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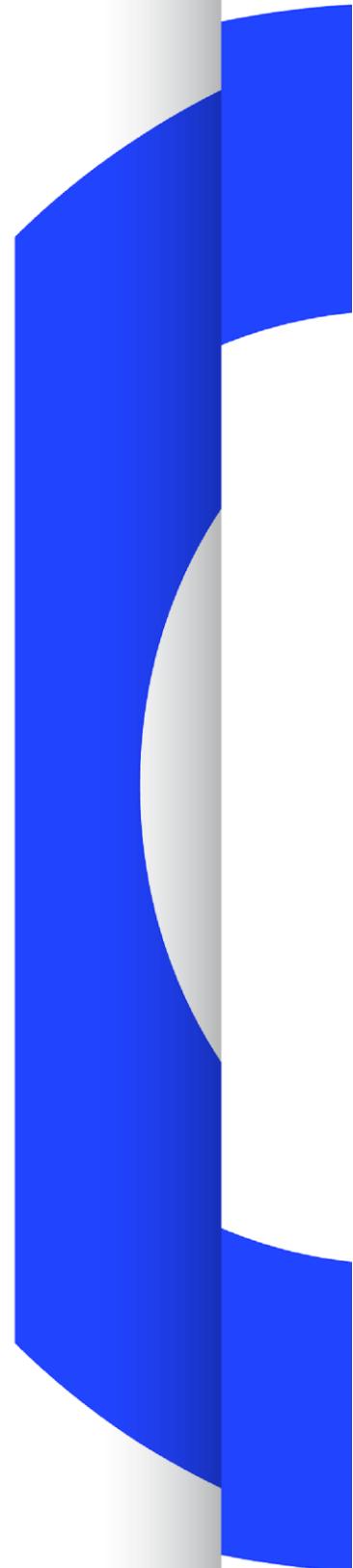
OPERATING EUROVISION AND EURORADIO

TR 065

GUIDELINES FOR DELIVERING ACCESSIBILITY SERVICES USING HbbTV

A GUIDE TO CURRENT PRACTICE AND
FUTURE POSSIBILITIES

Geneva
November 2021



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Note on the Scope of the Document

It is important to note that the options described in this document are not the only options available to television services for providing accessibility services. They are specifically those that may be available where the viewer has a television set equipped with HbbTV and a working broadband internet connection, and where the HbbTV services are available. There can be other options not involving HbbTV. For example, though this might be seen as inefficient use of broadcast spectrum, the delivery of a composite image that includes both the programme image and the signer can also be achieved by delivering a second broadcast channel.

Furthermore, it is important to note that the accessibility needs of the population at large in each area, such as serving those with hearing differences or sight differences, are not two-state or ‘binary’ requirements. There are differences, sometimes large and small, between users, and there can be a spectrum of differences and needs across the population. Accessibility services may need to serve the larger group or groups in the spectrum where it is not practical to serve them all in an optimum way.

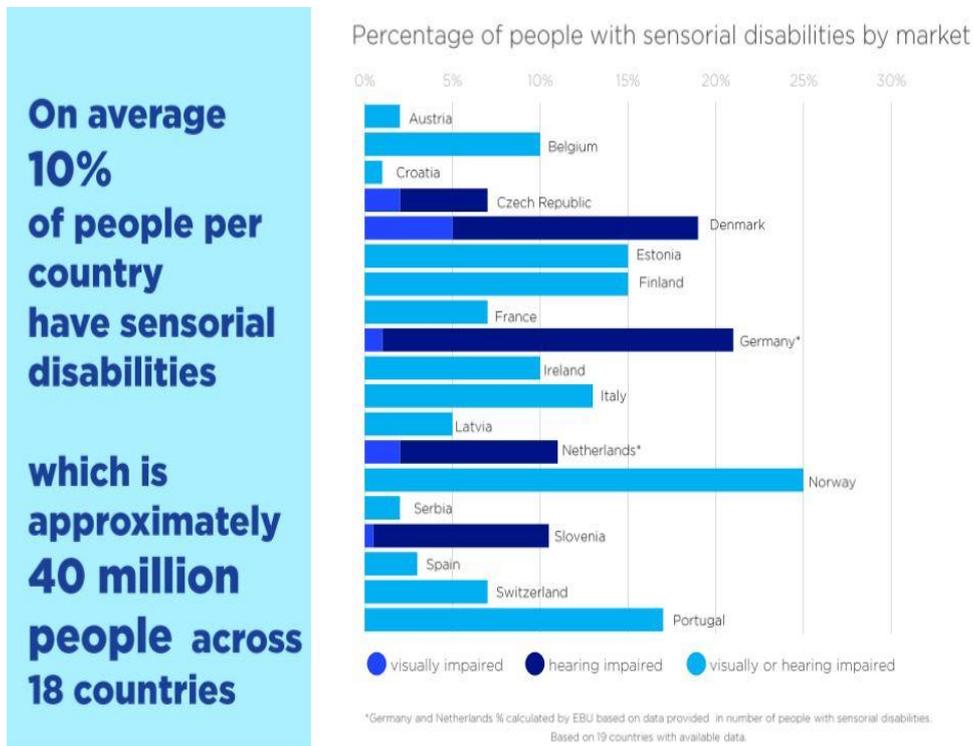


Figure 1: Histogram showing the percentage of people in different European countries having sensory disabilities or differences. The average is about 10%.

Source: EBU Access Services Group Survey

Executive Summary

Suggestions are offered for how HbbTV¹ can be used currently to provide the main media accessibility services for those with sensory differences, which can complement, improve existing media accessibility measures, or provide an alternative to existing accessibility measures.

In future, if fuller implementations of HbbTV or other technologies are part of receiving terminals, solutions with more user features than those practical today may be available.

The report shows that a decision on the provision of optional **Subtitles**² (also known as closed captions) today calls for a relatively complex analysis of the content provider's and user-community's current situation and their customisation needs. Different best solutions will apply in different circumstances.

The decision on the provision of **Sign Language Interpretation (SLI)** today is simpler, and an expedient solution is suggested in the report, which is to provide a second version of the programme by HbbTV that combines the programme and the signer³.

The suggested current expedient solution for **Audio Descriptions (AD)** is to provide, by HbbTV, a second version of an audio track that combines both the original audio and the description of what is happening in the scene, spoken in pauses in the dialogue.

The suggested current expedient solution regarding services that provide **Accessible Audio Experiences (AAE)** (and for which terms such as Clean Audio, Improved Intelligibility Audio, and Dialog+ have been used) is to provide one or more additional versions of the audio track by HbbTV that have been pre-processed before delivery to provide, for example, greater separation of the foreground (usually the person speaking) and background in the audio channel, or other mix of foreground and background⁴. This method is found to be less effective for live content than for pre-recorded content. Other solutions with more features may be applied for specific services such as those intended for binaural listening. It is important to remember, however, that there is no post-processing substitute for care in programme production.

All these suggested solutions are based on the technologies currently available in European consumer equipment. Other solutions may be available when and if there are new implementations widely available in consumer products, or technologies such as a standard AdvSS/NGA⁵ decoding system, are more widely available.

¹ HbbTV - Hybrid Broadcast Broadband TV. Specified in ETSI TS 102 796. The HbbTV Association has established an open standard for the delivery of broadcast TV and broadband TV to the home, through a single user interface.

² Closed Caption is term used in North America and some other countries

³ Note the caveat given in the Note on the Scope of this report.

⁴ Studies have shown that different individuals have different optimum audio mixes, and for some users, voice foreground plus enhanced elements from the background may help them to follow a narrative.

⁵ Advanced Sound System/Next Generation Audio



Figure 2: Outline of the way HbbTV is used

Figure 2. shows the relationship between broadcast services, internet services provided by the broadcaster or by other bodies, and the process of combining them to create the HbbTV service on the viewer's main screen or possibly on a companion device such as a tablet.

Structure of this report

This document contains a main part of 7 sections. Overall conclusions are contained in section 7.

Appendix A containing background information on the five **Basic Level Accessibility Services** addressed in this report.

Appendix B contains corresponding sections to those of Appendix A (A1/B1, A2/B2 etc.) that suggest what may be the best ways, given different circumstances and local environments, to provide these Accessibility Services.

Annex 1 contains a listing of ideas for future services that are emerging, including, for example, channel and user profiles and tactile signalling. These are currently being discussed in the ITU and other bodies and constitute Enhanced Level Accessibility Services. They are out of the scope of this report.

Annex 2 contains examples of existing Accessibility Services currently deployed by EBU Members, ARD, RAI, and SVT.

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Guidelines for delivering Accessibility Services using HbbTV - a guide to current practice and future possibilities

EBU Committee	First Issued	Revised	Re-issued
TC	2021		

Keywords: HbbTV, Accessibility Service, Sensory Disability, Sensory Difference, Subtitle, Dialog+, NGA Audio Description, Sign Language Interpretation, Accessible Audio Experiences, Clean Audio.

1. Introduction

The purpose of this report is to help organisations **that are considering the use of HbbTV to provide the most often implemented accessibility services**. In keeping with its subject matter, this document has been edited to include explanatory (alternative) text associated with diagrams and figures that can be read by suitable screen readers and other accessibility tools.

HbbTV⁶ is a media service application platform that can be installed in broadband-connected TV sets or included in broadband-connected Set Top Boxes. It can be used to provide a range of additional and/or complimentary multimedia content, providing a synchronised media experience using ‘Companion Devices’ such as smartphones or tablets. HbbTV can be accessed directly or via a DVB-I⁷ umbrella Application if it is available.

HbbTV has considerable potential for providing accessibility and other services for users. However, content providers and consumer electronics suppliers are still learning about which accessibility services should be allowed for in receiving equipment. The future potential of HbbTV is thus greater than the systems suggested in this report. It is hoped this report will both serve those wishing to start HbbTV accessibility services now and encourage the development and inclusion of more feature-rich services in future.

HbbTV allows viewers to access, control, and use services delivered by a combination of data from satellite or terrestrial broadcast, cable channels, IPTV, or broadband Internet channels. It is currently used in many countries in Europe and elsewhere.

This report outlines the approaches available using HbbTV to provide Accessibility Services, given that both HbbTV-equipped receivers and appropriate services are available to users.

Human Differences

The areas of ‘human differences’ that may limit the media experience include the following.

- Hearing
- Seeing
- Aging
- Cognitive differences
- Motor differences

⁶ Also an element of ‘Freeview Play’ in the UK

⁷ https://dvb.org/wp-content/uploads/2019/12/a177_dvb-i_specification.pdf

- Lack of ability to control the man-machine interface and non-ease-of-use of the receiver terminal

Factors affecting what can be done

The structure of the broadcasting and/or broadband delivery system, the language/national writing system, financial possibilities, and infrastructures affect what kinds of accessibility services may be provided.

The scope of this report in the end-to-end chain

This report is specifically concerned with measures that are practical today, drawing on HbbTV capabilities. These provide services largely intended for those with hearing and seeing differences.

The report is an evaluation *only* of suitable delivery systems for accessibility services, and not an evaluation of production systems for accessibility services. However, the production system influences what can be delivered. For example, the use of Machine Learning systems in production may determine what can be delivered to users.

The end-to-end accessibility arrangement

A simplified diagram of the end-to-end accessibility system is shown in Figure 3.

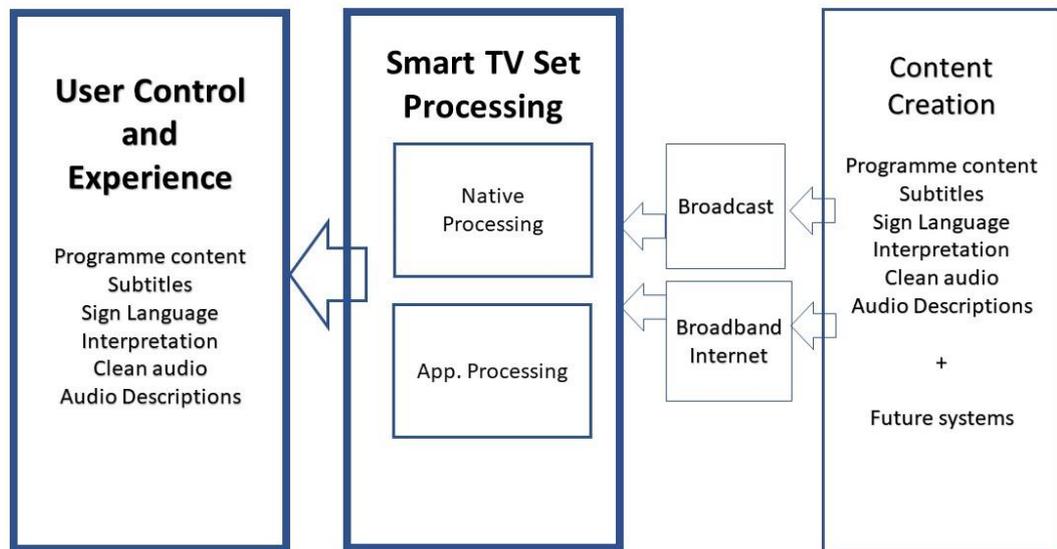


Figure 3: Outline of the functioning of the HbbTV Accessibility services

2. The UN CRPD, AVMSD and the EU Accessibility Directive

Most nations are signatories of the ‘UN Convention on the Rights of Persons with Disabilities’ (UNCRPD), which calls upon signatory nations to take all reasonable measures to ensure that PWDs (Persons with Disabilities) can share media experiences. HbbTV may be a valuable tool for achieving the goals of the UNCRPD, given that broadband is available. Other methods not using HbbTV are also possible.

The EU Audio Visual Media Services Directive (AVMSD) concerns requirements related to accessibility services, and this is in the process of being transposed into national regulation by EU Members.

The EU has also agreed a Directive calling for the comprehensive availability of accessibility services for services and products, including Digital Television, in the coming years. The member states of the EU are now charged with transposing the Directive into national law, and thus making precise the measures appropriate to their national circumstances.

HbbTV may form part of the national mechanisms for complying with the regulations in the national implementations of these Directives.

3. 'Basic' and the 'Advanced' Level Accessibility Services

Innovative ideas for accessibility systems will emerge over time, and these will be developed into services, given a demand for them, and if their practicality is established. Currently however, experience has shown that there is a short-list of media accessibility services that are of proven value to the community of those with sensory differences.

In this report the four services, and the complementary system for audio (spoken) subtitles, currently foreseen, that are listed below, are termed the **Basic Level**. Services and systems that may be added to those in the Basic Level in future will be termed the **Enhanced Level** in this report.

Ideas for future services that are emerging, including, for example, channel and user profiles and tactile signalling are listed in **Annex 1** to this Report. These are currently being discussed in the ITU and other bodies⁸.

The text of this report concerns the provision of these **Basic Level** services using HbbTV.

Basic Level On-screen Accessibility Services

1. *Text Optional Subtitles/closed captions*. Text lines that correspond to the spoken words or sounds of the content. Customisation of subtitles, if available, could include different text fonts, colours, locations, and text sizes.
2. *Audio descriptions*. An audio track that describes the action in the scene is played-out during gaps in dialogue or commentary. It is used when there is content in the video not already described in the main programme audio.
3. *Optional Sign Language Interpretation (SLI)*. An image of a signing interpreter that is overlaid over a portion of the image, signing the dialogue; and, if appropriate, other background sounds.
4. *Accessible Audio experiences (AAE) (often termed Clean Audio or Dialog+)*. Arrangements that allow the user to control the relative volumes or characteristics of foreground and background audio. User needs, in practice, can fall in a spectrum of optimum mixes for foreground and background.
5. *Audio/Spoken Subtitles*. An audio track that is a spoken version of the subtitles in the viewer's preferred language, normally used where the programme itself has dialogue in a different language. These are not habitually used in countries where dubbing in the local language is the normal practice, such as in Germany, Italy, and France, but they are used in countries such as Poland where this is not the case. These can be provided as a sound channel that is available by menu to the user.

⁸ <https://www.itu.int/pub/R-REP-BT.2207>

4. Synchronised Companion-Device Accessibility Services

In certain circumstances, the above services and other HbbTV programme-related services, can be provided on a ‘Companion-Device’ such as a smart phone or tablet, rather than through the TV screen and speakers. This can be valuable because, for example, in a family viewing group, the Companion Device can provide the option of accessibility services to those who need them, unobtrusively for those who do not require them.

Bringing the Companion Device into service can be achieved, for example, by inserting an on-screen QR code into the broadcast programme, which can be captured with the Companion-Device’s camera, working in conjunction with a previously downloaded App on the Companion Device. Other methods are also possible, such as using DIAL⁹ on devices in the HbbTV 2.0.x family.

5. ‘Reachability’ of Accessibility Services

In practice, the degree to which those who need them will make use of accessibility services depends on a series of factors, including:

1. The awareness of those who need the services that they are available.
2. The capability, affordability, and availability of the receivers that include the technology needed to make use of the services.
3. The capability, affordability, and availability of add-on equipment that will enable the receiving equipment to make use of the services.
4. The availability of appropriate DVB or other signalling that locates and exposes the data.
5. The ease of use and accessibility of the receiving equipment or add-on equipment and its user interface. This may be assisted by common control arrangements for accessibility services. **This may include common buttons and/or menus for accessibility services. The universal usage of the same arrangements may be a valuable future objective for the broadcast and manufacturer community.**
6. The ‘findability’ of the services in menus as part of the media offer, particularly for those who may benefit from the services.
7. The editorial quality of the services provided.

6. HbbTV versions

The receiving equipment that includes the technology needed in this report are television receivers and set top boxes that include HbbTV.

HbbTV has been developed over the last 12 years in a series of versions with evolved features and capabilities. These are shown below with the respective launch dates.

HbbTV 1.0 2010	HbbTV 2.0.1 2016
HbbTV 1.5 2012	HbbTV 2.0.2 2018
HbbTV 2.0 2015	HbbTV 2.0.3 2021

The specifications include mandatory and non-mandatory elements. These will affect the services that can be made available. Both the version used in the receiving equipment, and such options as

⁹ DIAL—for Discovery And Launch— a protocol that second-screen devices that can use to discover and launch apps on first-screen devices.

are available with the version, will influence which accessibility services can be available to the user. Thus the 'Reachability' of the service will be influenced by the distribution of HbbTV versions in the hands of the user community.

The EBU suggests¹⁰ that version HbbTV 2.0.3¹¹ should be used where possible, but the suggestions that follow in this report largely assume that HbbTV 1.5 or higher is available to the user.

HbbTV offers the potential to provide a range of accessibility services, including text subtitles, audio descriptions, audio subtitles, signers, and accessible audio¹², given the HbbTV version with the capability needed is available, and that delivered services are available.

Continuous dialogue with users about the services to be provided and user testing is always essential. Service providers must actively bring knowledge of available services, equipment availability, and limitations to the population of potential users

The Reachability of such HbbTV services will be determined by a series of factors, which include elements both outside and inside the specific technology used. Nevertheless, the penetration of HbbTV receivers and their versions and implementations will be one of the critical determinants of the usage of accessibility services and the reachability of the services. The public and consumer electronics industry is encouraged to maximise the availability and use of the latest versions of HbbTV, as this will allow the greatest number of options for users.

7. CONCLUSIONS

These are to be read after considering the contents of **Appendices A and B and Annexes 1 and 2**.

1. HbbTV can provide a means of providing the four basic accessibility services: optional subtitles, signers (SLI), audio descriptions (AD), and Accessible Audio Experiences (AAE). Audio version of subtitles can also be provided.
2. The potential for features for HbbTV services is greater than is practical today with currently available implementations of HbbTV consumer equipment.
3. The report suggests practical options for using HbbTV currently. These are:
 - To follow a decision tree about current circumstances to decide how best to deliver subtitles.
 - To provide a second version of the programme via HbbTV which includes a signer as an overlay, to provide SLI.
 - To provide an additional audio channel via HbbTV which is a composite of the normal audio and the audio description in dialogue pauses to provide an audio description service.
 - To provide an additional audio channel via HbbTV that has been created by the content provider at the playout centre by processing. This can offer an accessible audio experienced version of the audio channel, though this may not be optimum for all users or all types of content.
4. The report encourages the HbbTV community to consider how accessibility services can include more features in future.

¹⁰ <https://tech.ebu.ch/publications/r150>

¹¹ The latest version, HbbTV 2.0.4, will include a dedicated "Accessibility Framework" that allows the improvement of interoperability between accessibility features based on HbbTV and related features implemented at the terminal level. The EBU will consider an update of its recommendation once that standard is published and available on the market.

¹² Terminology subject to review.

Appendix A: The User Experience of Accessibility Services

The sections in this Appendix explain the background to corresponding sections in Appendix B (A1/B1, A2/B2 etc.) that suggest what may be the best ways, given different circumstances and local environments, to provide the Accessibility Service in question.

A1. OPTIONAL SUBTITLES/CLOSED CAPTIONS USING HbbTV

- **Subtitle delivery systems for television in Europe have evolved, historically.** The first phase, begun in the mid-1970s, used digital signals inserted in the vertical interval of the analogue television waveform to provide fixed and variable format ‘Teletext’. In the 1990s, systems were developed for the DVB-T and DVB-S digital modulation environments. These included digital multiplex versions of Teletext (‘DVB Teletext’) and ‘DVB Subtitling’. In the 2010s, the development of HbbTV has brought another mechanism to deliver subtitles.
- **Optional subtitles are useful for audience members who cannot easily hear or understand the audio in the programme:** for example, hard of hearing audiences or audiences in environments where the sound cannot be heard.
- Note that subtitles are also used for content that is not in a locally understood language, which is a somewhat different purpose. These subtitles can be ‘burned-in’ to the video. **Burned-in subtitles in some cases can be a barrier to the effective inclusion of optional subtitles,** including customised subtitles, for those with sensory differences, because of positioning conflicts.
- Use of the subtitles should be possible using equipment that is **widely available in the home,** and the switching in and out of the subtitles should be a simple operation.
- If there were a **common optional subtitle delivery format** that makes use of the HbbTV system now available in Europe, it would be valuable. Having common delivery systems would facilitate common receiver systems and would consequently encourage the wider availability and use of the service. However, as will be seen, this is probably not practical today.
- If there were a worldwide **common subtitle production format** it would encourage the widest generation, and consequently widest provision of optional subtitles. However, this is not possible today.
- In some circumstances, explained later, services will allow elements of the text to be changed or adjusted by the user (‘**subtitle customisation**’).
- In some circumstances, services may be **converted** to other forms of accessibility service, such as **text-to-braille conversion** given the appropriate systems are available.
- In the last decade, the SMPTE and EBU developed new subtitle ‘document’ formats based on W3C TTML. This is an **XML markup language** for Timed Text. There are production and delivery versions of TTML developed by the EBU. The delivery version of the EBU system is called **EBU-TT-D**¹³. The W3C subsequently developed the **IMSC**¹⁴ profiles of TTML, which can be seen as an umbrella system of the SMPTE and EBU TTML systems. Three **IMSC TTML** versions have been developed, IMSC 1.0.1 (which superseded the earlier IMSC 1.0), IMSC 1.1 and IMSC 1.2. Later versions with higher version numbers include additional features. Except in unusual cases, EBU-TT-D subtitle ‘documents’ are also valid IMSC ‘documents’, so that an IMSC processor can present EBU-TT-D documents. However, the reverse is not always the case.

¹³ <https://tech.ebu.ch/publications/tech3380>

¹⁴ <https://www.w3.org/TR/ttml-imsc1.2/>

- There is also a W3C-developed subtitling language for Web Pages, **WebVTT**¹⁵ derived from the SRT system originally designed for use with DVDs.
- The **editorial quality** of subtitles affects their usefulness. Aspects such as word accuracy and lip-movement-to-text-synchronisation are key factors affecting usefulness.
- Video can be delivered via the Internet using **different Internet streaming protocols**. These are the MPEG-DASH, HLS, and CMAF protocols. All the protocols allow the use of IMSC and EBU-TT-D subtitles. However, HLS is the only protocol that can be used with the standard Safari browser installed at source in iPhones.
- Services will need to accommodate one or more of a range of different receiver capabilities and customisation possibilities. They may apply to different extents in different countries. There will be the need for different delivery and reception profiles. These are **combinations** that include some of the following.
 1. Use of broadcast Subtitling without HbbTV.
 2. Usage of HbbTV 1.x receiver capability
 3. Usage of HbbTV 2.x receiver capability
 4. Direct use of EBU-TT-D
 5. Indirect use of EBU-TT-D
 6. Live Content: Broadcast Linear or Broadband Streaming
 7. Pre-processed Content: Broadcast Linear or Broadband Streaming
 8. Internet video delivery via CMAF, which may serve as a unifying format to cover both adaptive data rate systems DASH and HLS. CMAF prescribes the use IMSC

A1.1 The factors affecting the optimum way to deliver optional subtitles/closed captions using HbbTV

The decision on how to make the optional subtitles available to the prospective audience should be taken considering a series of factors. It may be useful to follow the ‘decision trees’ given in § B1 of this report.

The influence of systems currently in use

A first factor is the extent and type of subtitling services currently in use. There may be services in use that employ the original Fixed Format Teletext format. A decision is needed on whether to continue these services (if analogue broadcasting is still in use). There may also be services in use that make use of the DVB digital version of Teletext or DVB Subtitling¹⁶.

Extent of current use of HbbTV

In deciding to move to HbbTV, another critical factor to consider is the **extent of HbbTV-equipped receivers in the hands of users**, and the HbbTV versions and implementations they use. This will indicate whether HbbTV subtitles are worth pursuing.

¹⁵ WebVTT specification from W3C, <https://www.w3.org/TR/2019/CR-webvtt1-20190404/>

¹⁶ EN 300 743

The version itself will influence the possible choices of delivery method, and the rendering that can be used.

Another influencing factor is **whether the HbbTV services are already established**. This may influence the kind of service that should be provided. Simpler services may be more appropriate for newly commenced services. More sophisticated services may be provided where HbbTV services are well established.

Degree of customisation needed

A further factor is the extent to which the options of ‘**customisation**’ of the subtitles should be provided for. Customisation options for the subtitles are valuable to the user community, but they can only be provided if the delivery system and receiver capability allow. This means that the rendering of the subtitles needs to be done in the receiver by a downloaded application.

The W3C systems IMSC 1.1 and 1.2 allow additional presentation features going beyond those possible with EBU-TT-D. These may include the use of scripts that require advanced layout features such as ruby or text emphasis in Japanese.

The technical details of the implementation options are explained in Section B1 of this report. Simple decision trees are shown to help choose the optimum delivery method.

A2 USER EXPERIENCE OF SIGN LANGUAGE INTERPRETATION (SLI) USING HbbTV

- HbbTV can be used to provide SLI in a media delivery environment where both broadcast and Internet are available.
- Sign Language Interpretation (SLI) shows the user what viewers are hearing from voices or other activities happening in the scene. SLI helps meet the needs of a part of the community including those with **large hearing differences**, allowing them to share more easily in the video and sound media experience.
- The SLI user experience is a composite image of the television programme and a signer. The signer interprets into sign language the sound accompanying the image.
- Sign language is the **first language for some viewers** who find it easier to understand than text subtitles. In some cases, sign language can be the only language understandable by the user, and thus in such cases it can be a critically important service. There can however be limitations on its use because of a **shortage of trained signers** or other factors.
- There are many **different sign languages**, even between nations that nominally use the same spoken language, for example: British Sign Language (BSL) and American Sign Language (ASL) are different. There can also be differences in the signing needs of children and adults, and between diverse types of media content.
- SLI is particularly important for media content that provides local and national information, such as **news and emergency warnings**, where being aware of the content is a social necessity.
- The Users for SLI need a service that can be readily and conveniently accessed with equipment that they have available in the home.
- While there are benefits in customisation with new media services, the balance of opinion in the EBU is that for SLI, **given that the programme can readily be viewed as a composite image of the programme and the signer, having a simple system which can be simply switched into use is more important than having user scene-customisation features**. Furthermore, providing a composite image, programme makers may use layout knowledge and experience, and the known views of user groups, to optimise the structure of the delivered SLI composite image.

- Thus, the balance of advantages lies, for the user community, with ‘**source-inserted**’ signers rather than ‘**local-terminal-inserted**’ signers.
- Though recognizing that technology will evolve, based on the avatar capabilities seen so far, the User Groups for SLI currently do not favour **the use of avatars** (rather than humans) for signers. The use of the currently possible technically avatars for media is considered by user groups to be a second-class service that may only be suitable in specific circumstances.
- The HbbTV TV specifications allow, in principle, the option of a second video decoder, but it is **not a mandatory part** of any of HbbTV specifications. The second decoder has *not* been integrated with HbbTV for most receivers, and thus **the assumption that it is available in the receiver cannot be made** unless it is mandated in a local profile.
- Rather than create a composite image on the TV screen of the original image and the signer, if there were a second video codec, it would theoretically be possible to use the signer as a **Mixed Reality (MR)** overlay, given that the user has access to an MR system such as the Microsoft HoloLens, and which can be fed with a signer via an HbbTV signal. The user would look through the HoloLens at the screen carrying the programme and would see a signer located in space between the user and the TV screen. A precise sync of the MR and broadcast video would be supported by HbbTV 2.0.2. However, wearing the MR head mounted display could be a discomfort, and the HoloLens is not yet widely available to consumers. Thus, the assumption that this arrangement will be widely available, which would justify its use, cannot be made.

A2.1 Notes on the optimum scene lay-out for SLI

- Different optimum scene layouts are used for SLI images by different content providers, and there may be **no uniquely best format**.
- It is likely that there will be **different optimum layouts** for diverse types of content. For content where the important need is to understand the words being spoken, the signer may be given more prominence than for content where it is also important to observe the action in the scene.
- There are two suggested potential layout options for the composite image including the signer. They are as shown below.

Image Layout 1: Separate areas for video, signer, and subtitles. Figure A1 shows structurally the position of the original video image (top left), the interpreter (right). Figure A2 shows how the structure would apply in action, with subtitles at the bottom.

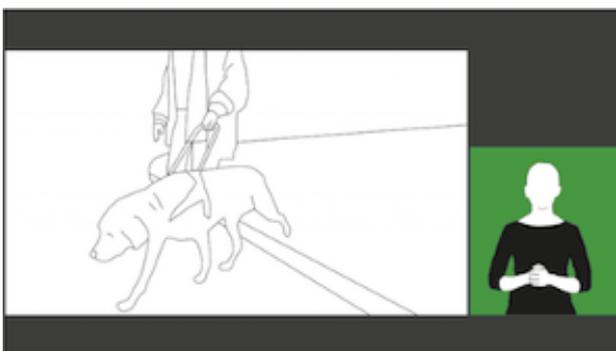


Figure A1
(Source: Pilar Orero)



Figure A2
(Source: TIPK TV)

Image Layout 2: Matting of image and signer, with possible adjusted original image geometry. Figure A3 shows signer (bottom right) and subtitles (non-overlapping bottom) overlaid on whole image. Figure A4 shows signer (bottom right) overlaid on an image where the original image has been shrunk in size and adjusted in geometry to give the most easily absorbed overall image.



Figure A3
(Source: RTV Slovenia)



Figure A4
(Source: WDR "Aktuelle Stunde")

- The view of correspondence with the WFD (World Federation of the Deaf)¹⁷ is that for **Image Layout 1**, the size of the signer should be about 1/3rd of the horizontal width of the screen, and it should occupy a space no smaller than 1/6th of the total screen area. The signer's immediate environment should be arranged to give a good contrast between the signer's body and the background.
- For **Image Layout 2**, the size of signer can be lower in the composite image frame, and the geometry of the original image can be adjusted geometrically for best effect by the content provider.
- The view of the WFD correspondence is that for **Image Layout 1**, subtitles, if used, should occupy about ¼ of the height of the image.
- The inclusion of subtitles in addition to the signer in **Image Layout 2** may be more difficult if the main image geometry has been changed.
- There may be different advantages in having the signer in the left-hand corner or right-hand corner of the image, but the view of the WFD correspondence is that having the signer on the **right-hand side** of the composite image is probably the better option.
- Ideally, the user might have the option of having the signer on either side of his choice, but this would require the composite image to be delivered in both forms, which may not be practical.

A3. USER EXPERIENCE OF AUDIO DESCRIPTIONS DELIVERY USING HBBTV

- Audio descriptions¹⁸ are audio tracks that **describe what is happening** in the current scene. They are played out in the pauses between dialogue, coupled with the dialogue/effects track. Together with the scene dialogue and audio effects, they can make the programme content followable by those with vision impairments/sight differences.
- Audio descriptions are **most useful for drama** but can also be used for other types of content, where the main programme audio does not adequately explain the key visual elements during the programme.

¹⁷ <http://wfdeaf.org/>

¹⁸ Sometimes called 'Video Descriptions'.

- The characteristics and style of the narrator can be chosen to be most appropriate for the content and audience.
- A further useful field of application for Audio Description is **emergency or warning systems**, for example as required by the EU AVMS Directive¹⁹. The goal of such HbbTV services would be to guarantee awareness by sight impaired audiences of public warnings. An audio notification can be arranged to give advice about local catastrophes and similar incidents. This can be combined with visual information. This AD-based warning can be realised with HbbTV using ‘Stream-Events’ and regionalised/localised using IP-based geolocation.

A4. USER EXPERIENCE OF ‘ACCESSIBLE AUDIO EXPERIENCES’²⁰ DELIVERY USING HBBTV

- An estimated 50 million people in Europe²¹ find speech dialogue and narrative in television programmes difficult to follow. **Reducing the background sound (music, effects, and ambient sound) can make the speech clearer.** This can be one of several alternative audio mixes that help the user’s experience. This is termed currently the provision of ‘an accessible audio experience’, though other terms are also used for such a feature, such as Clean Audio. There is however a spectrum of optimum mixes for users with hearing or sight differences, which includes those who benefit from more clear background sounds.
- An Improved Audio Experience can improve the clarity, quality, and consequent enjoyment for those with hearing differences, though **the needs of those with different sensory differences differ.**
- **Aspects of an ‘Accessible Audio Experience’ are relatively complex.** The optimum signal is not the same for all types of sensory difference. For example, following some types of content can call for not just the dialogue to be clearer, but also background sounds that are essential to follow the plot to be clearer. Alternatively, those with sight differences can find enhanced background sounds helpful to follow what is happening in the scene.
- **Hearing ability declines naturally with age.** For those with only minor hearing loss or reduced cognitive ability, a high level of background audio information often leads to a reduction in audibility or intelligibility. This can occur before hearing loss is clinically identified. Viewers sometimes thus increase the volume level, but this does not necessarily improve intelligibility.
- **An overriding influence on the accessibility of a programme audio track can be the care that is taken in production, and this should be borne in mind.**
- Various measures can be taken to help intelligibility. They include:
 1. **Recording and delivering foreground and background separately.** The optimum, but also most complex, way to provide an Improved Audio Experience, would be to record and store the audio input from persons (actors/commentators), other audio sources, or objects, separately, and include appropriate metadata with them. The separation could then be maintained while producing and distributing the content until rendering takes place in the final device, and their relative volume can be adjusted/personalised/customised. Due to various constraints in production, distribution, and rendering, **this is currently not possible in practice today with HbbTV.**

¹⁹ <https://eur-lex.europa.eu/eli/dir/2018/1808/oj>

²⁰ Sometimes termed Clean Audio or other term such as Dialog+

²¹ DVB document DMC 06, <https://lab.irt.de/speech-intelligibility-dialogue-via-hbbtv-2/>

2. Currently a **simpler solution is used** by HbbTV services and HbbTV-equipped TV sets. The foreground dialogue is separated to the extent possible from the background-audio before delivery by processing, such as Machine Learning, to create a new audio-mix (sometimes called 'Clean Speech'). This process can in principle be used for live and file-based content. It works best with non-live content, and thus for pre-recorded or on-demand content. The resulting new mix is a stereo audio-channel with easier to understand speech. This channel can be made available in several ways and can be offered as one separate audio-channel through HbbTV or other means. The playout centre processing used currently is less successful with live material.
3. Separating the dialogue in the final device. This option is offered in some premium Smart-TVs and can be chosen by the user when sender-side separation (2 above) is not available.

In summary, providing the means to allow the user to select and control a mixture of speech and background sound to suit his or her needs can be done in principle by:

- Providing metadata to create a new mix from the delivered sound channels in the receiver, developed in Japan, though this is not used in Europe.
 - Providing a new mix in the receiver using machine learning software,
 - Providing separate foreground and background channels, or,
 - Providing one or some separate alternative mix(es) with mixed levels of background and foreground.
4. An easier-to-follow format for users in a surround sound system can be to provide the **foreground sound via the centre audio channel, and the background via the other channels.**

Appendix B: Guidance on the practical Implementation of Systems in Appendix A

B1. IMPLEMENTATION OF SUBTITLING SYSTEMS (A1) USING HbbTV

Choosing the optimum components of the subtitle service

There are **multiple options** for the provision of subtitles in an HbbTV receiver environment. The choice of options possible is constrained by the content generation and delivery system, the user environment, and the requirement (or not) for customisation.

It may be helpful to follow a ‘**decision-tree**’ process as part of the process of deciding how to implement the HbbTV subtitle service. This is explained later.

The first part of the decision process concerns **whether to preserve existing delivery systems** for providing subtitles. Subtitling for television in Europe has developed in three phases over the last 50 years. The first phase was for Teletext (Fixed Format and Antiope Variable Format). The second phase was designed for the DVB digital broadcasting environment and included both a digital multiplex version of the original Fixed Format system, and DVB Subtitling. In the last decade, HbbTV has made possible the evolution to new systems making use of HbbTV. A decision is needed on whether any former systems in use should be continued or discontinued.

If the evolution to HbbTV subtitle systems is to be made, there are **two general groups of HbbTV options available**. The first group of options is to **render the subtitles using a specific App that must be downloaded to the receiver**. The second group is to **render the subtitles using the native renderer** in the HbbTV receiver.

The option of **directly decoding the appropriate format subtitles from the DSM-CC broadcast carousel** may also be an option, though this would not make use of HbbTV.

Sections B1.1 and B1.2 offer basic decision trees for a broadcast and broadband service. These need to be considered together for most broadcasters, because they simultaneously provide both kinds of service.

B1.1 Decision Tree for a broadcast subtitle service

An initial decision is needed on whether viewer customisation should be part of the service offered. If it is, then it will be necessary to process the subtitle data using a downloaded App.

The type of data that the App can process will depend on the App used, but in principle it could be TTML data (IMSC or its EBU-TT-D component), DVB Teletext, or DVB Bitmap data.

A decision is also needed on the degree of customisation to be offered. Different features are possible with EBU-TT-D and IMSC 1.2²². IMSC features are outlined in the footnote reference.

If viewer customisation is not needed, the receiver could process the data without using HbbTV.

²² <https://www.w3.org/TR/ttml-imsc1.2/>

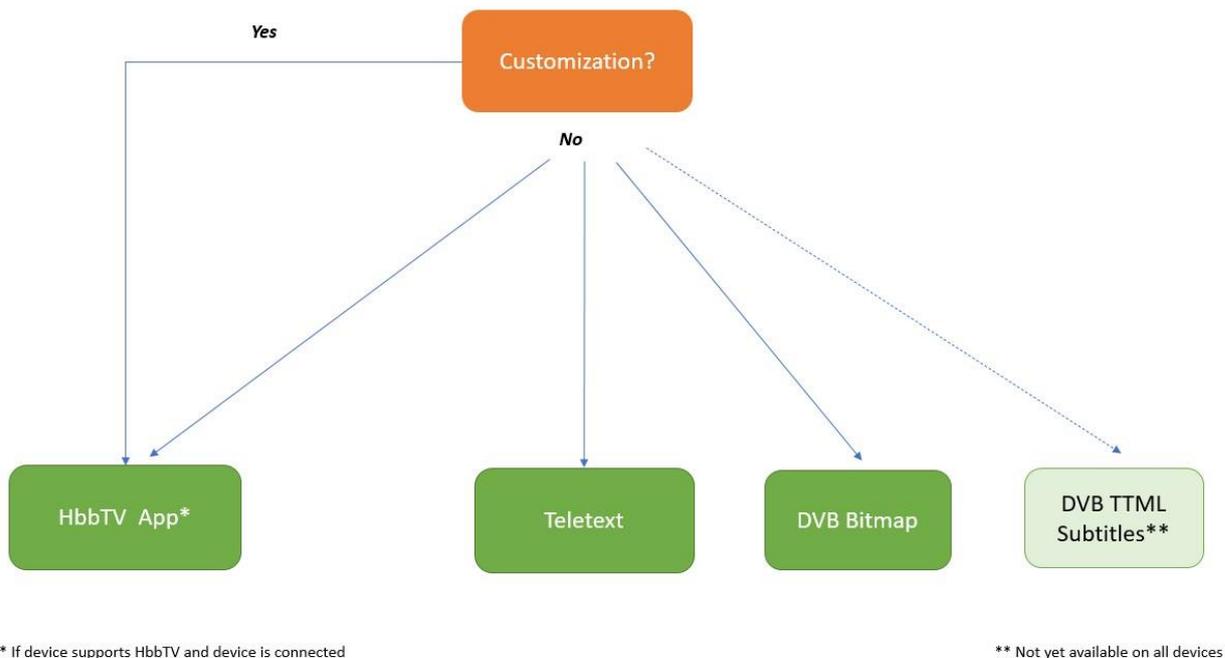


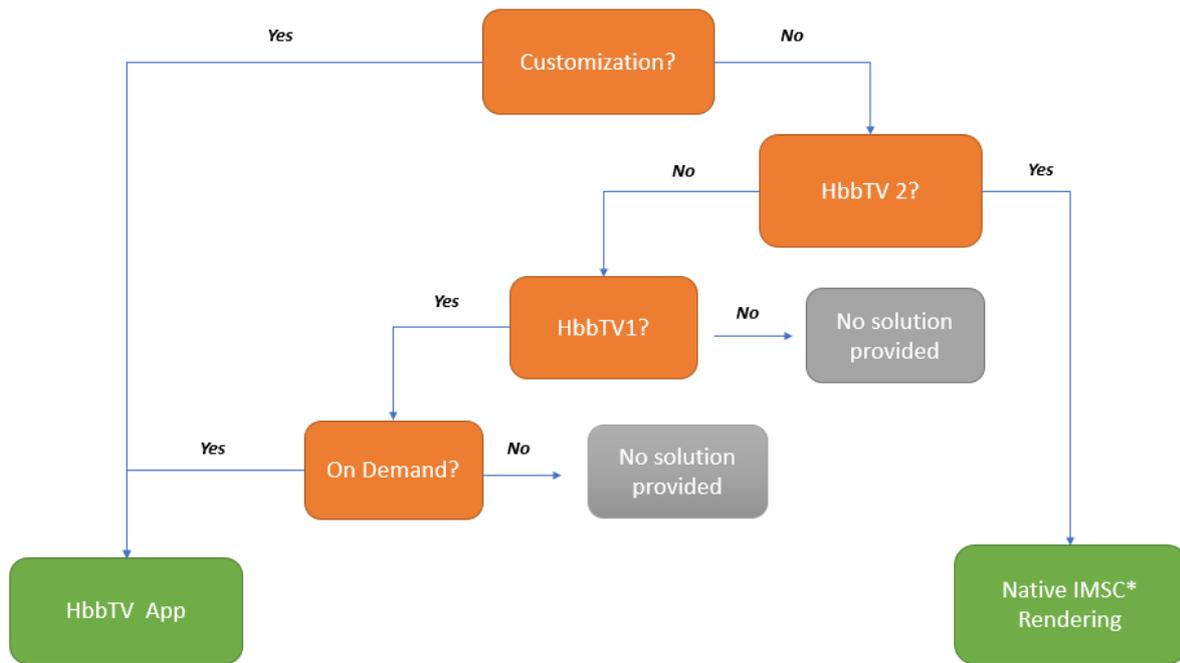
Figure B1: Decision tree for broadcast elements

Further explanation of Figure B1: The only way documented in this report to have customized subtitles for broadcast distribution is to use an HbbTV App. If no customization is required, an HbbTV App can be used for subtitles, but also Teletext subtitles, DVB Bitmap subtitles, and TTML subtitles. These standards can be natively supported by TV devices. While Teletext Subtitles and DVB bitmap subtitles are usually supported by TV devices, the DVB standard "TTML subtitling systems" is relatively new and not yet supported by all devices.

B1.2. Decision Tree for Broadband Delivery of Subtitles.

An initial decision is needed on whether viewer customisation should be part of the service offered. If it is, then it will be necessary to process the subtitle data using a downloaded App.

If customisation is not needed, choices will be affected by the version of HbbTV that is included in receivers. If the HbbTV 2.0 series is available, the service can be made available using native IMSC/EBU-TTML-D rendering. If an earlier version of HbbTV is available in receivers, then an HbbTV App is required to process the signals. The use of IMSC may be needed if some of its features are considered necessary.



* EBU-TT-D subset of IMSC

Figure B2: Decision tree for broadband delivery elements

Further explanation of Figure B2: The only way documented in this report to obtain customized subtitles for broadcast distribution is to use an HbbTV App. If no customization is required, an HbbTV App can be used for subtitles, but native EBU TT-D rendering can also be used, provided the device is an HbbTV2 device²³. If the device supports HbbTV 1, an HbbTV App can be used for on-demand content. For devices that do not support HbbTV 1, no solution is provided in this document. Also, for devices that support HbbTV 1 but require subtitles for live content, no solution is provided.

Possible variations in method of the delivery of subtitles

The matrices in Figures B3 and B4 indicate all the possibilities available in provisioning subtitles.

Table B1 below provides a series of short explanations of the terms used in the columns and rows of the matrices and should be read in conjunction with the matrices.

The choice of system to be used should be made based on the constraints of the delivery environment where the service is to be provided. These are given as row and column headings of the matrix in Figure B3.

The matrix in Figure B4 indicates the options available where an intrinsic sync is available with each of the options and indicates options that allow subtitle customisation.

Technically feasible options are shown with a tick in the relevant squares of the matrices.

²³ it is possible that some local profile could specify EBU-TT-D, in principle, or that some manufacturers could offer it in devices.

Table B1: Terminology used for the Option Matrices.
Blue boxes in the table are associated with native rendering.
Green boxes are associated with App rendering

Native rendering	
Providing subtitles via native rendering implies transmitting subtitles via a predefined and standardised delivery protocol and coding of characters and related display options such as colour and position. The actual rendering is then done by the terminal, based on these standardised formats.	
General advantages of native rendering compared to ‘App’ rendering:	
<ul style="list-style-type: none"> • can be easily combined with all HbbTV applications without having to integrate subtitle rendering libraries into all relevant HbbTV apps • may consume fewer resources on the device (RAM, CPU, ...) • may achieve a more precise sync of image and subtitles 	
DVB broadcast standards	
DVB standards provide three options for subtitling, the first two of which are normally implemented and available on all DVB receivers	
DVB teletext	DVB provides an encapsulation method for transmitting teletext data as specified in the 1970s. Subtitling using the teletext character and graphical set can be transmitted using this standard.
DVB bitmap subtitles	DVB bitmap subtitles define how to transmit subtitles as bitmaps. This grants a high degree of graphical freedom but requires higher bitrates. The text is unavailable to the receiver and therefore no customisation is possible.
DVB TTML subtitles	DVB TTML defines how to transmit timed text as TTML data, for example as EBU-TT-D or IMSC Text Profile, and how to signal the language and purpose of the timed text.
EBU-TT-D	
EBU has defined a profile of TTML that provides extended rendering options for subtitling. A renderer for EBU-TT-D is mandatory to implement on all HbbTV 2.x devices. An HbbTV application is required to start and control the rendering of EBU-TT-D subtitling.	
EBU-TT-D out of band	Separate files containing EBU-TT-D content can be linked to the HTML5 media element and will be rendered in sync with the video by HbbTV 2 devices.
EBU-TT-D in band	HbbTV 2 devices support in-band delivery of EBU-TT-D subtitles in DASH content. The segments containing the subtitles are packaged in MP4 files and handled like video and audio segments. EBU-TT-D subtitles can be delivered via DASH as a separate stream containing subtitle segments only. Using this variant, EBU-TT-D can also be synchronised to broadcast video via HbbTV2 multistream sync.

App rendering	
Rendering the subtitles by an HbbTV application loaded by each broadcaster ‘on the fly’ when changing the programme (the software is normally that developed by the content provider, but libraries with elements of the software could be shared.	
General advantages of ‘App’ rendering compared to native rendering: <ul style="list-style-type: none"> • very flexible with respect to rendering options (positioning, scaling of video, usage of extra symbols and animation options, ...) • customisation can be done more easily • freedom over which subtitling formats to be used (e.g., TTML, WebVTT or other formats can be used) 	
Based on HbbTV 1.x	
HbbTV 1.x versions provide a basic set of tools which allows to transmit and synchronise subtitles in several ways.	
DSM-CC stream events	DSM-CC Stream Events can be used to deliver subtitle text to be rendered on broadcast video. They are inserted into the DVB multiplex in real time. There is no explicit sync mechanism, and the basic delay must be adjusted. Care must be taken in remux scenarios not to lose the stream events and to maintain or re-adjust the timing. Frame accurate synchronisation accuracy cannot be guaranteed.
Sync. via Playtime	The HbbTV App reads the actual playtime from the av object and renders the subtitles at the correct timing. The subtitle texts can be loaded some time in advance. Frame accurate synchronisation accuracy cannot be guaranteed, but better synchronisation may be achieved than using DSM-CC.
Polling	The HbbTV App performs long polling on a web server which answers the requests at the correct time with the subtitle text. This requires calibration for the delivery delays (which must be known!) and a CDN that can handle all the requests in parallel. Frame accurate synchronisation accuracy cannot be guaranteed.
Based on HbbTV 2.x	
HbbTV 2.x extends the feature set of HbbTV 1.x and allow the following additional variants for subtitling. All HbbTV 1.x services will work also on HbbTV 2.x devices.	
DASH in band events	Can be used on HbbTV 2 devices to deliver the subtitle texts as cues via the HTML5 media element.
Sync. via TEMI	As for the “Sync. via Playtime”, the TEMI broadcast timeline can be used on HbbTV 2 devices to synchronise subtitles preloaded by the App to the broadcast video.
Polling using TEMI	The live case can be covered by combing (long) polling and TEMI values along with the loaded subtitles can be used to present them in good sync with the video. The delay in the broadcast chain should be long enough to allow this mode of operation.

Approach		Technical Options	Area of applicability			
			Broadcast		IP-Streaming	
			Preprod	Live	Preprod & On Demand	Live
native Rendering	DVB broadcast standards	Teletext	✓	✓		
		DVB Subtitling	✓	✓		
		DVB TTML	✓	✓		
	EBU-TT-D via HbbTV 2.x	EBU-TT-D out of Band			✓	
		EBU-TT-D in Band	✓	✓	✓	✓
Rendering by HbbTV App	on HbbTV 1.x devices	DSM-CC Stream Events	✓	✓		
		Sync. via Playtime			✓	✓
		Polling	✓	✓		
	on HbbTV 2.x devices	DASH Inband Events			✓	✓
		Sync. via TEMI	✓			
		Polling using TEMI	✓	✓		

Figure B3: Matrix of Options

Further explanation of Figure B3: When going for rendering by an HbbTV app then on HbbTV 1.x devices Stream Events and polling can be used in the broadcast context for preproduced and live content. For IP content of any kind, the sync can be done using the playtime.

On HbbTV 2.x devices, in addition to these methods, DASH in-band events can be used for any IP content. For broadcast content, the TEMI timeline can be used syncing subtitles for preproduced content, and the same timeline can be used to poll for subtitling for both preproduced and live broadcast content

Areas of applicability of all listed technical options for subtitling:

For native rendering, the DVB broadcast standards Teletext, DVB Subtitling and DVB TTML can be used for broadcast video only and all of them support both live and preproduced content.

Using the native rendering of EBU-TT-D in the HbbTV 2 context does support all combinations of broadcast and IP video and preproduced and live content if the subtitles are used in band.

Approach		Technical Options	Intrinsic Sync Mechanism	Easy and flexible personalisation
native Rendering	DVB broadcast standards	Teletext	✓	
		DVB Subtitling	✓	
		DVB TTML	✓	
	EBU-TT-D via HbbTV 2.x	EBU-TT-D out of Band	✓	
		EBU-TT-D in Band	✓	
Rendering by HbbTV App	on HbbTV 1.x devices	DSM-CC Stream Events		✓
		Sync. via Playtime	✓	✓
		Polling		✓
	on HbbTV 2.x devices	DASH Inband Events	✓	✓
		Sync. via TEMI	✓	✓
		Polling using TEMI	✓	✓

Figure B4: Matrix of Options concerning synchronisation

Further explanation of Figure B4: additional features of the listed subtitling methods:

- An intrinsic sync mechanism is given for all methods except for the DSM-CC stream events and the simple polling working on all HbbTV devices.
- Easy and flexible personalisation is given for all methods where the rendering is done by an HbbTV App.

B2. IMPLEMENTATION OF SLI

As explained in earlier sections, to allow straightforward use, and to allow the content provider to provide an optimised composite image.

- The optimum method to provide the SLI service using HbbTV ²⁴is to provide a separate composite channel via HbbTV.

The case for this in summary is as follows.

- This approach is possible with all versions of HbbTV after HbbTV 1.0.
- Switching in and out of the service by the user is simple using an on-screen menu.
- Precise synchronisation of the original programme image and the signer signal is not needed.

²⁴ There are alternative ways to provide composite content which includes SLI. These can include broadcasting the composite content at different times or on different channels. Providing the composite content later not in real time could allow more considered signing to be available.

- d. The user can be presented with image with adjusted geometry by the content provider.
- e. The user is not burdened with the need for a Mixed Reality Head Mounted Display.

B3. IMPLEMENTATION OF AUDIO DESCRIPTION

Audio Descriptions may be provided by means of a separate audio channel. This can in principle be either an AD channel alone, which is combined with the normal audio in the TV receiver ('receiver mix'), or a composite of the AD and the normal audio ('source mix' or 'broadcaster mix').

Options for delivering Audio Descriptions in the broadcast context include:

- Additional audio track with the AD audio in the broadcast multiplex based on conventional audio coding (its activation can be assisted by an HbbTV application). It will work on all DVB devices but consumes additional broadcast bandwidth for the AD channel.
- Additional NGA²⁵ audio track in the broadcast. Its activation can be assisted by an HbbTV application, but it consumes broadcast bandwidth. There is a common NGA concept in the ITU²⁶ but currently no common NGA delivery standard. Unfortunately, there is no harmonised support in consumer devices today for one NGA technology, which may be linked to the plurality of NGA delivery formats.
- Additional audio track via IP using HbbTV 2x sync features. This does not consume broadcast bandwidth. The audio description can be played back via the TV speakers, but also via a smartphone/headphone allowing individual use. An HbbTV 2.x device is required.

Options for Audio Description in the broadband context (live and on demand) on HbbTV devices:

- Provision of multiple complete Video and Audio versions of the content with different audio content. This is technically very easy to implement and offers maximum interoperability on the devices. It is operationally bulkier to store and handles content twice and needs to present it properly on the GUI side.
- Using DASH for offering additional soundtracks in conventional coding. This is straightforward and easy to handle. It does not work on HbbTV 1.0 devices.
- For both variants above a separate audio track can be offered for individual use via a smartphone/headphone. In this way audio description does not disturb other viewers. It requires HbbTV 2.x.

In general, the simplest and currently suggested solution to provide an Audio Description service as a separate audio channel that combines the normal audio and the audio descriptions. This saves the additional stage of mixing the normal audio and the Audio Descriptions in the receiver however the user is unable to vary the audio mix to meet their needs or preferences.

B4. IMPLEMENTATION OF AN ACCESSIBLE AUDIO EXPERIENCE

Note that a more appropriate term is being sought

²⁵ Next Generation Audio (or the Advanced Sound System in ITU nomenclature) is a creation and delivery format for audio which creates sound objects and metadata that indicates what is what the receiver should do with the sound object.

²⁶ ITU-R BS.2127

Options in the broadcast context:

- **Additional audio track in the broadcast** based on conventional audio coding (its activation can be assisted by an HbbTV application). It will work on all DVB devices but consumes broadcast bandwidth.
- **Additional NGA audio track** in the broadcast (its activation can be assisted by an HbbTV application). The level of background noise attenuation can be selected by user. It consumes broadcast bandwidth. There is however no unique standard NGA codec. There is thus no harmonised support for one NGA technology in devices today.
- **Additional audio track via IP** using HbbTV 2 sync features. This does not consume broadcast bandwidth. An HbbTV 2.x device is required.

The optimum audio track for users can be different and may depend on the sensory differences of the user concerned.

Using NGA channels, if available, would allow the user to individually adjust the levels of foreground and background, if they are delivered separately. When HbbTV 2 sync is used, several audio channels with differently preconfigured level settings can be provided.

Options for Accessible Audio Experiences in the broadband context (live and on demand) on HbbTV devices:

- **Provision of multiple complete Video and Audio versions of the content with different audio content.** This is technically very easy. There is maximum interoperability with devices. It is operationally bulkier to store, and content must be handled twice, and it must be presented properly in the GUI.
- **Using DASH for offering additional soundtracks in conventional coding.** This is straight forward and easy to handle. It does not work on HbbTV 1.0 devices.
- **For both variants above an NGA codec can be used.** In this case, the level of background noise attenuation can be selected by user. NGA channels might also be used to carry Audio Descriptions. There are different NGA codecs, and unfortunately no harmonised support for NGA in devices today.
- **Providing Audio Description as an additional audio track for the descriptions, with metadata to specify changes to mixing** is an alternative acceptable solution. This allows the user to vary the audio mix, and requires the receiver to mix the tracks together, which can add complexity to the receiver or application.

The suggested pragmatic current solution is to provide a second audio channel provided by HbbTV that can be selected by the user. In the production of the programme itself, a processing system creates a second audio channel which improves the audibility of the foreground audio. This ‘clean-feed’ can include strengthened dialogue and any key background noises necessary to follow the narrative. This is most effective with pre-recorded content.

Annex 1: Potential Accessibility Service Options for the longer term

1A. Options for using DVB-I together with HbbTV

DVB-I²⁷ is a DVB-developed application that can be used in principle to provide a single point of access for the user for all the broadcast channels, internet services, IPTV, and downloaded apps available to him. In the future, given development, it may provide a common access point for accessibility services such as those outlined in the report.

Ideally, the DVB-I user would be able to establish whether any service he or she seeks has one or more accessibility services available. This may require development of the DVB-I system, which are not yet available. The DVB group concerned with DVB-I is currently discussing these matters.

2A. Options for using Additional Apps for an HbbTV environment

Among the potential options for additional Apps for an HbbTV environment are the following:

- The development of a Mobile Companion Screen App that also allows interaction with the online HbbTV Player.
- Voice controlled TV Screen/HbbTV Player (e.g., via the mobile app or via Alexa/fire TV or similar.
- Potentially the HbbTV environment can also be used on the laptop/desktop in a browser to provide context related add-ons, e.g., AD for a live stream on YouTube

2A.1 Possible future new services

In discussion within the ITU²⁸ and other bodies.

- Tactile/haptic services
- Use of individual smart phones to optimise services for individual users who are viewing media collectively
- Cognitive issues such as adjustment of playback rates to suit user's needs
- Voice activation
- Remote control of TV set and services for users with limited mobility
- Use and Management of User profiles
- Use and Management of Channel profiles

²⁷ <https://dvb.org/webinar/dvb-i-service-discovery-and-programme-metadata-december-2019>

²⁸ <https://www.itu.int/pub/R-REP-BT.2207>

Annex 2: Examples of current services operated by EBU Members

ARD/rbb

Subtitle rendering configuration

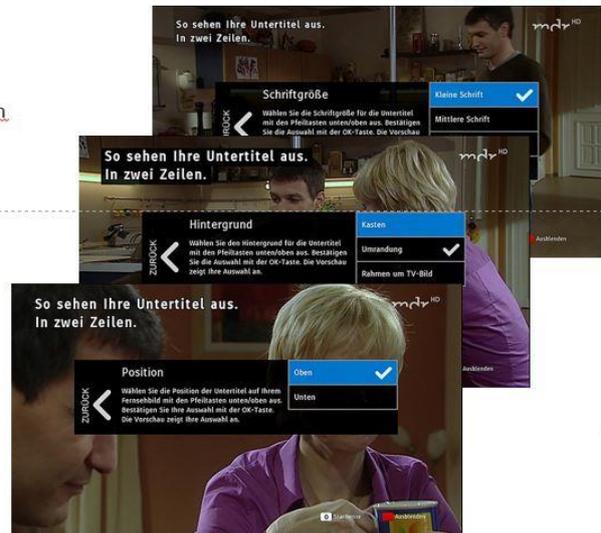
(Regular operation)

ARD offers subtitling via HbbTV rendering

- subtitles are transmitted via DSM-CC stream events
- configuration options are offered for font size, background and position



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Signer service

(Regular operation)

ARD provides a signer service:

- as IP stream started via HbbTV
- combined LinearTV and signer in one stream
- regularly for events of specific public value
- easy access via „Red Button“

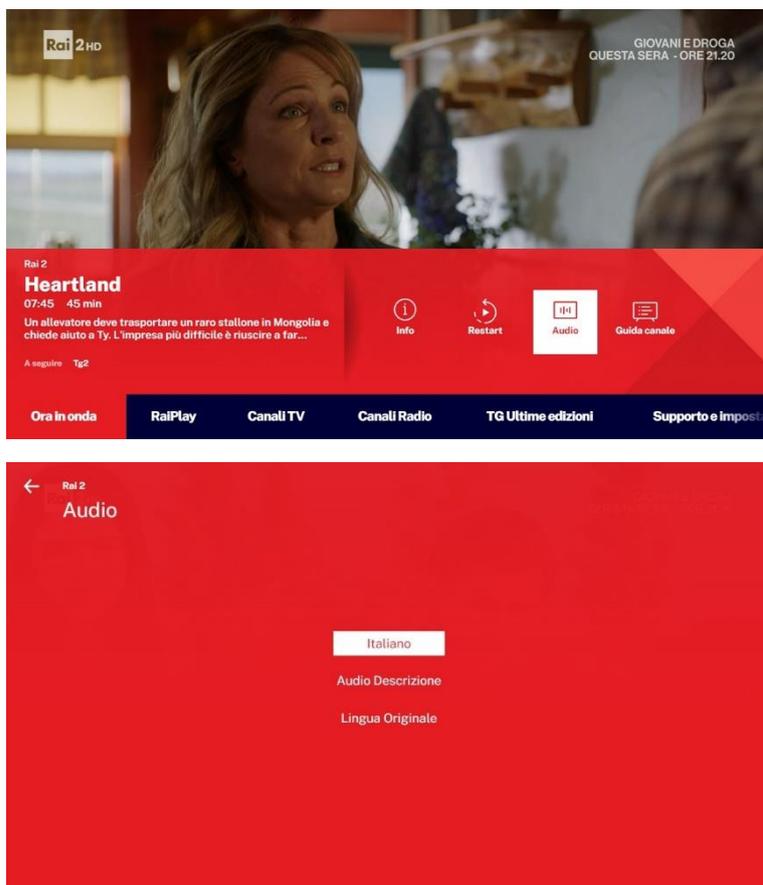


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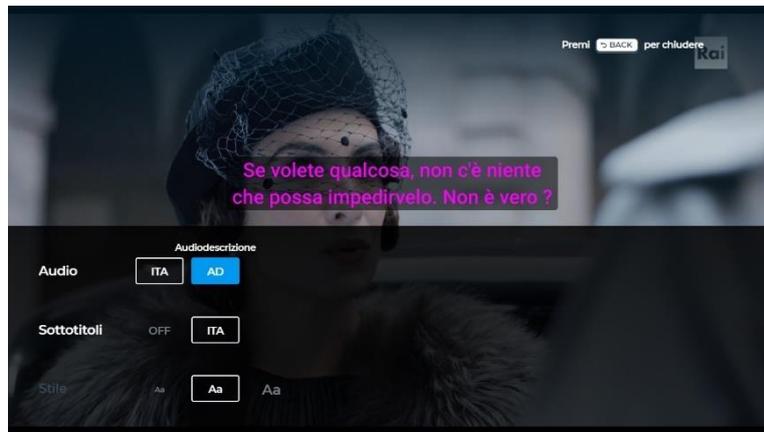
RAI

In many of RAI television broadcast services, auxiliary tracks are reserved for audio-description and original language. The auto-start application RAI TV+ implements selection of these tracks from the main page, while remote control yellow key switches among them, independently of the state of the graphic interface.



In the player page of multimedia portal RaiPlay, features are available to toggle subtitles with different font sizes and to select auxiliary audio tracks, mostly audio-description and original language.





SVT Services

SVT is running an HbbTV 1.5 service for SLI, much like the already included example from ARD/abb.

Signer service in regular operation

- Uses HbbTV 1.5
- Available on pre-recorded and live programs
- Replaces broadcast signal with DASH live or VOD asset
- No HbbTV 2.0.x sync, the stream is played from the right position via a seek operation





1. (Landscape view, “Många drabbade på Vrångö” text):
The picture shows the news show that has just started. The service checks via an API that this programme has a sign language interpretation version available and displays an indicator to press the yellow button to activate SLI. (Note that it’s displayed next to the teletext closed captions indicator).
2. (Darker screen, “Teckenspråkstolkning” text):
The user gets the option to turn SLI on or off.
3. (Signer in front of a screen with a ship):
The service starts the SLI version asset of the program and starts playback from the timestamp that the broadcast had reached.

At any time, the user can turn SLI off using the yellow button, which actually just quits the service and returns to the broadcast