understanding of the relevant parts of ATSC 3.0 (including though a direct liaison, if needed) so that, the DVB TA may be aligned with ATSC and even re-use relevant parts of ATSC 3.0 if DVB it appears to be appropriate.

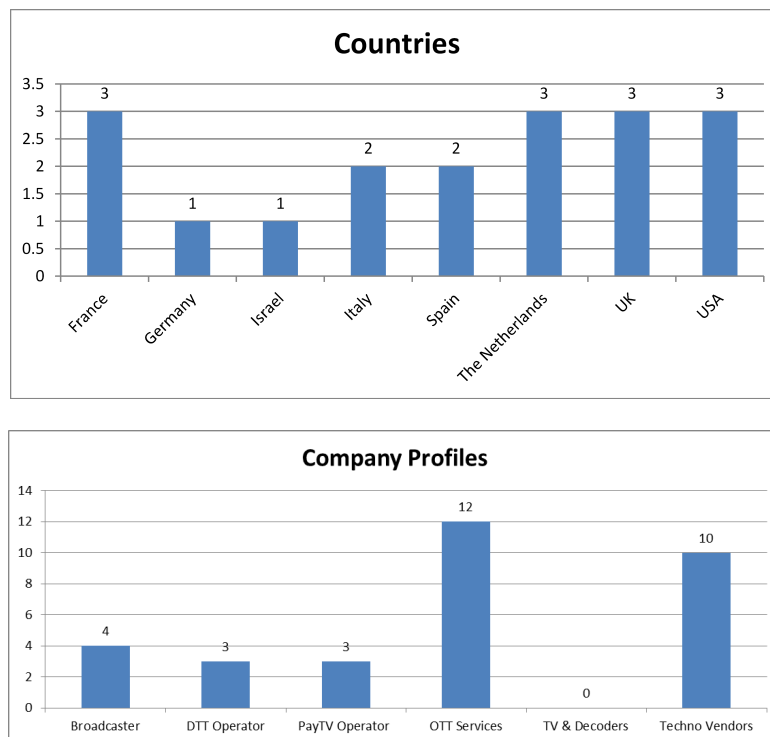
APPENDIX : TA SMG QUESTIONNAIRE & RESULTS

SUMMARY

(May 1 2017 – 18 answers)

Respondent Summary

We received 18 responses from 8 countries. 65% of the respondents are DVB members.



Section 1 - Market appetite and impacts of Targeted TV advertising

[Q1] How important do you think TA will be in TV advertising? Which share do you think it will represent (in volume) in 3, 5, 10 years? If appropriate, you can specify an answer for linear/broadcast TV, by geography, etc..

The prevailing opinion is that Targeted TV advertising is meant to become big, somewhere between 10% and 40% of TV advertising after 5-10 years (some even think faster than that).

Although some brands may wish to retain the “carpet bombing” nature of classical un-targeted TV advertising, targeting generally appears as a natural trend, because it is the norm in the growing and competing digital advertising, and because TV advertising is already targeted now (selecting channels and times that allow a certain audience to be targeted).

Deployments in the US and for non-linear viewing will be the first instances. Large scale deployment will need the availability of simple and efficient technical systems, which is not the case today. Compliance with privacy rules is another factor which may slow the deployment process and this needs to be addressed.

- [Q2] What do you think will be the value impact of TA on TV advertising ? will a TA sell at a higher price ? in which proportion ? what would be the relevant metric for TA (eg; GRP or CPM)**
- The general feeling is that TA should (and even must, otherwise, no point!) bring higher prices and higher value to TV advertising and help to stop its erosion, though there are many things to work out to make sure this value uplift will materialize.
- The value uplift may result from straight higher prices (potentially much higher, but on smaller demographics; a fork between 2x to 3x the value of non TA has been indicated), but also from a better monetization of off-peak slots, the arrival of new advertising brands previously not able to afford TV advertising, the capability to manage and monitor advertising across all devices and the possibility to bring better reporting to advertisers (on views but also actual action taken by consumers).
- The hurdles to resolve will include the generation of metrics which can unify the previous GRP and CPM, the automation of TA to avoid excessive manual costs, which could also be inflated by the need to purchase data and also to duplicate creative work to fit smaller audiences.
- Note : GRP stands for “ Gross Rating Point” and is the traditional metric to value classical TV advertising. CPM stand for “ Cost per Mille” and is the main metric to measure and value digital advertising.
- [Q3] How do you see the market organizing for TA? Who do you expect to take the lead in structuring and deploying practical TA proposals for advertisers?**
- The future structure of the market seems very unclear to the respondents at this time; several critical stakeholders are identified, starting with the traditional players of TV advertising (broadcasters, sales house, agencies) complemented by important newcomers; new players mastering digital ad-tech, the GAFAS, who are so strong in digital advertising and are eying the TV market, not to forgot the TV set makers (Consumer Electronics Manufacturers or CEMs) whose cooperation in the system is required.
- There is a consensus that many stakeholders must cooperate and align to make TA possible, but there are strongly opposed views as to whether the lead will end in the hands of the current leader(s), or whether it will be captured by the newcomers.
- [Q4] What do you think will be the impacts to TV channels of the emergence of TA? will it be an opportunity or a threat ? How should they act and organize to make it a success ?**
- The general opinion is that TA is a significant opportunity for broadcasters, and chiefly, the ability to integrate TV in the new advertising trends (targeting, data, precise reporting, ..), increase value and avoid continuation of money transfer to digital players.
- However, there are some threats and traps, which could deprive broadcasters from these upsides, and broadcasters are advised to jointly create and manage a very accurate system for TV TA, which will need to meet certain key requirements
- low execution costs
 - high quality and reliability, with faultless end-user experience
 - transparent and fair handling of privacy / opt-in
 - accurate and reliable measurements to build trust of advertisers
- [Q5] Do you believe using TA, you will get higher viewer engagement? Can this have a positive impact on your business?**
- There is quite a strong consensus that TA has the strong potential of increasing viewer engagement and satisfaction because targeted ads will be felt to be generally more acceptable and less intrusive by end-users. One risk of targeting still needs to be pointed-out, the one of having a very high repetition of the same ad(s) for single viewers.

Section 2 - Targeted TV Advertising use case and Parameters

[Q6] **What do you think will be the key requirements / attributes from advertisers (and the agencies, etc. working on the buy side) for TA ?**

Summary:

- Measurement & Reporting
 - Authentic, no fraud, reliability of end user impacts
 - Commonly accepted certification authorities/independent entities
 - Access required to rich data sets to facilitate targeting
 - Availability and reach of advanced audience segments
 - Timely reporting of advanced audience targets
 - Precision of targeting
 - Accurate reporting
 - Convergence with Digital Media (for example cross –device measurement)
- Systems & Standards
 - Reuse existing advertising systems from both worlds (broadcast & internet)
 - Interfaces/systems consistent with what is already in use
 - Market standard solutions
- Different campaigns will call on different combinations of these attributes:
 - Content related metadata
 - Time based attributes
 - Audience based attributes
 - Platform related metadata.

Several respondents did not provide an answer due to “insufficient knowledge of advertising sales”.

[Q7] **Do you see other key features of TA which would be highly important / relevant to other stakeholders ?**

Summary:

- Data, Data Privacy & Security
 - Viewer opinion/opt-in/opt-out?
 - Data Privacy (GDPR in Europe)
 - Flexibility to adjust changing data security requirements
 - Secure linking/re-directs (e.g. URL of ads)
 - More detailed user data could come from Telcos or TV manufacturers
- QoS
 - Viewers and broadcasters will want a seamless viewing experience
- Standards
 - Standardisation is key for cross-platform targeting (broadcast/OTT/operator platforms)
 - Common interface for TA across different distribution platforms so as to minimise cost and complexity in the broadcast infrastructure
 - Common public standards have been vital in bringing the [DAI] ecosystem together
- Ad Sales
 - Advanced audience analytics, forecast and pricing tools for sell-side.

- Offer the same features as available over the internet
- Interface to ad agencies' auction systems will be demanded by agencies
- Ad sales houses will want to be in control of audience segmentation (i.e. not the broadcaster or platform operator)
- Need to quantify and communicate ad inventory being replaced for transparency
- Targeted promos and sponsorship

[Q8] Can you please provide a candid description of the most likely, or desirable TA use case in your view (the one you would like to use, or to propose, or to enable, depending on the role of your company)

Summary:

- Use Cases
 - One respondent suggests a single national TV TA platform would exist in their country, trading desk with brands placing bids for ad slots. This platform will also manage and serve the targeted ads. This same entity would gather viewing data to facilitate TA.
 - TA for linear channels and horizontal markets
 - 1) VoD 2) Live/Linear over Broadcast and IP Unicast 3) Overlays: Live Broadcast and Unicast
 - DAI is already being used at scale for the following TV use cases: VOD, nDVR, live linear – all on both classic QAM/IPTV infrastructures and newer OTT/ABR infrastructures.
 - Options wanted for replacement of single ads, multiple ads or the whole ad break
 - To introduce VOD/Catch-up content through Apps
- Profiling/Segmentation
 - Advertisers/ad sales houses wish to target specific audience/demographic segments with ads, across all platforms
 - “Cluster Based” – i.e. not something different for everybody but targeted to groups of viewers
 - Ad sales houses will want to define/control the segmentation and work closely with the platform operator to enable this
 - Be able to buy a targeted segment of audience across all TV channels and pay only for the efficiency on this segment
 - Probably only a part of the existing TV inventory would be used [for TA] every hour
- QoS
 - Pre-delivery of adverts ahead of usage using IP Unicast and local cache storage to guarantee quality user experience, regardless of broadband connection.
- Measurement
 - TA based on several criteria with finest granularity possible and tracking of ads actually viewed

Introduction of various terms which could mean different things to different people including :- “Ad Replacement” , “Ad-Stitching” , “Ad-Insertion” , “Ad-Substitution”.

[Q9] (For Broadcasters) Do you plan to use TA for one delivery technology (FTA broadcast, managed / pay broadcast, IP-ABR) or on several delivery platforms? Is it important for you to use the same technology across different delivery platforms?

Summary:

- “We are only considering it and not yet convinced. I expect that our OTT delivery will be the first. Then maybe DTT (as we control that). We do not control cable or IPTV or satellite delivery platforms. All of our channels and services are FTA.”
- “At the end we want to be able to reach all screens / all types of devices via all types of networks”
- “The more delivery platforms that are addressable with one single delivery technology the better...(i.e. linear channels to DTT, satellite, cable and increasingly OTT open IP delivery)”
- “Would be great to have the same technology and use as much of existing technologies already used by broadcasters as possible”

Responses summarised only from broadcasters who responded.

[Q10] Which would be the existing TA elements (tech blocks..) which are already running in other systems (i.e. Internet) that should be re-used for TV TA and will need to interact with possible future DVB TA standards ?

Summary:

- DAI Engines
 - VAST, VMAP, VPAID
 - Ad Placement engines/ Placement Opportunity Systems (POIS)
 - (Ad) Pricing engines
 - Dynamic Adservers, DMPs (Data Management Platforms), Data exchanges, DSPs (Demand Side Platforms), Server Side Platforms (SSPs), Analytics & Tools, IAB Formats and compatibilities (like VAST compliance)
- Signalling & Insertion
 - Need for frame accurate splicing
 - SCTE TA standards
 - SCTE 35, 104 etc
 - We already have an HbbTV based TA offering and are quite confident that HbbTV 2.0 will provide even more necessary features for our requirements.
- Content Preparation & Distribution
 - Content transcoding/packaging
 - Content Distribution Networks (CDNs)
 - DRM
 - Internet delivery of content (ads)
 - Broadcast delivery of content (ads) could also be useful depending on storage on device
- Audience Measurement
 - Census-Level Data will need careful consideration [may not be relevant to re-use existing metrics] and will need to consider privacy/GDPR

Quotes:

“We need to reuse all the existing ad back office and not reinvent new things”

“Most of the elements and interfaces are defined in IAB”.

There was broad agreement on this question. Most thought that many of the back office systems already existed and that only some adaptation/interfacing to existing systems would be

needed to enable TA on broadcast platforms. However, existing systems did not always fully support all the standards and a lot of bespoke work was required for each delivery platform.

Section 3- Technologies (4 questions)

[Q11] Vertical market set top box (16 responses)

- The first type of solution is complex and proprietary. A few ADTECH companies offer these workflows. They rely on the box, often not connected (?). This includes Cisco Videoscape / Sky AdSmart, Invidi, FreeWheel, Visible World, Cadent / Blackarrow, SmartClip. Some of these solutions are using SCTE35 as in-band triggers.
- In Germany, some devices should support TA: Horizon STB (Unitymedia), Entertain TV (German Telekom) and Giga TV (Vodafone).
- The second type of solution is based on HbbTV which should lead to the same architectures for Broadcasters and Operators. E.g. SmartClip is offering TA over HbbTV (overlay, split screen, full screen via HbbTV 2.0?).
- Data analytic for HH segmentation is a key part of TA.
- A list of identified standards includes:
 - Splice signals : SCTE104, SCTE 35
 - Ad request/response/measurement : SCTE 130-3, IAB VMAP, IAB VAST
 - Video delivery : M2TS, ABR (HLS/HSS/MPEG-DASH)
 - Metadata: ADI 1.1/ADI 3.0/TVA

[Q12] Vertical and horizontal market, connected devices (14 responses)

- In the connected devices / OTT applications the solutions are based on SCTE104/SCTE35 to trigger the switch, connections to POIS to validate the ad slot, manifest manipulation (server side or device side) to replace the ads, VAST for interface with ad decision servers.
- DASH IF specification IOP on ad Insertion should be considered. It includes detailed description of server-based and app-based ad insertion.
- HbbTV relies on MPEG-DASH for broadband service, which is promising for TA.
- Several device manufactures are active in this field like e.g. Samsung/Sorenson and LG.
- Data analytic for HH segmentation is a key part of TA.
- A list of identified standards includes:
 - Splice signals : SCTE104, SCTE 35
 - Ad request/response/measurement : SCTE 130-3, IAB VMAP, IAB VAST
 - Video delivery : M2TS, ABR (HLS/HSS/MPEG-DASH)
 - Metadata: ADI 1.1/ADI 3.0/TVA

[Q13] Horizontal market (broadcast / TV receivers)(16 responses)

The technical solutions foreseen for this market are:

- Existing ad insertion solutions based on splicing in the remote device and ad clip filecasting. This includes:
 - SCTE104: a frame accurate digital cue tone / advertising marker used to trigger the switch in the device on the field. It's generated in the broadcast center, delivered over SDI or IP.
 - SCTE35: the conversion in the DVB compressed world of the SCTE104 triggers.
- HbbTV as a framework for the TA application.
 - More specifically HbbTV 2.0 seems more adapted to seamless switch in the TV set.
 - In Germany all HbbTV supporting devices should support TA.
- For one respondent TA is possible only if ads are preloaded. For another respondent TV manufacturers are already offering a solution (no detail).

A list of identified standards includes:

- Splice signals : SCTE104, SCTE 35
- Ad request/response/measurement : Scheduled ad insertion, panel based measurement
- Video delivery : M2TS
- Metadata: ADI 1.1/ADI 3.0/TVA
- HbbTV 2.0 Stream Events

[Q14] Do you have a specific architecture in mind which you can share? (13 responses)

- Most of the respondents have no solution to share.
- Solutions exist or are planned for broadcast based on HbbTV, proprietary for broadcast PayTV (e.g. AdSmart using SCTE35) and based on DASH for OTT. Nothing in common among these 3 types of solutions.
- SmartClip (Germany) addressable TV platform is also an HbbTV based solution.
- For one respondent ad clips need to be delivered in advance to guarantee high video quality.
- Another respondent can describe an architecture with an ad control plane (usually network based for platforms that have a return path) normalizing advertising functions between the various players in both the monetization and delivery planes.

Section 4: Hurdles and Wishes when planning / deploying a targeted TV advertising solution

Summary (Questions Q15-Q18) :

The 5 key technology hurdles derived from the answers given in section 4 of the questionnaire are:

1. TA solutions should seamlessly switch and substitute content

2. Synchronization issues should be solved with frame accuracy and enable just-in-time ad decisions.
3. There is a need to Minimize the different TV set/device behaviors.
4. A “trusted reporting” mechanism is required.
5. The security deployment in the whole chain is important to guarantee the TA Model.

The majority of the respondents agree on the first three issues (above) as technology topics to be resolved. On the non technological side the main topics could be grouped as follows:

- Privacy and Security is a must
- Market reach and ecosystem confidence is crucial.

61% of the participants think is too early to have a “preferred solution”, didn’t answer at all this question or answered with a “No”.

57% of the participants who answered, referred to Hbbtv as a good starting point to facilitate TA solutions.

Main conclusion from participants, is that cherry picking from different existing standards, could help create the base of the standard which could be complemented with new parts that could solve the existing gaps.

See Detailed inputs for more

Questions details and explanations

[Q15] What are the key (technology) hurdles when you deploy (or consider / plan the deployment) of a TA solution?

There are 4 main groups of answers which have been specified by several companies:

1. TA solutions should seamlessly switch and substitute content
2. Synchronization issues should be solved with frame accuracy and enable just-in-time ad decisions
3. There is a need to Minimize the different TV set/device behaviors on
 - a. Applications (hbbtv or others)
 - b. Formats
 - c. Codecs
 - d. And the lack of Storage space
 - e. The end-user bandwidth
 - f. Interoperability
4. A “trusted reporting” mechanism is required
5. Maintain compatibility with existing device population
6. How to deal with multiple viewers on shared screens
7. How to ensure the security deployment in the whole chain

8. Auction algorithms;
 9. VAST compliancy
 10. Impact on network and CDN
 11. How to mix existing internet technologies with the traditional TV's architectures.
 12. Global 360 advertising views on multiscreen
 13. User profile storage/recovery - unique identifier of user terminal
 14. Addressable device market and their reliability on the client side and scalability and ease of integration on the server side
 15. Big gap between functionality of scheduling systems in place and desired features for TA.
 16. Integration of components / vendor support / consistency of the application of standards across different vendors.
- 17.** Lack of standards outside of the MVPD environment around how advertising orders are communicated between advertisers/agencies and the tech stack.

[Q16] What about non technology issues?

The non-technology issues are grouped as follows:

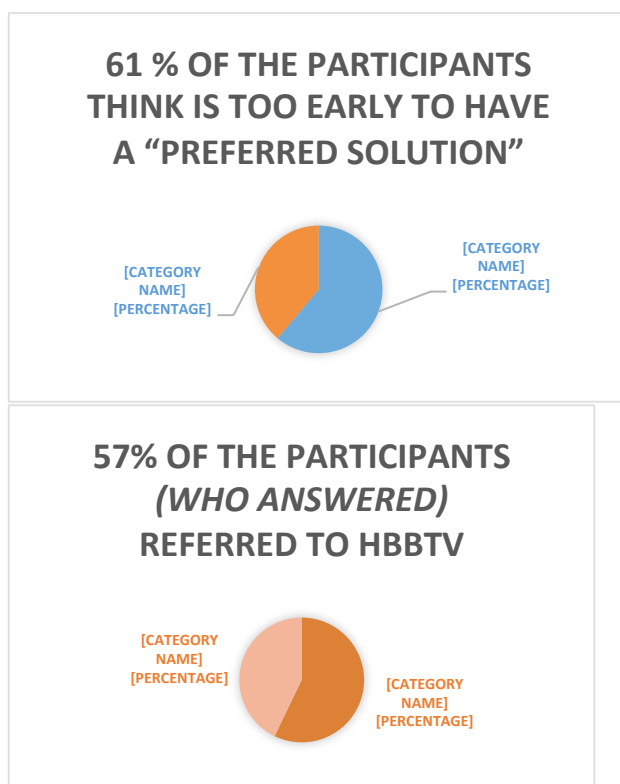
- Privacy and Security is a must: 33% of responses talk about privacy and security issues in data-collection, -storage, -management and -sharing.
- Trust between parties in the chain and data reporting is required
- Market reach and ecosystem confidence is crucial.
- The alignment of all parties from advertiser to agency to inventory owner (content provider) to platform provider (MVPD) in terms of requirements, value proposition, worth and priority against other projects.

[Q17] Can you please identify the top 3 / 5 technology issues which you would like to see resolved?

There is a general consensus on the top 3 technology issues to be resolved:

1. **Seamless replacements or splicing of ads/content between different technologies** (broadcast, broadband, pre-cached or not), ensuring frame accuracy and the right user experience on all possible corner cases. (*scenarios such as a user leaving channel during TA, and coming to the channel again after a few seconds, etc.*).
2. Need of a **technical alignment to create a precise signaling of ads** in the broadcaster play out and the client side to enable accurate media synchronization with the TA solution and workflows.
3. **Minimize the different TV set/device behaviors** related to the performance (limits, delays and latencies) of the different elements linked with the TA solutions (formats, audio/video codecs, user bandwidth, stat mux on broadcast, device storage and caching etc.)
4. **How to ensure a consistent trustworthy data and ad tracking systems for TA solutions.**
5. Development of a **common system architecture, standardized interfaces** and a common **set of features** for TA.
6. **Reliable and stable device identification** fully compliant with the European policy regulations.
7. **How to identify different viewers** in front of the screen and how to profile.
8. Standardization of inventory file formats and APIs, as provided (or not) by sales systems (traffic and billing systems)
9. The speed up of implementation of SCTE TA standards in products. This ranges from scheduling systems, play-out automation, encoders up to receivers and media players.

[Q18] Do you have any view, or can you identify any “preferred” solution, whether existing or future/potential, when dealing with these issues?



- A cherry picking of different existing standards could help create the base of the standard which could be complemented by new components to resolve the gaps that exist.
- For broadcast - local ad insertion from hard drive can be very effective.
- Standardization according to SCTE

Section 5 - Scope for TA Standardization

[Q19] Do you view the lack of TA standards as a key hurdle / negative playing against the successful deployment of TA? (17 responses)

12 out of 17 recognize a lack of standard in TA. One is a clear no, four others say no with caveats:

- Not really, except maybe in TV receivers
- Some standard available, but even with them there are difficulties
- Only on the advertising/agency side of the process (is it a DVB remit?)
- Not a lack of standards, but a lack of implementations

[Q20] In which specific aspects do you find it an issue that such standard does not exist? (15 responses)

- Signaling, interoperability of signaling between platforms
- Ad delivery, ad insertion, ad validation

- Not clear about HbbTV support (in TV receivers)
- Single “currency” for measurements
- Communicating orders from advertising/agency

Someone stated that operators do not have any means to do TA in a standardized way and this is different from broadcasters (that have HbbTV) and OTT (that have DASH).

Someone stated that targeting engine and analytics side are already available on the market (*editor’s note: no need of standardization?*)

[Q21] Can you candidly describe the scope or the set of issues that in your view such TA standard should address ? (15 responses)

- Signalling, interoperability of signaling between platforms (e.g. SCTE-35), Ad ID, mechanisms to manage seamless switching (signaling for sync/trigger messages in TS);
- Workflows for advertisers, BC, Operators, OTT providers; TV (TA) platform interfaces with existing digital ad platforms;
- Ad delivery, ad insertion and ad validation; ad reporting; metric to track ad completion
- Communicating orders from advertising/agency
- Practical scheduling as well as its technical implementation.

[Q22] Do you see any other standard on which a possible future DVB standard should build , or integrate ? In this case, what would be the added value / features of a DVB standard ? (14 responses)

- SCTE (6 out of 14); one suggested this should be strongly preferred to avoid lack of support and progression
- HbbTV (4 out of 14), Cable Labs - CANOE and others as ADI 1.1, ADI 3.0, ESAM, ESNI (4 out of 14)
- IAB (VAST, VMAP) (3 out of 14)
- Delivery protocols as HLS, HSS, MPEG-DASH, M2TS (1 out of 14), none (1 out of 14), DVB security standard (1 out of 14)

[Q23] Given the existing/likely regulatory constraints that will apply to TA, what impacts do you see for a TA DVB standard ? (15 responses)

Privacy and data protection are recognized – from all the respondents – to impact TA standard. Two main approaches are suggested:

- The TA standard should comply with privacy and data protection regulation; dialogue and/or liaisons with regulators will help in conforming the standard. DVB guidelines are welcomed. Regional adaptation should be taken into account (specific territorial constraints exist for data usage, transmission of data between borders, etc.)
- A minority view suggests (2 out of 15) that the standard should not enforce the regulation (allowing flexibility)

Section 6 - Timing and Support for a new DVB Standard

Summary

One clear message that can be derived from the answers given in section 6 of the questionnaire is that the development of a potential DVB TA standard is urgent (in terms of timing). So it has to be considered, that if the standardization process takes too long, “tools (and standards) from the internet domain” may be adopted more widely and be used instead. The majority of the respondents stated that they are (at least) considering to participate and to contribute to the standard. Further, most of the companies who took part in the survey would “very likely” support a DVB TA standard in their products, given that it is accepted by the relevant market

players. However, one respondent finds that a DVB standard isn't necessarily required as "DAI [(Dynamic Ad Insertion) - A/N] is already happening" and further, that a new standard could even lead to confusion in the market. One of the participants points out that "patent troll's activities" may potentially lead to an unpredictable cost structure which could obstruct adoption of the standard. When asked in which market a DVB TA standard could be deployed, respondents name applications in horizontal (such as DTT and DTH) as well as in vertical (OTT, IPTV or cable TV platforms) markets.

[Q24] What do you think should be the rough timeline for generation and market release of the standard? (16 answers)

Figure 5 shows a histogram of votes illustrating the expectations of the respondents with respect to a market release date of a potential DVB standard. The histogram has been created by using the following rules:

- "ASAP" (with no further clarification) is interpreted as 2017
- In case that a time period has been indicated, both the beginning and end of this time period is counted as a vote (Thus, the sum of the number of votes is larger than 16.)

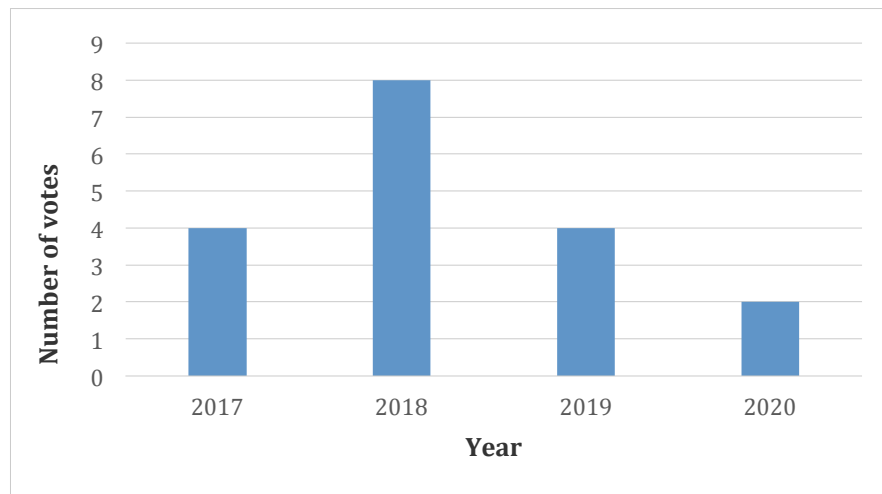


Figure 5: Number of votes for an expected / claimed date of market release

[Q25] Will your company be interested to actively participate and contribute to the standard / adopt an observation position / just ignore the matter? (15 answers)

Figure 6 illustrates to what extent the respondents are planning to actively participate in the standardization process.

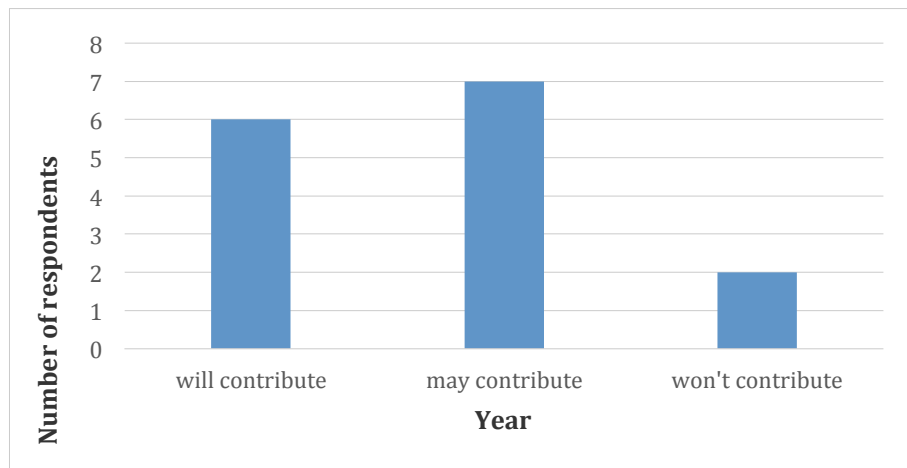


Figure 6: Expressed intention for participating in the DVB TA standardization process

[Q26] If such a standard by DVB is eventually generated (and assuming it is done in a proper manner), how likely is it that your company will support it in its products / operations? (16 answers)

12 of 16 respondents are sure that their company would adopt a (useful) DVB TA standard.

[Q27] Which market do you see as the natural / primary users for such a DVB TA standard? (16 answers)

Obviously, this question has been interpreted differently as some respondents name a geographical region (Europe, US, global) while others refer to a market structure (horizontal vs vertical) or mention single market players (broadcasters, media sales houses, advertisers, agencies, TV manufactures, technology vendors, platform operators, MVPDs).

One of the respondents suggests that vertical markets do not necessarily require a DVB standard for implementing TA while a horizontal platform depends on the consumers' devices to support TA.