DVB-I Pilot Germany

Report Phase 1 (Sept. 2022 - Mar. 2023)

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Project contact:
Remo Vogel
Rundfunk Berlin-Brandenburg
Referent Distributionsstrategie
HA Distribution
Produktions- und Betriebsdirektion
Email: dvb-i@rbb-online.de

Press contact:
Thomas Schierbaum
Bayerische Medien Technik GmbH
Business Development- und Marketing
Tel.: +49 89 45 1151-51
Email: presse@bmt-online.de

Website:
https://dvb-i.tv/services/#germany

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Management Summary

The aim of the DVB-I standard is to be able to continue to offer the well-known and usual simple use of linear TV programming even if the program is no longer distributed exclusively via the established broadcast channels satellite, cable and terrestrial, but increasingly also via IP streaming. With DVB-I, the two forms of distribution broadcast and IP can be combined **into a common user experience** that corresponds to the usual one of broadcast. Inaddition, DVB-I provides easy **access to pure IP streaming services** (without satellite, cable or terrestrial reception). DVB-I thus combines the advantages of both transmission channels and thus reaches target groups who only know video usage as streaming. Furthermore, DVB-I offers a flexible distribution solution that can implement new technologies, such as UHD and accessibility, but also offers cost-effective solutions for smaller user groups with selected content or regionalization. The core element of the DVB-I specification is the **definition of a program list (= service list)** in which one or more different distribution variants can be specified and prioritized for each program. The DVB-I standard is particularly suitable for putting television use on **TV sets** on a new and more flexible technological basis, but can also be implemented software-based on **OTT boxes/sticks or mobile devices** via apps.

As part of the **"DVB-I Pilot Germany",** which started in September 2022 and whose phase 1 ended in March 2023, a common view of the technical **functions (proof-of-concept)** of the standard and the associated opportunities and challenges emerged.

The following **21 broadcasters, companies and organizations** were involved in the "DVB Pilot Germany": ARD, bmt, Dolby, DVB, EBU, Fraunhofer FOKUS, LG, Media Broadcast, MIT-xperts, OnScreen Publishing, ProSiebenSat.1 Media, rbb, RTL Deutschland, SES, Sofia Digital, Sony, TARA Systems, TP Vision, Vestel, WDR and ZDF.

Key **findings** were:

The aggregation of the **common service list of** the participating station families was **successfully implemented and presented on the first prototype TV sets**. Impressive was the switching from broadcast to IP when the devices were disconnected from the broadcast network, moderate switching times between IP streams and the **fast integration of services** such as HbbTV, content guides, DRM sign in, dynamically added event channels, playlists and next generation audio. The **regionally correct program sequences** were provided via a postcode entry on the TV set. Towards the end, non-representative **user tests** of rbb took place in the rbb UserLab. The majority of testers would recommend a SmartTV with **DVB-I** to a friend or family. In parallel, a large number of DVB-I players have been successfully implemented on a wide range of Android/iOS/web-based devices.

In addition, **requirements** have been formulated that still need to be consolidated for a possible market launch:

The aggregation of the **service list** requires a **technical-organizational instance** that compiles the services of the program broadcasters into a regionally correct program sorting and makes them available for retrieval by the DVB-I clients. For the order, the

public value recommendation of the state media authorities would be suitable. Furthermore, there is a need for criteria for the sorting of offers that are not included in the public value list.

For private content providers, when distributing content via the Internet, it is important that the offers can be activated via user authentication and protected by the use of a commercially available DRM system. The DVB-I standard provides for user authentication and the start of the DRM-protected stream in a (HbbTV or HTML5) application in a service instance. For commercial operation, it is important to ensure that standardized **DRM support is available in all clients available on the market**.
Based on the findings of the pilot operation, improvements and additions to the DVB-I DRM and LogIn functionality have been addressed to the DVB project and HbbTV.
The aim is to ensure the compatibility of HbbTV DRM support with other applications, but other DRM concepts, such as the **integration of a platform operator**, must be taken into account.

The availability of clients (SmartTVs and apps) is crucial for the market success of DVB-I. Currently, there is a device manufacturer in the "DVB-I-Pilot Germany" with a very extensive DVB-I implementation and regular updates. Other manufacturers offer partial implementations and still others observe the pilot and follow developments in their own R&D departments. One of the manufacturers has promised to be able to make some of its SmartTV sets already available on the market DVB-I-capable with an update. The next step is to expand the availability of prototype devices in order **to be able to test DVB-I services on a broader basis**.

The cooperation in the "DVB-I Pilot Germany Phase 1" was characterized by a high degree of motivation, result orientation and innovative strength. It was also the start of a regular **exchange of information** with the Task Force DVB-I of the **German TV Platform**, with the newly founded DVB-I Forum, the **DVB-I Pilots Italy** and the European **DVB project.**

Against the background of the successful "DVB-I Pilot Germany", the broad support from the broadcasting industry and the positive national and international feedback, the members recommend an additional **phase 2** in order to consolidate outstanding points for a possible market launch. In addition to the above-mentioned aspects, questions of **service list updates** (e.g. for dynamic event channels), **satellite parameters** for tuning without an Internet connection, **new use cases** and **modern user interface** (e.g. use of playlists, links to VoD content) as well as possible **personalization and audience measurement concepts** will be considered.

The DVB-I standard, which has been in existence since 2019, has made enormous progress in Europe in recent months – not least thanks to the initiative of the "DVB-I Pilot Germany". With the adjustments envisaged for Phase 2, the standard offers a great **opportunity for an open and horizontal TV market** in the process of digital transformation.

1. Introduction and initial situation

Television use is increasingly shifting to the Internet. Along with the increasing variety of offerings, new business and usage opportunities, new challenges are also emerging for program providers, device manufacturers and viewers.

Today, the streaming of linear TV content on SmartTV devices is next to conventional television reception. It is usually done via the apps of third-party platforms that compete with each other. The apps may vary in content and functionality and do not include conventional broadcasting. Not all TV content may be available in all apps, and not all apps may be available on all TVs. In addition, the FAST channels (Free Ad Supported Streaming TV) are new offerings that attract the attention of the audience. For TV providers, this can create new hurdles, dependencies and market fragmentation. The findability of their content is becoming increasingly important.

At the same time, the economic broadcast distribution of mass-attractive content with its program-accompanying additional services for the large families of broadcasters still exists. Hybrid distribution approaches are therefore needed in order to prepare the transition to pure Internet-based program distribution intelligently and economically in the interests of TV providers.

Audiences, in turn, expect to access streaming content from linear TV programs in a way that is as user-friendly and reliable as traditional TV broadcast on TVs.

DVB-I offers a technical solution for many of these challenges and opens up the opportunity for an open and horizontal TV market in the process of digital transformation.

Fig. 1: SmartTV receivers are increasingly being used live and on demand via the internet connection. So far, this works via app portals or third-party platforms, but not with the familiar navigation using the programme buttons on the remote control. At the same time, the use of linear television via classic broadcast channels will remain relevant for a long time, even if this is declining. For the critical transition phase, DVB-I offers a technical solution. (Source: rbb)

2. Introduction to DVB-I

The main objective of the DVB-I standard is to be able to continue to offer the well-known and usual simple use of linear TV programming even if the program is no longer distributed exclusively via the established broadcast channels satellite, cable and terrestrial, but increasingly also via IP streaming.

Today, the use of IP streams on TV sets is usually associated with the launch of special apps, which in turn do not allow the broadcast to be included. It is associated with a longer user journey and stands alongside conventional TV reception.

With DVB-I, the two forms of distribution broadcast and IP can be combined into a common user experience that corresponds to the usual one of broadcast.

The core element of the DVB-I specification is the definition of a program list (service list) in which one or more different distribution variants can be specified for each program. An IP-based "Content Guide" can be used to provide metadata for both linear and on-demand offerings, on the basis of which the TV can offer comprehensive search functions.

The DVB-I specification was developed by the DVB project, which has been very successful in setting standards for this market since the beginning of digital television. The definition of the "Commercial Requirements" for DVB-I began in January 2018. With the publication of a first version of the technical specification as "DVB Bluebook A177" in November 2019, an important milestone was set for the technical standardization work. A further developed version of the specification was later submitted to ETSI and published there in November 2020 as "ETSI TS 103 770 V1.1.1". The latest version of the DVB-I specification "DVB Bluebook A177rev4" was published in September 2022. Extensions to the DVB-I standard, e.g. DVB-I with TA (Targeted Advertising) and DVB-I via 5G, are currently being specified by the DVB project.

The DVB-I standard is particularly suitable for putting television use on TV sets on a new and more flexible technological basis, but it can also be implemented on pure OTT boxes/sticks or mobile devices.
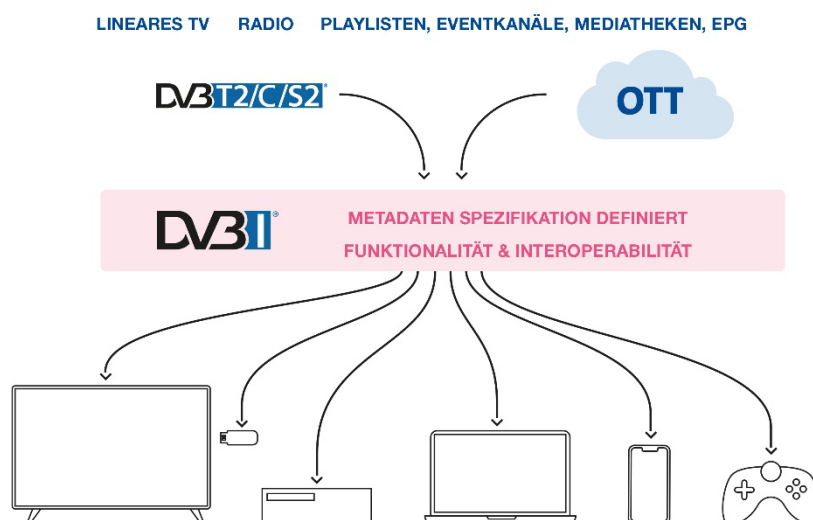

Fig. 2: Areas of application of DVB-I (Source: rbb)

3. Advantages of DVB-I

DVB-I offers viewers the opportunity to use a variety of services via a simple and quick-to-use user interface. While linear television is at the heart of the DVB-I concept, it can also be used to map event streams and on-demand offerings and make them visible via a uniform search function. From the user's point of view, it is irrelevant via which path, broadcast or IP, the individual program elements are transmitted. This enables a seamless and convenient migration of linear program distribution from broadcast to IP.

Through the simple integration of additional offers (live streams) or features such as UHD versions of TV programs, a higher variety and quality of services is possible without sacrificing ease of use or clarity. Since all features can be offered through the native device UI, there is no need to install or launch specific apps.

Individual features offered by DVB-I are presented in more detail in chapter 4.4 "Services and developments" of the pilot's description.

4. Description of the DVB-I Pilot Germany

Initial preparatory work and presentations on DVB-I took place in parallel with the development of the specification in Europe from 2019 onwards. From 2021 onwards, there were preliminary considerations about a possible pilot project in Germany, which finally started at IBC 2022. The focus of the activities was the mapping of a complete DVB-I ecosystem and its evaluation (proof-of-concept).

Based on the successful results and the agreed time limit, a further phase 2 is recommended to consolidate the requirements for a possible market launch (see Chapter 7).
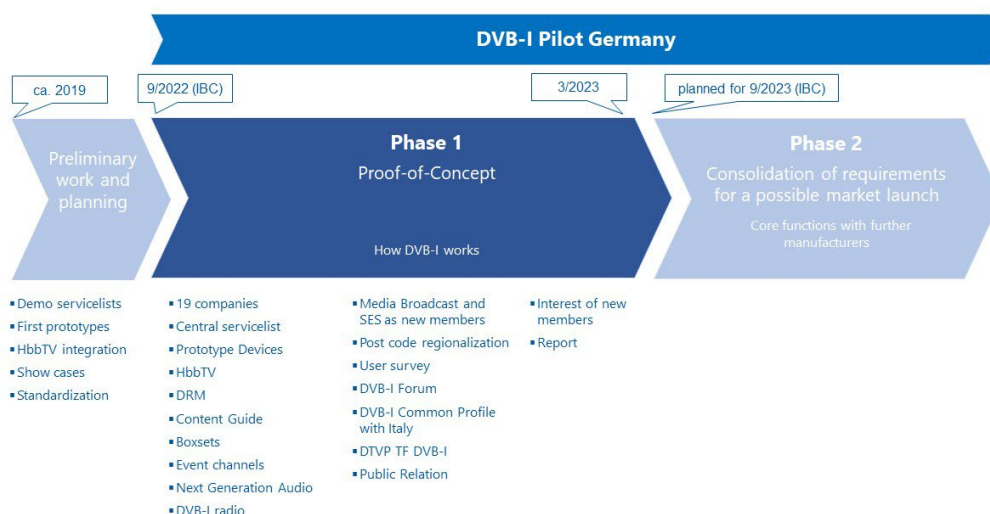

Fig. 3: Timeline, milestones and sequence of phase 1

4.1. Goals

Phase 1 of the pilot was a temporary cooperation to develop a common understanding of DVB-I functionality as well as a standardized future scenario to map the complete DVB-I ecosystem. Participants were broadcasters and manufacturers of TV sets and software. The pilot started at IBC 2022. The objectives were:

- Development of a common and standardized future scenario
- Demonstration of the potential user guidance of DVB-I
- Providing a vision for a national market scenario
- Demonstration of technical cooperation between public and private broadcasters
- Development of solutions for the use of DRM and subscription services
- Identification of technical gaps and requirements in the standard
- Gaining experience with the aggregation of service lists
- Collection of findings for further consideration of a possible launch of DVB-I services in Germany.

4.2. Participants

Fig. 4: Logo wall of the DVB-I pilot Germany

The project participants with their main topics were:

Core:
- ARD: Service list generation, HbbTV, EPG and radio
- Bayerische Medien Technik: Service list generation and regionalization
- Media Broadcast: DRM, DVB-I Client Demonstrator, Service list generation
- RTL Deutschland: Service list generation, DRM, user authentication
- SES: Mapping of satellite reception parameters in the service list
- Seven.One Entertainment Group: Service list generation, DRM
- ZDF: Service list generation, Content Guide, Playlists, Event Channels, Demo-Web-Clients

Extended group:
- Dolby Laboratories: Next Generation Audio
- Fraunhofer FOKUS: Provision of a DVB-I client
- LG: Provision of a prototype receiver device
- MIT-xperts: Service List Generation
- OnScreen Publishing: Provision of a DVB-I client
- Sofia Digital: Provision of a DVB-I client
- Sony: Information exchange and testing of the service list
- TARA Systems: Provision of a DVB-I client
- TP Vision: Provision of a prototypical receiver device
- Vestel: Provision of a prototype receiver

Associated project participants:
- DVB project: Harmonisation of requirements and specifications, support for trade fair appearances and communication
- EBU: Harmonisation of requirements and specifications, support for trade fair appearances and communication

4.3. Organization of the working groups

The pilot was organized as an open cooperation between different participants in the TV market. The roles of the participants range from broadcasters and content providers to aggregators to device manufacturers and service providers. Since DVB-I is an open ecosystem and benefits from the broadest possible support, it was acted with the highest possible transparency. At the same time, the development statuses of the devices involved were treated confidentially and in separate communication tools.

A core group organized the pilot and made the essential decisions. The extended group was called in selectively, depending on the role. The DVB project and the EBU had the status of associated participants who were to coordinate the international harmonisation of the requirements and specification.

For organizing the work efficiently, the following eight subgroups were formed from the members of the core group:

Subgroups	Topic	Participant
Common Requirements	Transfer to DVB-I IF Coordination with ital. Pilots	RBB (chair), RTL, WDR, ZDF
Requirements by CM-I & TM-I	Support for standardization	ZDF (chair), RBB, bmt
Illustration of event channels	Possibilities and requirements	ZDF (chair), RBB, RTL, WDR
Manufacturers & Tests	Communication and interoperability	ZDF (chair), bmt, RTL
Service List Architecture	Service Lists Aggregation, Regionalization, Updating	bmt (chair), Media Broadcast, RBB, WDR, ZDF
Requirements	Update Requirements	RBB (chair)
Mobile Pilot Application	Android App	RBB (chair) WDR, ZDF
DRM	Cross-channel concept	Media Broadcast (chair), RBB, Pro7Sat1, RTL,

Tab. 1: Subgroups in the "DVB-I Pilot Germany"

4.4. Services and developments

4.4.1. Service list Aggregation

Several groups of broadcasters took part in the pilot. Each station group is responsible only for its own television programs (services) and creates and maintains its own service lists. There are different solutions for generating the service lists, as it depends primarily on the system architecture of the broadcasting group. One implementation was based on an extension of the existing content management system (CMS), while other broadcasting groups expanded their existing systems responsible for generating DVB metadata.
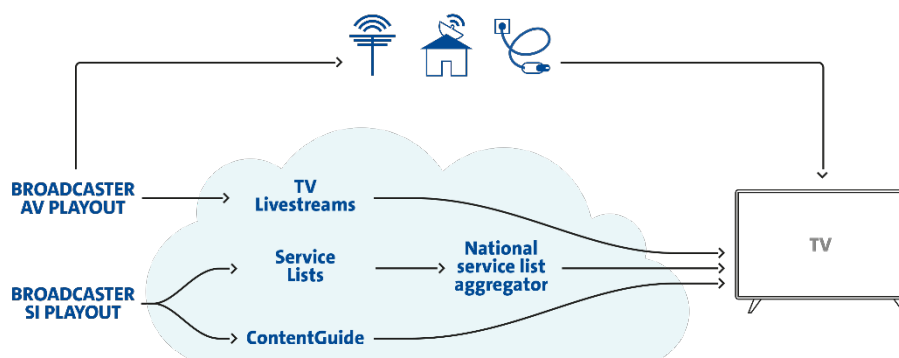
Fig. 5: The hybrid service list is the central element of DVB-I (Source: rbb)

For the pilot, it was agreed that the DVB-I client should only load a complete service list. For this reason, it is necessary that all service lists are merged in advance. In DVB-I, this process is called service list aggregation.
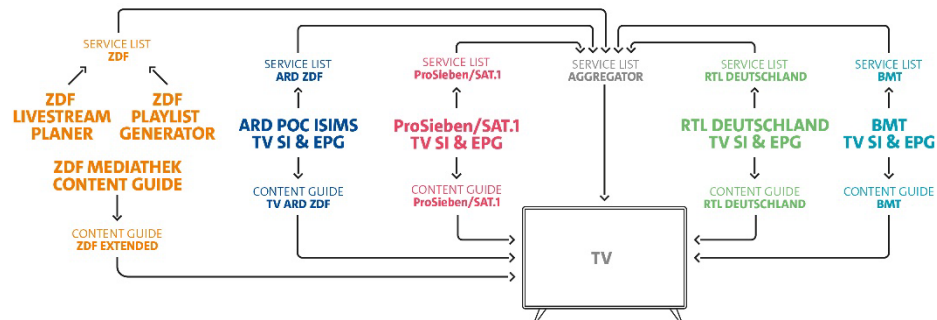

Fig. 6: Overview of service list supply of transmitters and aggregation for the pilot (source: rbb)

The development of an aggregator was commissioned. Its main tasks were:

- Provision of a web service,
- API for uploading servicelists via script languages,
- Integrated XML syntax check based on the DVB-I schema,
- Checking for duplicate LCN values,
- Check if ContentGuideSource exists,
- Check whether at least one service is included,
- Checking and, if necessary, inserting a ContentGuideSourceRef,
- Provision of a test and a production list.

This was preceded by an agreement on the distribution of the LCN numbers, which were also stored as a prototype as a fixed template. In addition to the demonstration of service list aggregation, the postcode-based regionalization concept of DVB-I and a service list according to the Public Value recommendation of the German state media authorities were also presented (see section 4.4.6).

1	Das Erste		33	Regio TV Schwaben HD
2	ZDF		34	Regional Fernsehen Oberbayern HD
3	RTL		35	TV Mainfranken HD
4	Sat.1 NRW		36	TV Oberfranken HD
5	ProSieben		37	tv.ingolstadt HD
6	BR Fernsehen Süd		38	TVA Ostbayern HD
7	VOX		39	ARD-alpha
8	ntv		40	tagesschau24
9	kabel 1		41	One
10	münchen.tv HD		42	ZDFinfo
11	Kika		43	ZDFneo
12	3SAT		44	BR Fernsehen Nord
13	arte		45	MDR S-Anhalt
14	Phoenix		46	MDR Thüringen
15	ZDF Playlist		47	NDR FS HH
16	ZDF Event		48	NDR FS MV
17	NDR FS NDS		49	NDR FS SH
18	WDR Köln		50	rbb Brandenburg
19	MDR Sachsen		51	SWR RP
20	SWR BW		52	WDR Retro Playlist
21	hr-fernsehen		53	WDR Aachen
22	rbb Berlin		54	WDR Bielefeld
23	rbb Dolby AC4		55	WDR Bonn
24	SR Fernsehen		56	WDR Dortmund
25	Radio Bremen TV		57	WDR Duisburg
26	a.tv HD		58	WDR Düsseldorf
27	allgäu.tv HD		59	WDR Münster
28	Franken Fernsehen HD		60	WDR Siegen

Tab. Fig. 2: Complete TV service list of the pilot according to the agreement with the corresponding program slot number (LCN). All red-bordered programme slots are intended for regionalization, e.g. the regionally correct ARD third programmes on place 6 and the regionally correct local TV station on place 10.

4.4.2. HbbTV

Today, the HbbTV standard is implemented in virtually all SmartTV devices. It offers an openly accessible and uniform application environment for SmartTV apps and – via the "Red Button" – a simple linking option to such apps from linear TV programs.

Due to its ease of use from the linear context and the high reach on the device side, HbbTV is now the most important and widely used platform on the market for the consumption of media library content and other offerings on SmartTV devices.

The DVB-I standard has therefore been designed in such a way that the "Red Button" function on the basis of HbbTV remains available here as well and can be used both from broadcast instances and via those delivered via IP. This means that the full range of functions of HbbTV is also retained with DVB-I and the existing applications can continue to be used.

HbbTV as a standard feature of all SmartTV devices was already included and integrated in the pilot in all TV prototypes and Fig. 7 shows the regularly operating HbbTV application of ZDF in operation on an OTT service instance. The linking for OTT takes place via the DVB-I service list, for the broadcast instances it remains with the linking via an AIT in the broadcast signal.
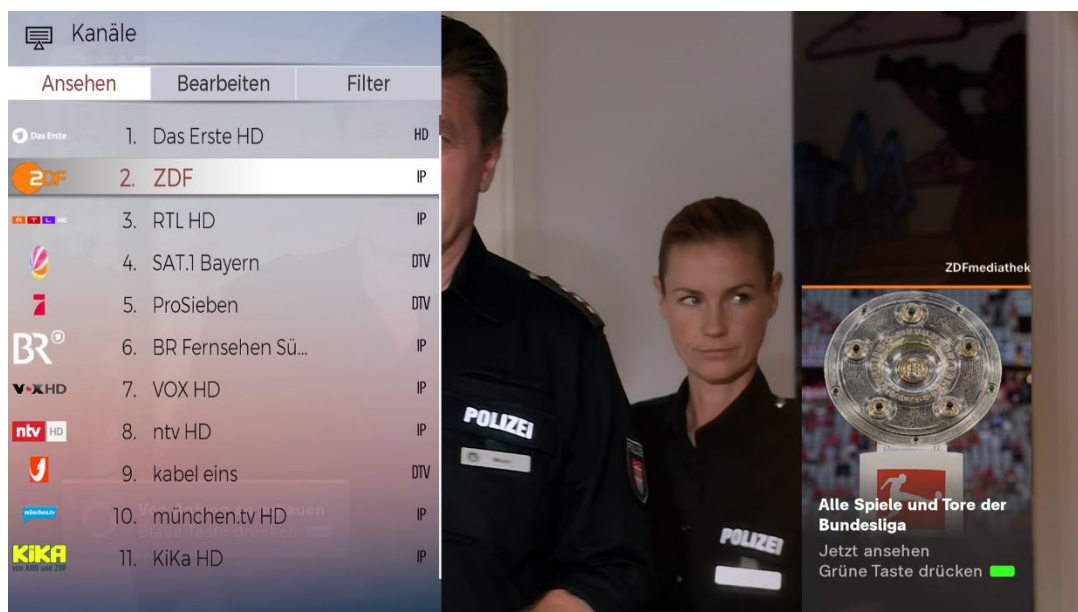
Fig. 7: Hybrid service list on a TV set from Vestel

In addition to mapping the established "Red Button" function, HbbTV does even more in the DVB-I context: an HbbTV application can also handle the activation of DRM-encrypted programs. This opens up new degrees of freedom in the TV market, as the individual broadcaster can make individual activations without additional modules or smart cards. For more information on the DRM aspect, see section 4.4.4.

In addition to DRM handling, HbbTV can also be used to present content that the user can find via a search in the content guide. For this purpose, deep links to the media library of the respective broadcaster are linked to the individual media content in the content guide (more on this in section 4.4.7).

4.4.3. Next Generation Audio (NGA)

For the "DVB-I German Pilot", an additional service was tested for the use of a new type of audio coding method (Next Generation Audio or NGA in short). NGA offers users additional functionality to adapt the listening experience in end devices to individual preferences (audio personalization).

The NGA service in the pilot provides a setting for speech intelligibility "Dialogue Enhancement" in the end device. The volume ratio between dialogue and background can be adjusted to individual preference. Dialogue Enhancement is an NGA feature that can offer direct added value for the audience at a comparatively low cost – it works without special production of the content and can be added automatically by the audio encoder.

For the test operation, the NGA coding method AC-4 was used in cooperation between RBB and Dolby. Dolby AC-4 is a standardized audio codec (ETSI TS 103 190), which is included in the DVB standard (ETSI TS 101 154) for NGA encoding. Dolby AC-4 is supported by professional audio processors (e.g. encoders) as well as by the end user devices on the market, so that a complete end-to-end test operation is already possible in the pilot (see Fig. 8).

1. Titan Live Encoder enkodiert aus Stereo Mischung ein AC-4 Bitstrom und fügt Dialogue Enhancement Metadaten hinzu
2. DVB DASH assets werden in der Cloud zur Verfügung gestellt
3. RBB wird als zusätzlicher Dienst mit AC-4 Audio in der DVB-I Service Liste zur Verfügung gestellt
4. DVB-I Endgeräte dekodieren den AC-4 Dienst mit implementiertem Dekoder
5. Hörerschaft kann die Sprachverständlichkeit über das Dialogue Enhancement User Interface einstellen
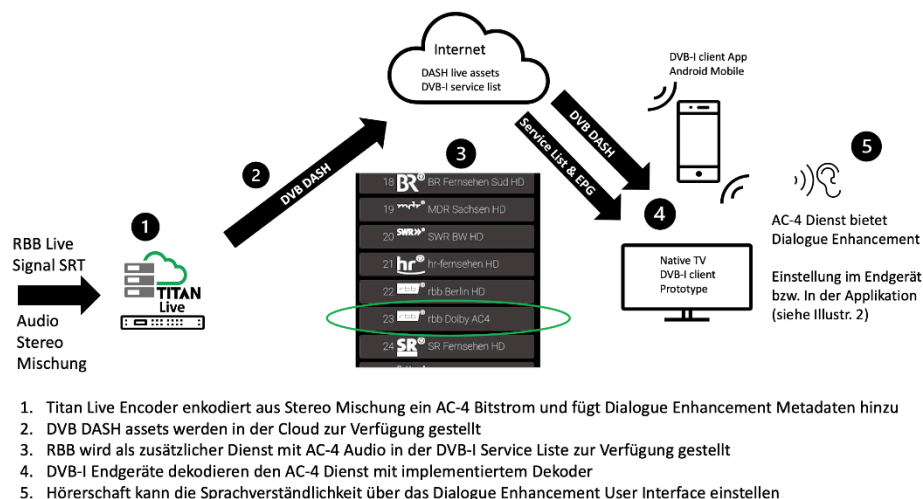
Fig. 8: Workflow for the provision of an NGA service based on the RBB live signal

All tested TV prototypes for native DVB-I-TV implementations have an integrated AC-4 decoder and provide a user interface to control the "Dialogue Enhancement" functionality (see Fig. 9 top image). In cooperation with OnScreenPublishing, a user interface was also implemented for the mobile Android DVB-I applications presented at IBC 2022 to control the Dialogue Enhancement functionality. User settings from the application are transferred to the AC-4 decoder, which is implemented on the mobile Android device (Fig. 9 lower picture).

Fig. 9: User interface for Dialogue Enhancement on a Philips DVB-I Prototype TV (page 15) and in a DVB-I application on an Android mobile device (page 16)

4.4.4. DRM

When distributing content via the Internet/via IP streams, it is important for private content providers that the content can be activated by user authentication (sign in) and protected by using a standard DRM system (e.g. Microsoft Playready, Google Widevine).

For this purpose, the DVB-I standard provides for user authentication and the start of the DRM-protected DASH stream in an HbbTV application or a native HTML5 application to be handled as a "Type 1.2 Linked Application" in a service instance. While the HbbTV app is aimed at DVB-I use on HbbTV compatible TV sets, the HTML5 app can be used for non-HbbTV devices (e.g. tablets, smartphones, PC browsers...), provided that the option defined in the standard to implement both apps in one service instance leads to reliable evaluation and playback in the respective client (5.2.3.1 DVB-I-Spec).

The advantage of mapping DRM and user authentication in one app for content providers is, among other things, control over the DRM systems and players in the application, and geo-restrictions can also be managed via this.

User authentication (sign-in) and start of a DRM-protected stream was implemented in the German DVB-I pilot project for the channels of RTL, VOX (HbbTV app) and NTV (HTML5 app), whereby the sign-in process was simulated by pressing "OK". The activation in the client was carried out by a token transmitted by the license server, which can also be configured across several channels of a broadcaster in the DVB-I portfolio. After activating the sign-in, the application starts the DRM-protected stream of the respective channel.
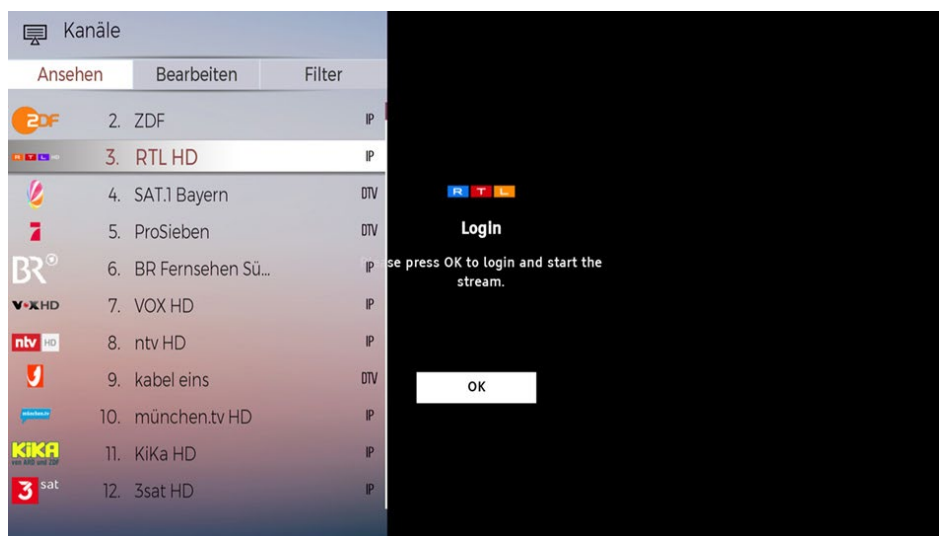
Fig.10: Example of a sign-in access of the channel "RTL"

Findings, limitations and further developments on user authentication and DRM with DVB-I:

1. So far, the functionality of the DRM/Sign In applications could only be comprehensively and successfully tested on the Vestel client due to the limited availability of SmartTV test devices in the current phase. DRM streams could be started reliably, with moderate "zapping time", using the HbbTV app and HTML5 app. DVB-I browser solutions, as expected, only played the HTML5 app.

2. If DVB-I is rolled out to other clients in "regular operation", it must be planned that DRM-protected DVB-I services may not work or only work to a limited extent on individual clients, e.g. due to lack of DRM support of the client or other technical dependencies in the player. Possible adjustments in the app (or the player) cannot be calculated precisely in terms of time, this requires special consideration and communication.

3. The current DVB-I standard does not provide for an HbbTV "Red Button" application to be loaded in addition to the implementation of an HbbTV-DRM/Sign In App described above. (See 5.2.3.1 DVB-I Spec "For a particular MediaUri@contentType, there shall be at most one RelatedMaterial element...). DRM-protected services cannot therefore be supplemented with the usual HbbTV services in this DVB-I use case. This problem has already been addressed in the DVB project and HbbTV (see below).

4. As an alternative to the approach described above, the respective broadcaster can also refer to an HbbTV-Start application in the DVB-I service list, which combines user authentication, DRM and the HbbTV Broadcaster App. This solution was implemented in the Italian DVB-I pilot, but restricts, among other things, possible extensions of the usage scenarios to platform operator (see below).

5. The DRM system itself (DRM products with associated specifications and profiles) is not within the scope of DVB-I and the German DVB-I pilot.

6. Currently, the DVB Project/CM-I is defining extended commercial requirements for different DRM use cases based on the experience of the German and Italian DVB-I pilots, with the aim of improving or expanding DRM/Sign In options. These include:

   - Start of an HbbTV "Red Button" autostart application in addition to the DRM-protected stream (see above)
   - DRM-Handling "native DVB-I", without starting one "linked application".
   - Use case where a platform operator manages a "broadcaster DVB-I service" for some broadcasters/service providers, while DRM + stream playback is provided by the broadcasters/service providers
   - Use case where a platform manages audio and DRM + stream playback for some broadcasters/service providers in a "platform DVB-I service list".

4.4.5. Event channels

The DVB-I standard allows the display of additional channels, so-called event channels, which are transmitted exclusively via the Internet. These enable the mapping of special efforts such as the Olympic Games, the Football World Cup or major political events, documentary series, theme days, etc. These can be offered for a limited period of time or at fixed, recurring times (e.g. daily 2-4 pm).

Event channels are normal channels that can also be provided in the program list and displayed in the EPG. If a user selects an event channel outside of availability, a so-called "Out of Service banner" is displayed. The event channel program slots can also be permanently assigned, provided they are entered in the LCN table.

A dynamic addition and removal of event channels, on the other hand, requires a certain dynamization when the service list is retrieved by the end devices. During the initial installation, a service list is only read in and saved initially. For dynamization, the service list must be updated at cyclical intervals. This technical implementation must be examined more closely in phase 2.
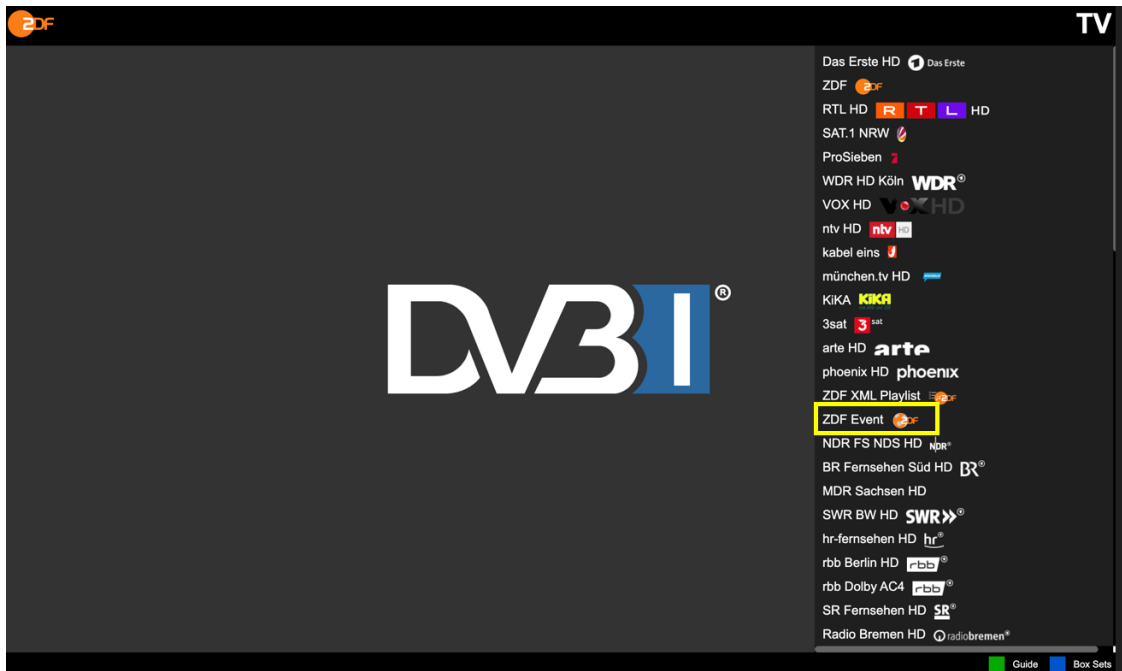
Fig. 11: Dynamically added ZDF event channel in the DVB-I service list

4.4.6. Playlists

With the DVB-I standard it is possible to generate playlists. The service list can refer to a playlist instead of a live stream or app. The playlist is an XML file that can be populated manually or dynamically. 1-n DASH stream URLs (audio or video) can be stored, which are then played starting with the first URL according to their order. It is possible to tilt back and forth.

Fig. 12 ZDF playlist channel in the service list

Fig. 13: ZDF playlist with the possibility to skip back and forwards in the list

4.4.7. Region-specific channel sorting

The DVB-I standard enables channel sorting within the service list with the LCN-Table (Logical Channel Numbering) feature. Combined with the postal code query contained in the last DVB-I draft document A177 Rev.4, a region-specific channel sorting can be implemented that enables local content to be easily found.

When setting up a DVB-I receiver, the postal code of the location is entered by the user. The service provider aggregator then transmits a regionally correct service for this location to the DVB-I receiver via the Internet and displays it on the user interface.

As part of the pilot, some exemplary transmission areas were created by the bmt for demonstration purposes (see Table 3). A default list "Germany" has been provided in case of missing or incorrect entry. In cooperation with the company TARA Systems, their LiveOn TV Android application was implemented with the possibility of entering postal codes in the user interface as well as a data query from the bmt service provider server. For the later implementation of a nationwide region-specific channel sorting, bmt is currently developing an aggregation software, which will contain all postcode areas and the associated broadcasting areas and transmitters in Germany.

Broadcasting area	TV Channels
Augsburg	a.TV HD, BR HD South
Dortmund	WDR HD Dortmund
Duesseldorf	WDR HD Düsseldorf
Nuremberg	Franken Fernsehen HD, BR HD Nord
Munich	Munich TV HD, BR HD Süd
Münster	WDR HD Münster
Cologne	WDR HD Köln

Tab. Fig. 3: Example regions for region-specific channel sorting

	München	Augsburg	Nürnberg	Köln
1	ARD	ARD	ARD	ARD
2	ZDF	ZDF	ZDF	ZDF
3	RTL	RTL	RTL	RTL
4	Sat.1 Bayern	Sat.1 Bayern	Sat.1 Bayern	Sat.1 NRW
5	ProSieben	ProSieben	ProSieben	ProSieben
6	BR Fernsehen Süd	BR Fernsehen Süd	BR Fernsehen Nord	WDR Köln
7	VOX	VOX	VOX	VOX
8	ntv	ntv	ntv	ntv
9	kabel 1	kabel 1	kabel 1	kabel 1
10	münchen.tv HD	allgäu.tv HD	Franken Fernsehen HD	center.tv
11	Kika	Kika	Kika	Kika
12	3SAT	3SAT	3SAT	3SAT
13	arte	arte	arte	arte
14	Phoenix	Phoenix	Phoenix	Phoenix
15	ZDF Playlist	ZDF Playlist	ZDF Playlist	ZDF Playlist
16	ZDF Event	ZDF Event	ZDF Event	ZDF Event
17	NDR FS NDS	NDR FS NDS	NDR FS NDS	NDR FS NDS
18	WDR Köln	WDR Köln	WDR Köln	BR Fernsehen Süd
19	MDR Sachsen	MDR Sachsen	MDR Sachsen	MDR Sachsen
20	SWR BW	SWR BW	SWR BW	SWR BW

Tab. Fig. 4: Regional-specific DVB-I offerings in the pilot. On the red-bordered program numbers, the regionally correct offers are placed depending on the postcode of the reception.

The region-specific channel sorting supports in particular the findability of regional programs of the public broadcasters, of windows of the nationwide private broadcasters as well as of local TV providers and open citizen channels. For the order of the programmes, the public value regulation published by the media authorities and the recommendation for the listing of public and commercial offerings in Germany would be appropriate, which could not yet be fully implemented due to the later publication. Local and regional content was, among other things, an important criterion for determining these offers (see chap. 6.).
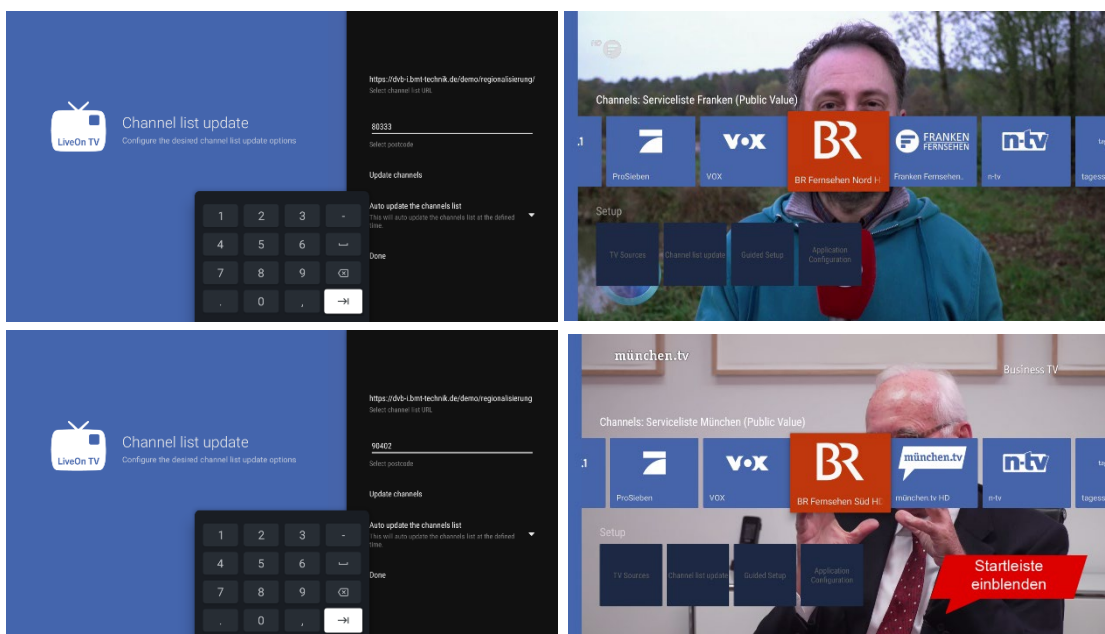
Fig. 14: Screen interfaces for setting up the location and displaying the region-specific service lists of the bmt for the regions of Franconia and Munich in the LiveOn TV Android application from TARA Systems. BR Fernsehen Nord and Süd as well as Franken Fernsehen and münchen TV are presented regionally.

4.4.8. Content Guide / Electronic Program Guide (EPG)

Analogous to the existing playout channels, which offer only a limited overview of the offer, a content guide is defined in the DVB-I standard, which provides significantly more information (images, backward EPG, season and episode information, etc.) through the IP distribution channel than is previously possible via DVB-T2, -S or -C. In addition, it is possible to link to on-demand content.
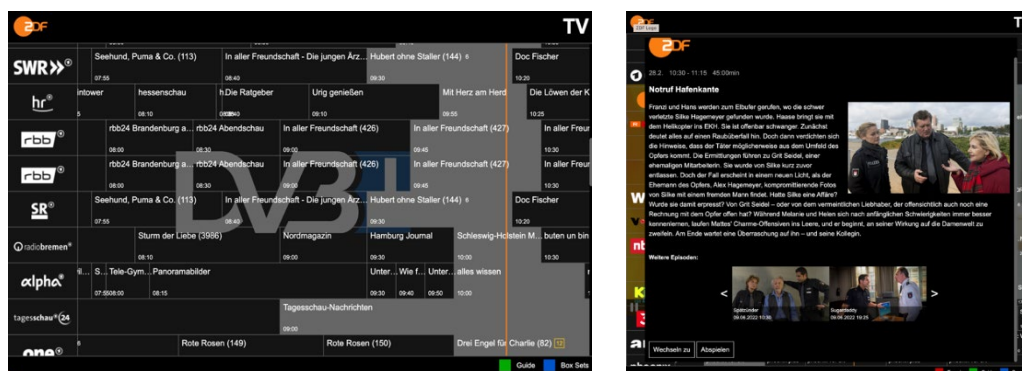

Fig. 15: Interface of the ZDF DVB-I Player with the Content Guide

When changing channels, the information about the current and upcoming program ("Now & Next") is displayed. Here, it is also possible to link to an app, for example HbbTV, in order to enable a restart function of the current program.

From a technical point of view, the Content Guide is completely independent of the service list. It only needs to know which channel is being queried and it can be regionalized.

4.4.9. Box sets

New to the DVB-I standard are additional on-demand content ("box sets"), which can be accessed via the Content Guide. These are lists that then link to the respective offers.

There are three hierarchical levels:

- The top level is the category ("boxset category") such as news, movies, etc.
- The second level is the list ("boxset list") for the called category, which are then e.g., "today-news" or the "today's journal" etc.
- The third level then shows, for example, a list of individual programs ("boxset content")

For playing the content, the device decides for itself which app it uses (if specified). For example, TVs can switch to the HbbTV offering, mobile devices to the website or native apps.

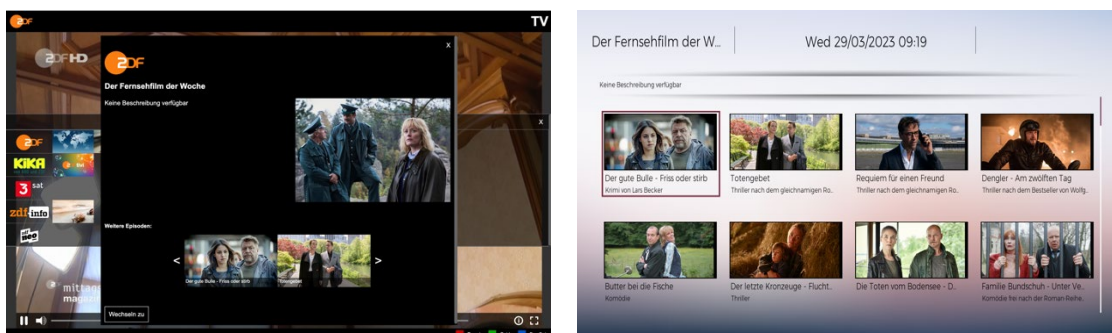Content provided via box sets can be freely configured.

Fig. 16: Box sets in the ZDF DVB-I player

4.4.10. Radio

The distribution of radio via DVB plays an important role. For example, about 163 radio programs are transmitted on ASTRA 19.2E, 64 of which are currently offered by ARD. This radio world could also be transmitted to DVB-I.

In line with the use of the radios on the big screen, they are supplemented by appealing and informative VisualRadio applications. The signalling of the applications is carried out via the HbbTV Autostart application.

Fig. 17: VisualRadio applications with NowPlaying information or a live image of the Berlin broadcasting center

As part of the pilot, additional commercial requirements were passed on to DVB so that the industry-standard streaming standard for radio Icecast is also taken into account by the DVB-I standard.

For the time being, the pilot does not regionalize the radio programs, but this is easy to implement with the existing methods demonstrated for TV.

4.4.11. DVB-I clients in the pilot

In the pilot, apps for mobile devices and streaming boxes were used as well as the first prototype SmartTV devices with DVB-I function. The status of the implementations varied from provider to provider and was accompanied by the companies with updates with varying degrees of intensity. For reasons of neutrality, the report does not elaborate on the scope and quality of the respective DVB-I implementations.

In summary, it can be stated:
The aggregated service list was successfully presented on the first prototype TV sets. Impressive was the switching from broadcast to IP when the SmartTV devices were disconnected from the broadcast network, moderate switching times between the IP streams and the fast integration of services such as HbbTV, content guides, DRM sign in, dynamically added event channels and next generation audio. The regionally correct program sequences were provided via a postcode entry on the TV set.

The availability of clients (SmartTVs and apps) is crucial for the market success of DVB-I. The next step is to expand the availability of prototype devices in order to be able to test the service concepts on a broader basis. A manufacturer has held out the prospect that SmartTV sets already available on the market could be made DVB-I-capable with an update.

The following prototype clients were used in the pilot:

- **Sofia Player (App)**
  The Sofia Player is a reference implementation commissioned by the DVB consortium in the early days of the DVB-I project. The Progressive Web App enables demonstrations on tablet PCs and smart watches.
  Platforms: Web, Progressive Web App, HbbTV

- **OnScreen Publishing (App)**
  A full DVB-I client supporting DVB-T/S and IP streams using DASH and HLS"
  Platforms: Web, Progressive Web App, HbbTV and native apps (Android and iOS)

- **Vestel (TV)**
  Prototype SmartTV with DVB-I implementation.
  Platforms: TV and HbbTV

- **Philips TP Vision (TV)**
  Prototype SmartTV with DVB-I implementation.
  Platforms: TV and HbbTV

- **LG (TV)**
  Prototype SmartTV with DVB-I implementation.
  Platforms: TV and HbbTV

- **SONY (TV)**
  Prototype SmartTV device that has been tested exclusively at SONY.

- **TARA Sytems (App)**
  TARA Systems supported region-specific channel sorting with its DVB-I LiveOn TV-Android app.
  Platforms: Android and HbbTV

- **Fraunhofer FOKUS**
  Fraunhofer FOKUS made its DVB-I client for Android TV available to the project participants for testing and evaluation purposes.
  Platforms: Android, HbbTV

- **ZDF DVB-I Player (experimental)**
  This is a ZDF HTML5 development. The player is primarily intended as a visualization, as there were no reference applications in the beginning that supported the functionality of DVB-I.
  Platforms: Web and Progressive Web App.

- **Paul Higgs Validator (testing software)**
  The DVB-I Validator is an analysis software for DVB-I metadata for inspection and testing purposes.

- **Media Broadcast (Demonstrator)**
  Developed by Media Broadcast and Sofia Digital, the DVB-I demonstrator is primarily designed as a modern DVB-I client for large-screen TV environments (Android TV), but also offers an Android version for mobile devices and tablets
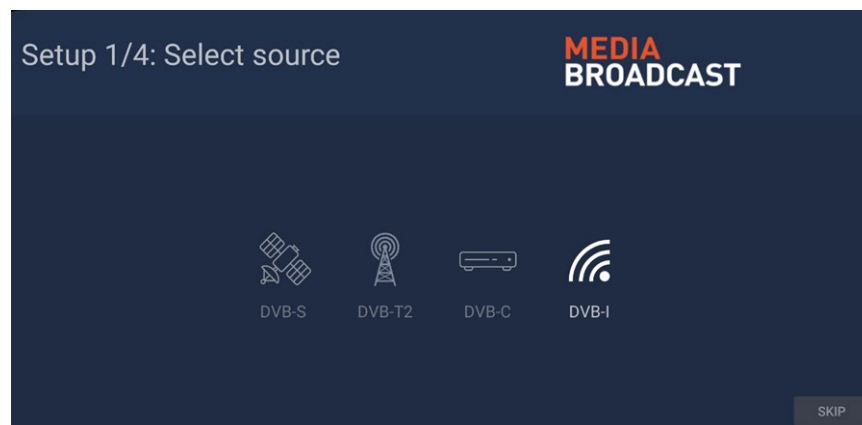

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Fig.18: Media Broadcast DVB-I Demonstrator

The demonstrator uses the Sofia Backstage Guide Manager DVB-I Server with integrated ESG data and supports the DVB-I Central Service Registry (CSR). In addition, the built-in tuners are already supported in Android TV devices, enabling a seamless transition between DVB-I and traditional distribution. Even at this early stage, attention was paid to intuitive usability for non-technical people, but also to useful aspects such as the presentation of relevant stream information. The DVB-I demonstrator of Media Broadcast forms the basis of the official application of phase 2 of the pilot.
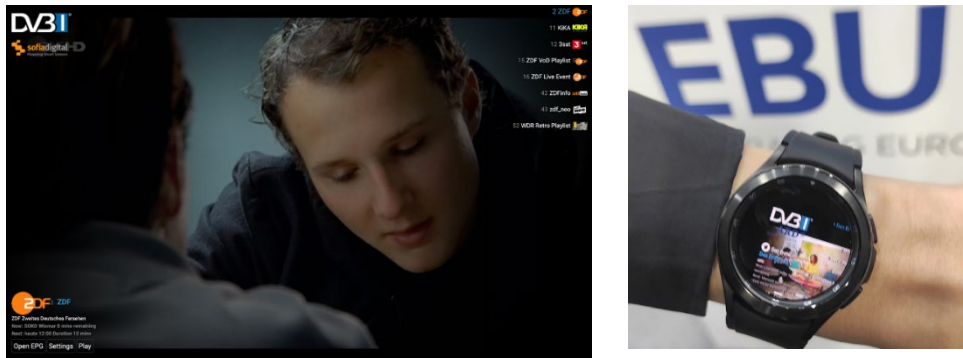

Fig. 19: Sofia's reference implementation on tablet PC and smart watch (Source: bmt)
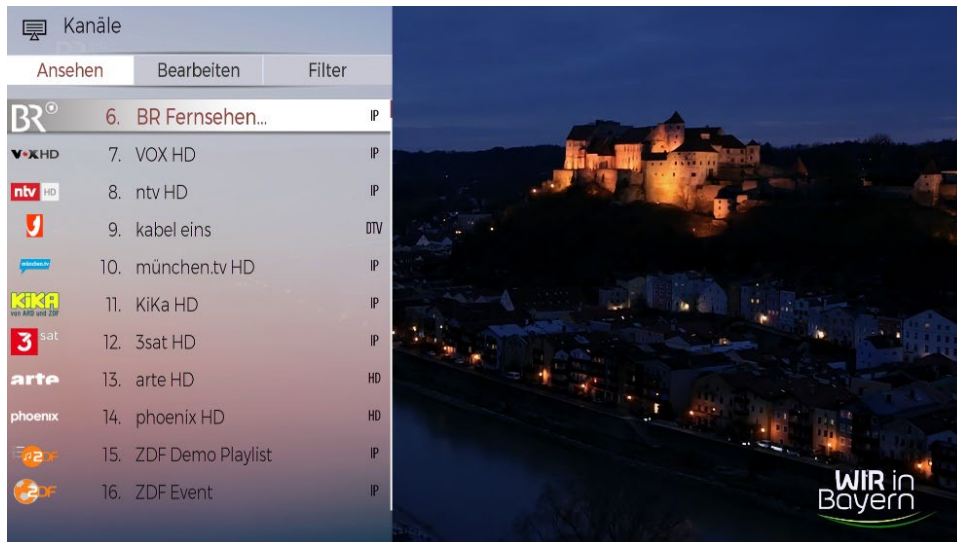

Fig. 20: OnScreen Publishing DVB-I Player

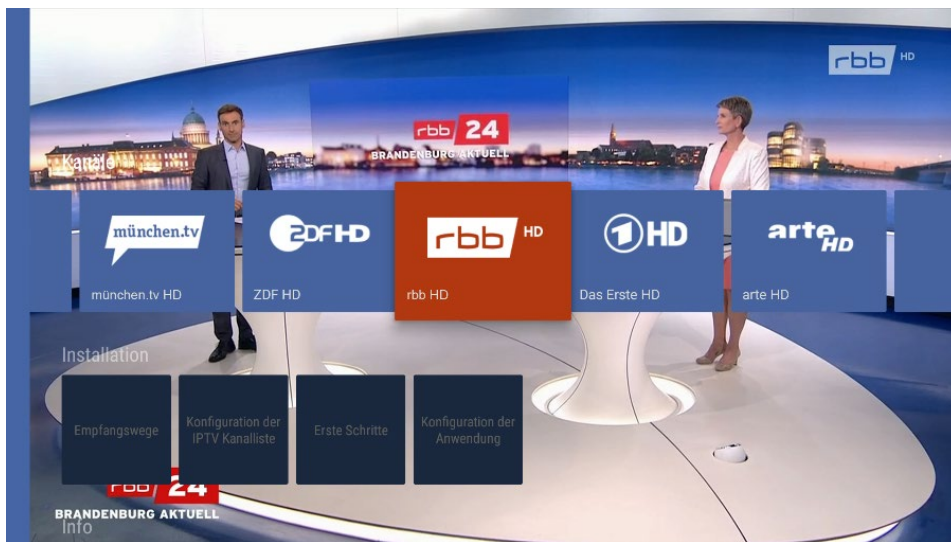Fig. 21: Hybrid DVB-I service list on Vestel device

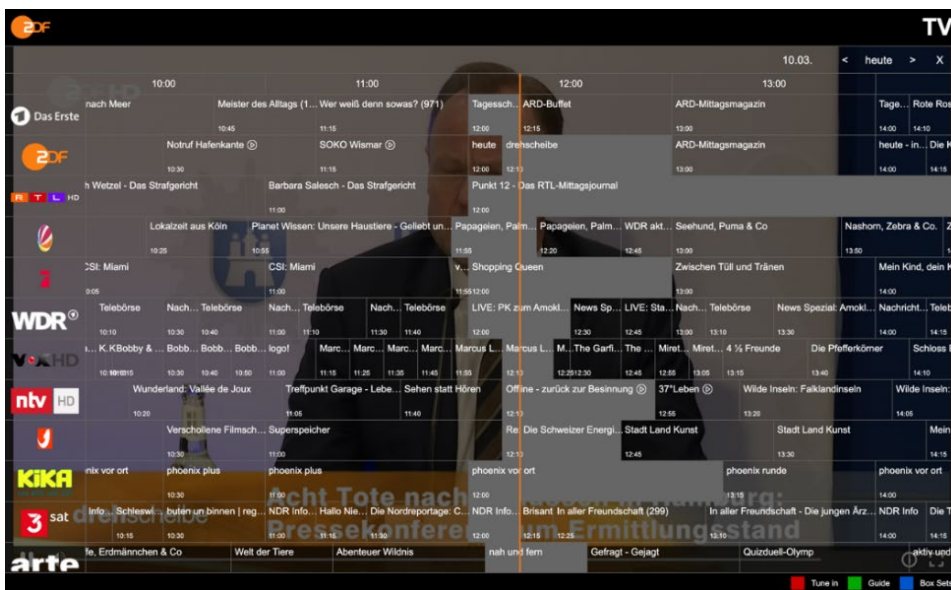Fig. 22: Program interface of the LiveOn TV app from TARA Systems

Fig. 23: EPG interface of the ZDF DVB-I Player

4.5. User testing

On March 3 and 6, 2023, the rbb UserLab conducted user tests with six testers. On site at the rbb FABRIK, the DVB-I pilot was tried out and various usage concepts were discussed in the group. In addition, some topics on the pilot were discussed as part of a workshop on technical innovation management with trainees as media designers for image and sound from the third year of their apprenticeship. These results were also included in the evaluation.

The appointment was divided into two parts: individual sessions and group discussions. In the first part, each tester tested the DVB-I pilot separately and additionally answered various questions about the equipment, the subscribed TV packages and general feedback on the pilot.
In the second part, a uniform understanding of possible peripherals, different television reception standards and subscriptions to streaming and video-on-demand services was developed at the beginning. Subsequently, various usage scenarios for new channels were discussed, which are supplemented either by offering higher audio or video quality, by a topic channel or an event stream in the channel list.

Another topic dealt with the expectation of the integration of channels of subscription TV offerings. Finally, the question of how users imagine their video evening in the future and what requirements and expectations they have of the range of TV and video services was asked.

In the discussions with the testers, it became clear that video-on-demand content and time-independent use are playing an increasing role in contrast to the "zapping" scenario. The overall greater range of linear and non-linear content leads to more conscious selection behavior. The tester group consisted of users who watch linear television as well as users whose primary interest is in the use of content regardless of time, including in the media library.

Single sessions
All testers have given feedback that the prototype behaves very similarly to their current SmartTV and only the loading times are longer when changing the channel. The new reception path, which, among other things, allows more freedom in the individual spatial placement of the SmartTV, was rated positively. The login for the subscription TV channels after switching was perceived as annoying and should be managed centrally. The fast switching speed was important to all testers and would accept a video quality that only improves after a few seconds after switching. In terms of transmission speed, the testers preferred a high image stability and accepted the higher delay during transmission.
The regionalization of the channel list was of secondary importance. Much more important is a simple and effective way to manually adjust the channel list. The majority of testers would recommend a SmartTV with DVB-I to a friend or family.

Group discussion

New channels
The possibility of offering a theme channel or even an event-based additional stream was rated as positive. The reference to the new offer should be made with already existing program notes such as the red button teaser, whereby the red button teaser is generally classified as annoying by some testers. An alternative idea was a prominent mark in the channel list or, instead of a teaser in the picture, an icon in the lower area of the SmartTV. In this context, the inclusion of recommendations based on preferences and previous use was discussed, with data protection and the possibility of opting out, among others, being discussed.

The sorting of a new channel for event-based streams, topic channels or higher picture and sound qualities should be done by assigning it to the offering station ("parent station"). For each station there is a sublist of additional channels, which are provided with letters or a numbering that indicates the parent station. For example, a sequential numbering for the subtransmitter could be 1.1, 1.2, etc. Navigation within the sublist could be done using the arrow keys and the back button on the remote control. With regard to the offer of a higher picture or sound quality, it was discussed that the corresponding quality is automatically offered based on set preferences or on the basis of user behavior.

A stand-alone number for the additional station at the end of the existing list or an override was clearly rejected. The topic channel should only be available if programming is broadcast there and should not be used for further curation of content that is also available via the media library.

Channel list Subscription-TV and Free-TV
The duplication of services is not desired. When a new package is booked, the question should be asked where the channels should be stored - whereby suggestions are made based on usage behavior and the choice of a preferred picture quality is made. The Logical Channel Numbering (LCN) list should not be adjusted automatically. In addition, the idea of profiles for each TV operator (i.e. personalization for the one who turns on the TV) was discussed, including by storing the preferred channel list.

The perfect TV or video evening
The majority of the testers wanted a portal in which, regardless of whether it is subscription TV, free TV or video-on-demand (VoD), a compilation is carried out according to their own usage behavior or set preferences. The source of the content fades into the background. The idea of a personal playlist for the time-independent use of missed programs in combination with VoD content and recommendations was discussed. In this context, the issue of profiles has once again been mentioned as important.

4.6. Networking nationally and internationally

Due to the broad composition of the partners within the pilot project, there was a good national and international network between public and private broadcasters and other market partners, such as platform operators. The cooperation with equipment manufacturers and the bilateral exchanges with broadcasters abroad (BBC, Mediaset, RAI) have also resulted in international networking.

In addition, an exchange took place at national and international level with the following committees:

4.6.1. German TV platform

The topic of DVB-I was already taken up in the German TV Platform at the end of 2020 and dealt with in the "Task Force Delivery" of the Media over IP working group. Within the framework of these activities, various scenarios for the introduction and use of DVB-I were developed and discussed with the market partners; many participants in the later pilot operation were also involved in this work. Shortly before the first public presentation of the pilot, a full-day workshop on DVB-I took place in August 2022, in which the plans for the pilot were also presented and the demos were shown and discussed in advance.

4.6.2. VAUNET

At the end of the pilot phase, members of the pilot presented the concept of DVB-I and reported on the current status of the work at a meeting of the "Technology and Innovation Forum" of the Association of Private Broadcasters (VAUNET). In the ensuing discussion, the relevance of DVB-I for the entire range of broadcasting services became clear.

4.6.3. EBU

In order to take into account the importance of DVB-I as an important distribution channel in the future, but also backwards compatible, the HbbTV & DVB-I working group was founded in autumn 2020 under the leadership of Christian Klöckner (WDR), Remo Vogel (RBB) and Bram Tullemans (EBU). The aim of this group is

- supporting EBU members in the decision-making process and implementation: the group exchanges experience and implementation, organises workshops and prepares the EBU's Technical Recommendation for DVB-I, and
- joint communication with DVB for coordination with CE manufacturers, as well as issues of findability and prominence at European level.

Together with EBU T&I, the topic of DVB-I is adequately presented at internal EBU seminars such as Horizon and demonstrated at trade fairs such as IBC22 at the EBU booth – see also sections 3.7.2 and 3.7.3.

4.6.4. DVB

A number of partners in the pilot project have participated in the work carried out by the DVB Committee, which is crucial for technical standardisation. The pilot project itself was presented at DVB, where it was recognized as a driver for further technical specification work. In order to enable a good exchange of experience between content providers and CE manufacturers on implementations, the *DVB-I Forum channel* was created on Discord in addition to the already established DVB groups. Subdivided into community channels, questions are clarified on the various points and solutions are discussed, which are reflected back in implementation and standardization.

DVB continued to be an important partner for the German pilot project for the demos at IBC 2022, DVB World and may become so again for IBC 2023.

4.7. Public relations

The topics and dates of the public relations work were decided in the core group and coordinated with the extended group in terms of content. The focus was on presentations at conferences, press releases, social media, interviews and background-discussions. The bmt coordinated the press work. EBU and DVB provided support for the IBC's trade fair appearance and international communication. On the https://dvb-i.tv/website, DVB has set up a section for the German pilot.

The national and international response to the "DVB-I Pilots Germany" was impressive, with numerous visitors at the trade fairs and broad coverage in the trade media. On LinkedIn, 16 posts reached a total of 10,000 impressions.

4.7.1. Press releases

No.	Article	Date	Link
1	DVB-I Pilot Project Germany"	07.09.22	https://www.bmt-online.de/wp-content/uploads/2022/09/20220907_PM_DVB-I_Pilot_Deutschland-2.pdf
2	The "German DVB-I Pilot"	07.09.22	https://www.bmt-online.de/wp-content/uploads/2022/09/20220907_PR_German_DVB-I_Pilot-2.pdf
3	DVB-I at the MEDIENTAGE MÜNCHEN	13.10.22	https://www.bmt-online.de/wp-content/uploads/2022/10/20221013_PM_DVB-I@MTM22_1.pdf

4.7.2. Videos and social media
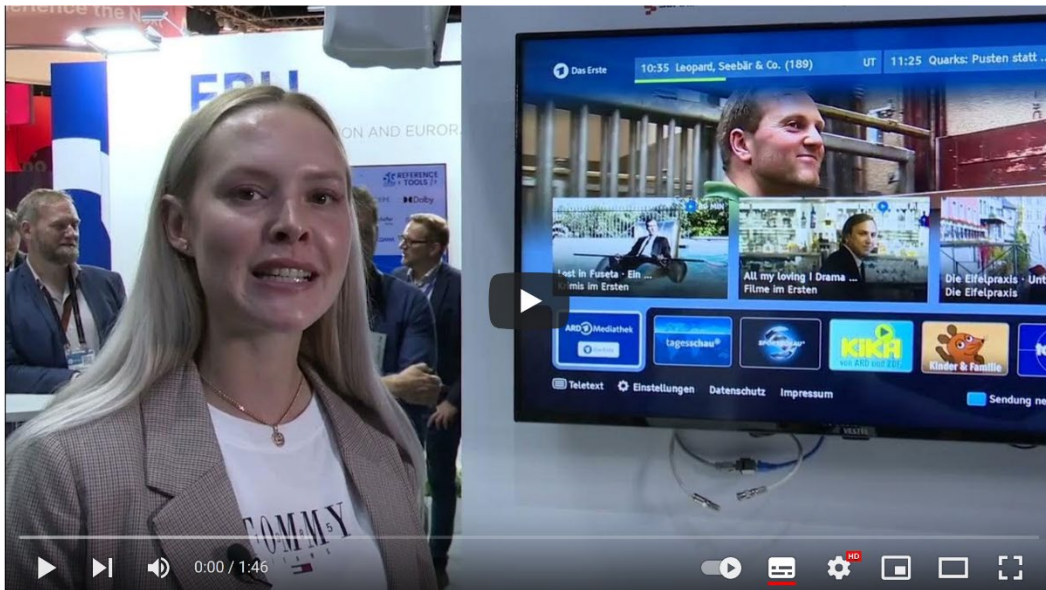
Fig. 24: EBU explanatory video on the "DVB-I Pilots Germany" at IBC 2022

No.	Canal	Date	Link
1	YouTube bmt IBC22	13.09.22	https://youtu.be/t3DZScCrv-Q
2	YouTube EBU IBC22	09/22	https://www.youtube.com/watch?v=8XZCjpiWuhw
3	EBU Horizons 22	15.11.22	https://tech.ebu.ch/publications/presentations/horizons2022/lessons-learnt-from-german-dvb-i-pilot

4.7.3. Presentations

Fig. 25: Project manager Remo Vogel (RBB) presents the "DVB-I Pilots Germany" at EBU Horizons 2022 in Geneva

No.	Presentation	Date	Place	Speaker
1	DVB-I workshop with the Bavarian State Agency for New Media	28.06.22	Munich	Rainer Biehn, Stefan Hackl, bmt
2	Masterclass "SmartTV – Trends and Potentials for Local Television"	06.07.22	Local Broadcasting Days, Nuremberg	Klaus Merkel, rbb
3	DVB-I workshop with the state media authorities	15.07.22	Online	Rainer Biehn, bmt
4	ZVEI / PTKO Meeting	20.07.22	ZVEI Frankfurt	Remo Vogel, rbb
5	DTVP DVB-I Workshop	16.08.22	ZVEI Frankfurt	Klaus Merkel & Remo Vogel, rbb
6	Stand der Task Force DVB-I & German DVB-I Pilot	04.10.22	DVB PCM Plenary Online	Remo Vogel, rbb
7	DVB-I pilot project Germany	26.10.22	FKTG Conference, Erfurt	Remo Vogel, rbb
8	German DVB-I Pilot	05.11.22	DTG Council MeetingOnline	Remo Vogel, rbb Peter Pogrzeba / DTAG
9	German DVB-I Pilot	10.11.22	HbbTV Symposium, Prague	Rainer Biehn, bmt
10	EBU Horizons 22 Seminar	16.11.22	EBU Horizons, Geneva	Remo Vogel, rbb Christian Klöckner, WDR
11	German DVB-I Pilot	22.12.22	mabb	Remo Vogel, rbb
12	Status of the Task Force DVB-I including DVB-I Pilot	19.01.23	Hamburg Open	Peter Pogrzeba / DTAG

4.7.4. Trade fairs

Fig. 26: Impressions of the EBU and DVB booths during IBC 2022 and bmt at Medientage München 2022 (Source: DVB, bmt)

No.	Trade fair	Date	Place
1	IBC, EBU- und DVB-Stand	09.12.9.22	Amsterdam
2	Media Days Munich	18.-20.10.22	Munich

4.7.5. Press clippings

No.	Article	Date	Link
1	DVB Scene Magazine	03.09.22	https://dvb.org/wp-content/uploads/2022/09/dvbscene-60.pdf#page=6
2	Advanced Television	07.09.22	https://advanced-television.com/2022/09/07/german-dvb-i-pilot-commences/
3	Broadband TV News	07.09.22	https://www.broadbandtvnews.com/2022/09/07/german-dvb-i-project-underway/
4	Panorama Audiovisual - Spanien	07.09.22	https://www.panoramaaudiovisual.com/2022/09/07/german-dvb-i-pilot-uibc-experiencia-televisiva-futuro/
5	FKT	07.09.22	https://www.fkt-online.de/news/news-detail/30575-neue-initiative-dvb-i-pilotprojekt-deutschland-gestartet/
6	Edge Radio 1067	07.09.22	https://edgeradio1067.com/german-dvb-i-project-in-progress/
7	TV & Video Industry News	07.09.22	https://tvtechnews.uk/2022/09/07/german-dvb-i-project-underway/
8	Germany Detail Zero	07.09.22	https://germany.detailzero.com/news/86512/New-initiative-DVB-I-pilot-project-Germany-started.html
9	The News Page	07.09.22	https://the-news-page.com/german-dvb-i-project-underway/
10	Digitalmagazin	09.09.22	https://www.infosat.de/technik/neue-initiative-dvb-i-pilotprojekt-deutschland-gestartet
11	Connect	14.09.22	https://www.connect.de/news/dvb-i-live-tv-streaming-standard-3202894.html
12	Film-TV-Video	22.09.22	https://www.film-tv-video.de/business/2022/09/21/neue-initiative-dvb-i-pilotprojekt-deutschland/
13	Medialabcom	29.09.22	https://www.medialabcom.de/newsletter/2022/10/index.html#beitrag3
14	SatelliFAX	14.10.22	
15	Digitalmagazin	13.10.22	https://www.infosat.de/technik/dvb-i-auf-den-medientagen-m-nchen?utm_source=newsletter&utm_campaign=dmplus&utm_medium=email
16	Digital Television	14.10.22	https://www.digitalfernsehen.de/top-news/dvb-i-pilot-wird-auf-ersten-prototypischen-smart-tvs-vorgestellt-744394/
17	Teltarif	16.10.22	https://www.teltarif.de/dvb-i-rundfunk-internet-streaming/news/89653.html
18	Chip	17.10.22	https://www.chip.de/news/Er-wird-in-Deutschland-getestet-Neuer-TV-Standard-DVB-I-gestartet_184475437.html
19	Broadband TV News	08.11.22	www.bandtvnews.com/2022/11/07/implementing-dvb-

20	Chip	10.03.23	https://www.chip.de/news/Er-wird-in-Deutschland-getestet-Neuer-TV-Standard-DVB-I-gestartet_184475437.html
21	FKT	28.04.22	https://www.fkt-online.de/fachartikel/artikeldetail/dvb-i-pilotprojekt-auffindbarkeit-der-inhalte-wird-immer-wichtiger

(Top of table continuation)

| | | | i-services-is-easy-qa-with-remo-vogel-on-the-german-dvb-i-pilot/?mc_cid=c634361a15&mc_eid=6ec47309f6 |

5. Regulation

Prior to the launch of the pilot, bmt held information events with state media authorities on the subject of DVB-I. With the Bavarian State Agency for New Media (BLM) on 28.06.22 and with other interested state media authorities on 15.07.22. Another information event between rbb and the Medienanstalt Berlin-Brandenburg (mabb) took place on 22.12.22.

The discussions that took place there did not constitute a conclusive legal assessment and served only to form opinions. It was argued that a display of DVB-I technology as a media platform or user interface within the meaning of the State Media Treaty is not affected. For the order of the programmes, the public value regulation published by the media authorities and the recommendation for the listing of public and commercial TV offerings in Germany would be appropriate. This is intended to make it easy for viewers to find certain offers on user interfaces that are particularly relevant for the formation of public opinion. With regard to this criterion, DVB-I, with its possibility of region-specific channel sorting, paves the way for the technical implementation of this recommendation. Furthermore, the public value regulation also refers to the possibility of being able to easily change the listing by the user at a later date.

If a possible regular operation is derived from the pilot model of the "German DVB-I List", it must be discussed to what extent an authority is needed to manage the findability and, in particular, to sort channels that are not on the public value list into the service list according to customary market criteria.

6. Requirements in the direction of standardization

The pilot operation resulted in a number of requirements for the further development of the DVB-I standard. Some of these confirmed previously known gaps in the standard, and some were newly identified as part of the pilot activities.

It was already known that the handling of DRM systems, which has been provided for in DVB-I in principle since the first version of the standard, has gaps in scenarios where cross-provider encryption/activation is to be practiced, but on the other hand provider-specific "red button" applications are to be offered. Details on the DRM aspects are described in Section 3.4.4.

Another complex of new questions or gaps in the standard concerns the Content Guide. The detailed aspects here include:

- Linking of on-demand offerings in parallel from both HbbTV applications and standard web apps
- Linking content items from playlists
- Additions of further metadata
- Enabling sublists for box sets
- Detailed questions in the context of use in event streams
- Expansion of search queries and result classification

Questions have also arisen about the handling of the service list, which, however, are still being discussed internally.

Most of the points listed here have already been brought to the fore in the context of the cooperation with DVB and are dealt with there at different levels, partly as basic "requirements" for new standard versions, partly as technical details for the implementation of the standard and partly as discussion points within the framework of the DVB-I Forum.

The solution of all the problems mentioned here will take several months after the end of the project, and it is of great importance for the project partners to accompany the further standardization process.

7. Recommendation and next steps

Against the background of the successful "DVB-I German Pilot", the broad support from the broadcasting industry and the positive national and international feedback, the members recommend an additional phase 2 in order to consolidate outstanding points for a possible market launch in Germany. Phase 2 could start at IBC 2023 and the pilot could be continued in its current organizational form for a limited period of time.

The following points are to be worked on in phase 2:

- Definition of the technical and administrative criteria for a technical-organizational instance for the aggregation of the central service list in Germany
- Regulatory framework
- Technical issues with regard to service list updates, e.g., for window circuits and for dynamic event channels
- Concepts for DRM support in commercially available clients
- Consideration of platform operators
- Satellite parameters for tuning without an Internet connection
- Extension of prototypical service concepts in order to be able to test interoperability on a broader basis
- Evaluation of new use cases (e.g., use of playlists, linking to VoD content and user tests)
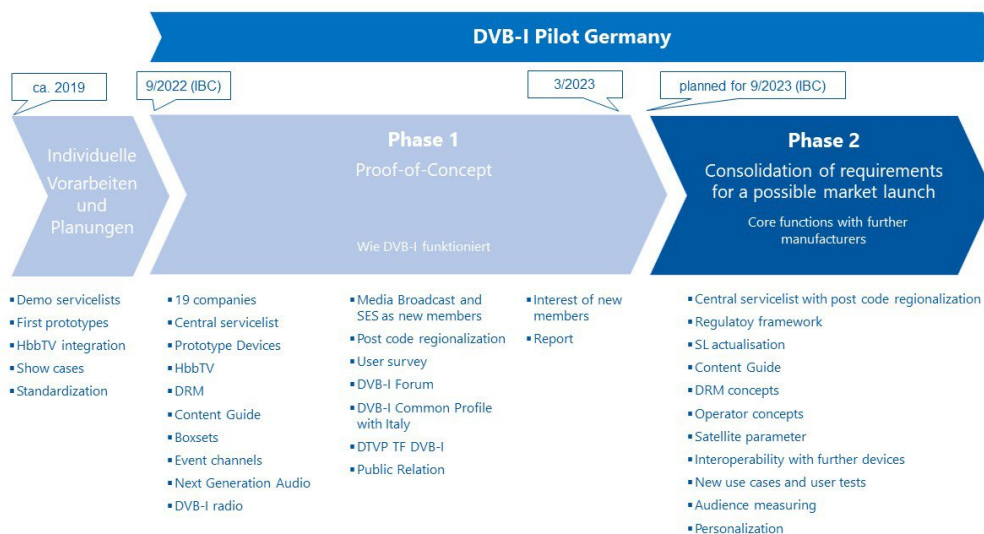- Investigation of possible personalization and audience measurement concepts

Fig. 27: Timeline, milestones and sequence of phase 2

During the summer months, intensive cooperation with the market partners will continue. In addition to numerous enquiries from Asia (China, Korea) and Australia/New Zealand, there will be discussion panels and presentations at ANGACOM, the German TV Platform, the Media Web Symposium and DVB-World. At the end of June, the German TV Platform, together with DTG, is planning a joint international DVB-I Plugfest in Berlin at Fraunhofer Fokus.

At the same time, the current partners are collecting topics for a possible phase 2 and defining the corresponding priorities. In addition, there are already requests from other manufacturers to participate in the next phase 2.

The DVB-I standard, which has been in existence since 2019, has made enormous progress in Europe in recent months – not least thanks to the initiative of the "DVB-I German Pilot". With the adjustments envisaged for Phase 2, the standard offers a great opportunity for an open and horizontal TV market in the process of digital transformation.

8. Appendix

8.1. Team of authors

Thomas Schierbaum, bmt (responsible)
Jan Müller, Dolby
Michael Pennewiß, rbb
Klaus Merkel, rbb
Remo Vogel, rbb (Project Manager)
Frank Heineberg, RTL
Christian Klöckner, WDR
Ilona Kachel, ZDF
Marc Hoffrichter, ZDF
Rainer Kirchknopf, ZDF

8.2. Members of the project core team

Rainer Biehn, bmt
Stefan Hackl, bmt
Christian Maugg, bmt
Thomas Schierbaum, bmt
Joachim Kniesel
Franz Bakenecker, Media Broadcast
Sebastian Krahn, Media Broadcast
Jan Wessels, Media Broadcast
Lynn Knappheide, ProSiebenSat1
Dr. Siegbert Messmer, ProSiebenSat1
Katja Pavlova, rbb
Michael Pennewiß, rbb
Klaus Merkel, rbb
Remo Vogel, rbb (Project Manager)
Anna Gloede, RTL
Frank Heineberg, RTL
Markus Schilling, RTL
Tom Christophory, SES
Christian Klöckner, WDR
Rainer Kirchknopf, ZDF
Ilona Kachel, ZDF
Manfred Gördes, ZDF
Marc Hoffrichter, ZDF
Stephan Schulte, ZDF

8.3. Members of the extended project team

Peter McAvock, EBU
Bram Tullemans, EBU
Jan Müller, Dolby
Emily Dubs, DVB
Eoghan O'Sullivan, DVB
Dr. Louay Bassbouss, Fraunhofer Focus

Dr. Stephan Steglich, Fraunhofer Fokus
Paul Higgs, Huawei
Sunbock Park, LG
Henry Cunha, LG
Johannes Schmid, MIT-xperts
Gordon Maynard, OnScreen Publishing
Juha Joki, Sofia Digital
Mika Karnerva, Sofia Digital
Ulrike Haltrich, SONY
Nigel Moore, SONY
Michael Schäfer, TARA Systems
Nicholas Frame, TP Vision
Peter Lanigan, TP Vision
Motoshi Bito, Vestel
David Bustin, Vestel / Cabot