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Technical Report

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**Part 18: Working Group G "Digital broadcast  
television" final report**



## FOREWORD

The procedures for establishment of focus groups are defined in Recommendation ITU-T A.7. The ITU-T Focus Group on Audiovisual Media Accessibility (FG AVA) was proposed by ITU-T Study Group 16 for creation in-between TSAG meetings and it was established on 22 May 2011. The Focus Group was successfully concluded in October 2013.

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## Table of Contents

Introduction.....		3
A.	First question: What is the state of the art of accessibility and digital broadcast Television?.....	3
A.1	Digital television and the key stakeholders (a short introduction to set the scene).....	3
A.2	The current broadcast television market.....	3
A.3	Production and distribution technologies .....	6
A.4	The current situation regarding TV accessibility .....	7
A.5	A snapshot of digital television standardization.....	7
A.6	Legislation and regulation digital television accessibility.....	7
A.7	Issues with current work practices for accessibility in digital television .....	9
A.8	Platform issues.....	11
B.	Second question: What is the vision for 2015 and 2020? (i.e. how might developments like three digital television (3DTV) and the presence of a return channel in hybrid broadcast/broadband TV change the television experience?) .....	11
C.	Third Question: What are the barriers in 2011 that currently prevent these visions from becoming a reality?.....	12
D.	Fourth Question: What actions are needed to break down current barriers in order to make the 2015 and 2020 visions for television a reality?.....	13
Annex A:	List of Abbreviations.....	15

## **Summary**

This Technical Report of FG AVA was prepared by Working Group G "Digital broadcast television" that FG AVA had foreseen as a future work item for ITU-T Study Group 16 (SG16) "Multimedia" and ITU-R Study Group 6 (SG6) "Broadcasting service".

The main challenge to make digital television accessible is to understand and manage all elements of the end-to-end broadcast delivery chain. This includes managing support for access services from stakeholders and developing the necessary consensus and momentum.

## Introduction

This Technical Report presents the preliminary work by Working Group G (WG) on the four questions below, which address the main challenge of making digital television accessible.

### A. First question: What is the state of the art of accessibility and digital broadcast Television?

#### A.1 Digital television and the key stakeholders (a short introduction to set the scene)

The transition from analogue to digital television began in 1997. By the end of 2011, the USA, Japan and much of the countries in Europe had switched on digital television (terrestrial, satellite or cable) and switched off analogue transmission. Many territories will be starting digital transmission and turning off analogue in the course of the current decade.

In urban areas with good broadband penetration, solutions using digital television broadcast combined with the Internet seem likely to become mainstream in coming years. These techniques adopt different commercial names, e.g. as hybrid TV, connected TV, smart TV, HybridCast, catch-up TV. The standardized approach known as integrated broadcast-broadband (IBB) provides a standard application programming interface (API)/browser in all integrated digital television (IDTV) with Internet, with a large deployment of services from major broadcasters in Europe.

The emergence of hybrid delivery using 'Over the Top (OTT)' Internet delivery (both 'main screen' and 'second screen' scenarios) is already influencing the business models of pay-TV operators.

Internet protocol television (IPTV) has matured rapidly in the first decade of the century and is now one of the main digital media platforms in city states such as Hong Kong. It is difficult to foresee whether IPTV will make substantial inroads into the digital broadcast television. This is conceivable in affluent urban areas and unlikely elsewhere.

#### A.2 The current broadcast television market

In terms of revenue generation, television (both analogue and digital) has a global turnover of EUR 280 billion (USD 370 billion<sup>1</sup>). Advertising and subscription fees are the dominant revenue streams, with public or state funding still accounting for less than 10% of the total.

Television still outstrips other kinds of electronic media including electronic games, the cinema and recorded music, see Figure 1.

At the global level, some national TV markets such as China are still growing strongly<sup>2</sup>. The figures for TV can be compared with other media reported in a recent study published in the Economist<sup>3</sup>, see Figure 2.

The main foreseen changes are:

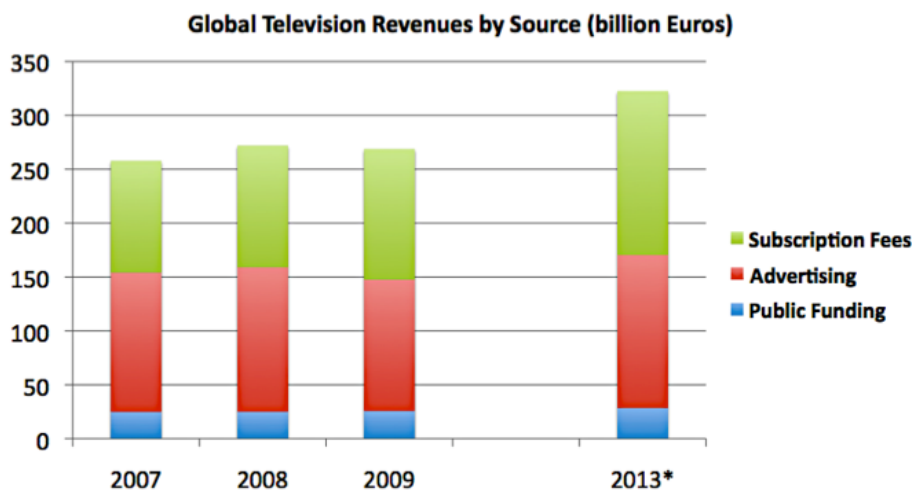
- steady growth in video games;
- gradual decline for recorded music and magazines.
- *Market size* (global figures for the proportion of households watching TV)

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<sup>1</sup> **IDATE:** [http://www.international-television.org/tv\\_market\\_data/world-tv-market-2010.html](http://www.international-television.org/tv_market_data/world-tv-market-2010.html). The exchange rate used here to derive the dollar values is EUR 1 = USD 1.3 (2 January 2012).

<sup>2</sup> Broadcasting in China grew by 25% in 2010. *Television in China* 7 Jan. 2012. The Economist Print Edition.

<sup>3</sup> *All the world's a game* 10 Dec. 2011. The Economist Print Edition.



Source: IDATE: [http://www.international-television.org/tv\\_market\\_data/world-tv-market-2010.html](http://www.international-television.org/tv_market_data/world-tv-market-2010.html)

Figure 1-World TV market (source: IDATE)

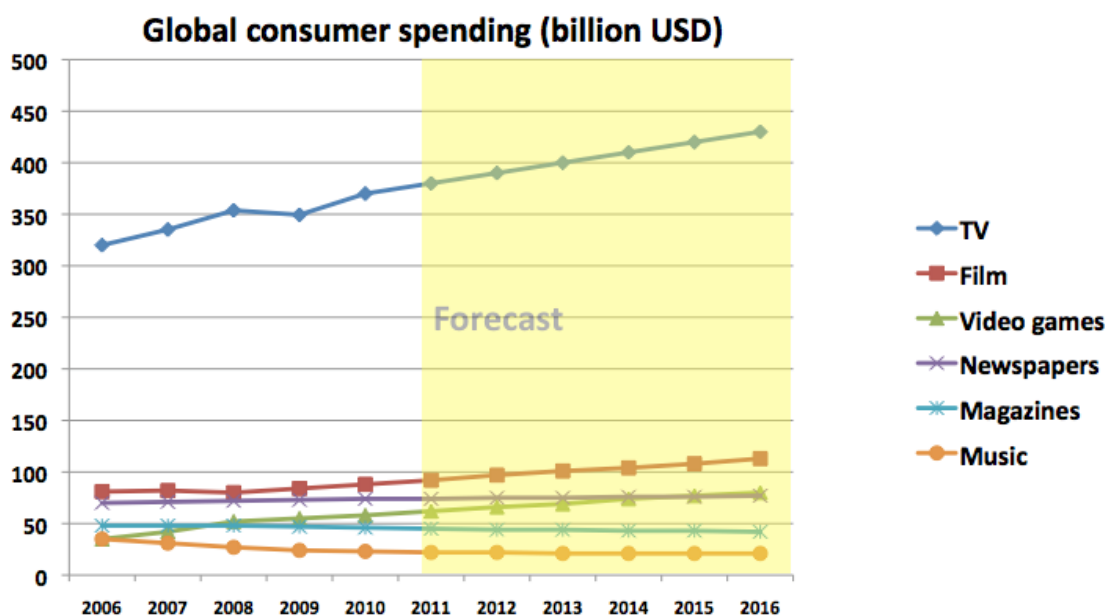


Figure 2-Global consumer spending on audiovisual media (Source: The Economist, PriceWaterhouseCoopers, IDATE)

- *Viewing* (trends in daily viewing time, synchronous vs asynchronous viewing via catch-up TV, personal video recorders (PVRs), connected TV, etc., compared with other kinds of media and entertainment).

TV viewing [2012] is still predominantly an activity that takes place when the programme is transmitted, although asynchronous viewing (watching at a time that suits viewers rather than when the programme is broadcast) continues to increase. Figures for the third quarter of 2011 in the UK indicate that approximately 10% of viewing is now asynchronous. Most of this is done via PVRs although "catch-up TV" services on broadcast networks or the Internet now account for a significant proportion. Asynchronous viewing takes place overwhelmingly within 24 hours of the programme transmission time.

Figures from a study conducted in the Netherlands reported by Tullemans<sup>4</sup> confirm this shift to a mix of synchronous and asynchronous viewing. Viewers continue to watch broadcasts at transmission time but the growth in viewing come from the 3% of viewing is asynchronous. Almost half of on demand views are generated within 24 hours after the broadcast. Live broadcast creates the agenda for on demand use:

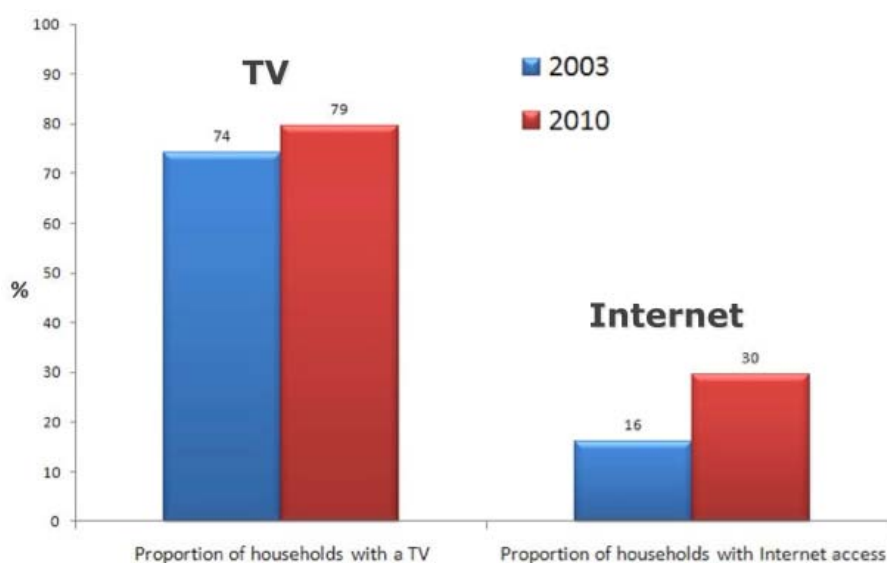
– *Funding and business models*

The main revenue streams for funding television depend on the territory, but invariably consist of one or more of the following:

- advertising and sponsorship;
- subscription (pay-TV);
- broadcast license (public service);
- state funding.

Advertising has stabilized and may continue to grow. Pay-TV has been growing for more than a decade but the business model may come under pressure from services offered 'over the top' on the Internet or from second screens like smartphones, tablets and laptops. See Figure 4.

The business model for TV access services is predominantly a public service imposed by the national regulator and funded out of existing revenue streams. There are instances of direct government funding (e.g. Belgium) and cross-subsidies<sup>5</sup>. New Zealand also offers captioning on some of its advertising spots (primarily lifestyle products targeting mature audiences). There are also instances where access services are sponsored<sup>6</sup>.

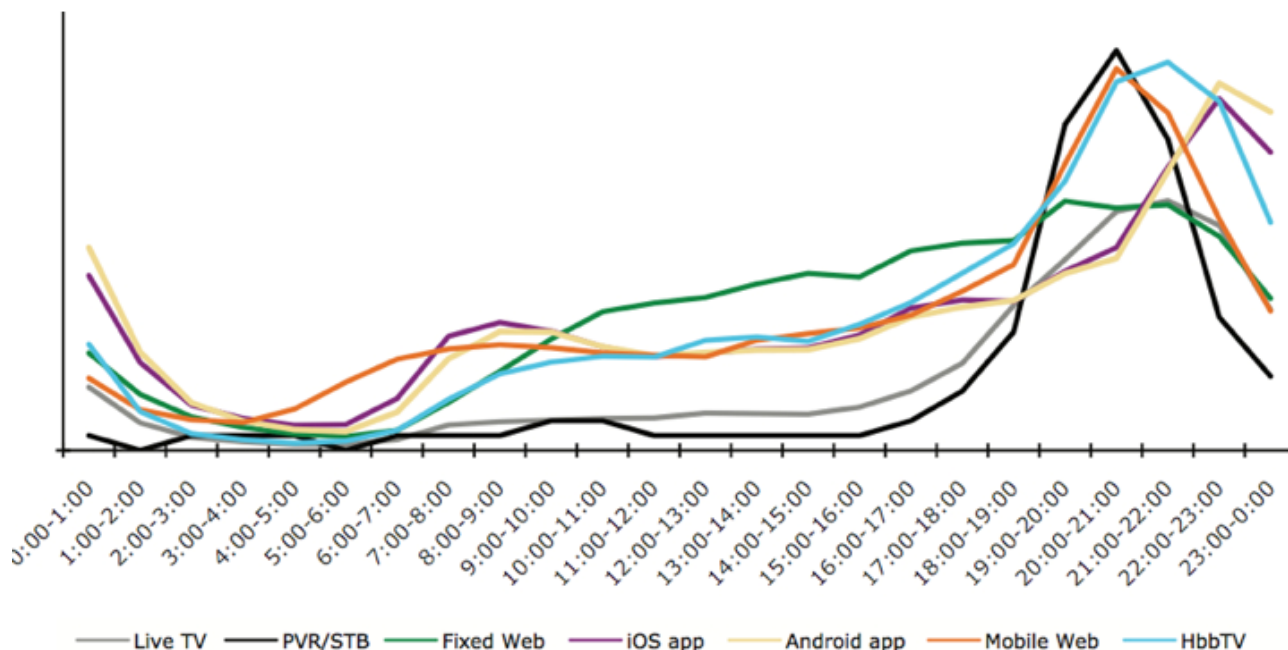


**Figure 3-Proportion of households with TV or Internet access (source: ITU 2011)**

<sup>4</sup> Bram Tullemans. Multiplatform measurement - The watercooler has gone digital. pages 14-15.Tech-i Issue 13 • September 2012. EBU, Geneva.

<sup>5</sup> In New Zealand, TVNZ used advertising revenue from teletext ads to pay for captioning.

<sup>6</sup> In the USA; visual signing on a UK video clip channel are sponsored by a paint company.



**Figure 4-Television viewing over a 24-hour period for on-demand platforms in the Netherlands**

### A.3 Production and distribution technologies

As the article by Tullemaans indicates, television is delivered not only on broadcast platforms (terrestrial, satellite and cable) but also on a multiplicity of IP platforms (IPTV, fixed line and wireless Internet, proprietary platforms running on top of the Internet (Nintendo Wii and Sony PS3) as well as hybrid platforms (IBB, HybridCast, hybrid broadcast broadband television (HbbTV), smart TV, etc.).

Experience to date indicates that media companies need to think carefully about their multi-platform production and distribution strategies which are often termed AODE<sup>7</sup>, COPE<sup>8</sup> or POPE<sup>9</sup>.

To take an example, the BBC i-Player is probably the most comprehensive service of its kind in terms of multiplatform delivery of TV. It demonstrates the need to establish a clear demarcation between the production of TV content (TV programmes, access services and information services, e.g. programme guides) and the distribution technologies that are used to deliver that television content. If this is not done, the result is either:

- multiplatform distribution where no access services are available; or
- the need for costly, platform-specific solutions to adapt and deliver TV content with access services.

<sup>7</sup> Author Once, Deliver Everywhere (AODE).

<sup>8</sup> Create Once, Publish Everywhere (COPE).

<sup>9</sup> Produce Once, Publish Everywhere (POPE).



#### **A.4 The current situation regarding TV accessibility**

There are four main factors that have an impact on television accessibility:

1. **Usability-The intrinsic accessibility of TV programmes themselves** (human factors and usability issues of television pictures, sound, setting-up and re-tuning, discovering, using and enjoying TV programmes).
2. **The viewing context-The extrinsic factors which influence accessibility** (e.g. the use of devices such as remote controls; interfaces between TV receivers and assistive technologies such as hearing aids).
3. **Access services accompanying TV programmes and other on-screen solutions.**
4. **Accessibility through special receiver functionality** such as the use of text-to-speech (TTS) technology to provide spoken electronic program guides (EPGs) or an interface to the viewer's existing assistive technologies (e.g. hearing aids and screen readers).

#### **A.5 A snapshot of digital television standardization**

Broadcast (the five families of digital TV standards such as ATSC, DVB, ISBN, DMB) and the accessibility standards that are a part of them or have been produced by industry bodies (e.g. the Consumer Electronics Association accessibility standards for ATSC digital TV receivers);

- IP (IPTV, over the top TV);
- Mobile and hand-held (tablets, etc.);
- Hybrid solutions;
- Regional standards like NorDig, DTG, TNT2;
- ITU standards.

#### **A.6 Legislation and regulation digital television accessibility**

A good legal framework is required that is in accordance with the stage of market development and national traditions.

International directive and recommendations should not only encourage the countries to establish regulations concerning the access services, but also to indicate how important the right legal environment is to avoid the social exclusion of elderly and impaired citizens.

Hard and fast regulations-laws or acts of parliament-are typically the first stage of implementation of digital television and are at the beginning of delivering the advanced access services. They are the most popular way of regulation, especially in emerging economies.

If a country decides to choose this model, it should realize that accessibility regulations must be clear, precise and appropriate to the needs and potential of the TV market.

Here two examples of problems faced by national regulators are given. In Slovakia, high quotas that were set for audio description led to the suspension of the implementation of the law on TV accessibility. Another example, in Poland, imprecise wordings led to very serious interpretation disputes. The amendment of this part of the Broadcasting Act has been planned but it may take a considerable amount of time.

Self-regulation, recommended by the European Union<sup>10</sup>, preferred by stakeholders and usable on the stabilized stage of market development, is posed on the opposite side regulation area. This way of regulation may be very effective if the stakeholders, particularly broadcasters, possess sufficient social awareness as well as a successful business model. Most frequently these two conditions are met simultaneously only by part of the television market.

Co-regulation, leaving the right to intervene to the State or authorized regulatory bodies, should be the recommended model of regulation first of all in the field of delivering access services to persons risking social exclusion.

The Directive 2010/13/EU mentioned above may be an excellent example of an appropriate regulatory framework.

*"... Co-regulation gives, in its minimal form, a legal link between self-regulation and the national legislator in accordance with the legal traditions of the Member States. Co-regulation should allow for the possibility of State intervention in the event of its objectives not being met..."*

- Broadcast (trends for terrestrial, satellite, cable-is regulation technologically neutral?)
- IP (IPTV, over the top TV);
- Mobile and hand-held (tablets, etc.);
- Hybrid solutions;
- Intellectual property rights legislation and its impact on access services (i.e. *droit moral* provisions and the need for contracts that give permission for the provision of *derivative works* such as captioning and audio description with a TV programme).

The issue of copyrights and intellectual propriety with reference to the access services provision has been a subject of a very large and emotionally charged discussion. Creators of films, dramas and other works, broadcasters and content providers and in the end people preparing scripts for subtitles and audio description all represent different interests and viewpoints. However, they all agree that the problem needs urgent regulation.

The first question to ask is: Are subtitles and audio description production (script) an artistic activity that leads to a derivative work that has its own moral rights?

The second question: Does the original work, for example a TV programme, enriched with an access service become a new artistic work being under separate copyright and intellectual property regulations or does the derivative work just extend the radius of access of the original?

A curious observation is that the subtitles and signing provision, traditionally made for many years, did not give rise to discussions of intellectual property rights. The discussion concerning audio description has provoked the addition of this service to the copyright "packet".

To reply to the above questions in a very controversial and provocative manner, the following is proposed:

Assumption: Any original work provided with access services such as subtitles, audio description and others remains the same work. The provision of an access service is not to be treated as a distortion of the original work and thus a breach of the moral rights associated with this original work.

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<sup>10</sup> Directives 2010/13/eu, par. [44].

Statement: Any original work (film, drama, etc.) for which there is an agreement for it to be broadcast may be enhanced with access services by the broadcaster as part and parcel of the rights ceded to the broadcaster.

## A.7 Issues with current work practices for accessibility in digital television

*General issues:*

- **Change management-at a time of economic austerity, what is the (business) case for accessible television-is it understood?** As television in most markets derives its main revenues from advertising and subscriptions, it is necessary to look at the costs from the perspectives of broadcasters and pay-TV operators in relation to the claimed benefits. We hope that we can use Sky in the UK (both Sky One and the pay-TV system) as examples of good practice as they were early to include access services in both their receivers and PVRs and fully meet (or in the case of audio description (AD), exceed) the targets set by OFCOM. It would be interesting to know if Sky is willing to explain why it makes commercial sense to invest in accessibility.
- Following meetings in China, Denmark, India, Ireland, Japan, Poland, Portugal, Sweden and UAE, it is evident that TV organizations and those who regulate them lack knowledge of the relatively small marginal costs of making TV accessible for national TV channels.
- **Similar needs-different contexts, timescales and solutions.** How to introduce or scale up accessibility provisions that require changes in current production working flows, changes in the platforms that deliver television, also taking into consideration different implementation timescales. There may be various solutions that fit the bill.

Some examples:

- (a) Addressing the needs of persons who are hard of hearing will depend on whether the territory traditionally has used dubbing or captioning for foreign language programmes. Attitudes to captioning in dubbing countries will be quite different.
- (b) There are different approaches to closed captioning-teletext or bitmaps-both of which may satisfy access service requirements.
- (c) Having dedicated buttons for captions and audio description on television remote controls may not be the only approach to reducing the number of viewer button clicks. Alternatives include the use of virtual channels on EPGs and also the initial setting-up of the defaults of the TV receiver to automatically display intra-lingual captions in a given language if they are present.

The danger of following a "one-size-fits-all" approach is that it may result in implementation delays and even stifle innovation.

- **Understanding the end-to-end ("e2e") television chain and the interactions between each part.** As the January 5 brainstorming session of the US Consumer Electronic Association R4 Working Group 19 revealed, very few of the stakeholders understand how, for example, captions for both programmes and advertising are produced, delivered and can finally be displayed correctly on the viewers' receivers in the home. Standardizing the receiver without regard to how the access services are produced and delivered will not necessarily lead to improved accessibility.
- **No clear consensus by digital television stakeholders on quality and access services.**  
Some examples:
  - (a) Captioning and linguistic compression

The criterion for assessing quality in captioning in several territories looks at what can be loosely termed the *quality of service*, i.e. the extent to which the text is a verbatim transcription of what was said with the possible addition of information about verbal cues. If one looks at captioning from the perspective of *quality of experience*, the focus changes to consider the extent to which linguistic compression can help viewers with modest reading skills watch captions and also have time to decode the non-verbal aspects of the programme-i.e. watch the programme rather than read the programme.

(b) Captioning and synchronicity with the programme

Live subtitles produced by stenography have a delay of a few seconds. This may be even more if they are produced by re-speaking (5-15 seconds are delays reported for the UK, Denmark and Spain, with the UK having the shortest delay). Discussions about captioning quality in Australia are beginning to address the issue. Is there evidence to support re-synchronization of live captioning? How important is lip-synch captions for pre-prepared captioning?

(c) Loudness

One of the most unpleasant feelings for those watching television arise from major changes in sound level when changing TV channels as well as within the same TV channel (differences between sound levels in TV programming and advertising and promotion interstitials).

This effect is uncomfortable for most viewers but especially for those with hearing and visual impairments. For the former, using the hear aids, the rapid increase in loudness results in an unpleasant, even painful sensation. As for the visually-impaired, it forces them to continually use the remote control which may be a source of embarrassment.

Loudness normalization is also in the best interests of broadcasters who receive a huge number of complaints from viewers. Many complaints are also addressed to the regulatory bodies, in expectation of disciplinary reactions on their part.

Fortunately, technical methods to rectify the matter already exist. The most popular in Europe is the EBU Recommendation R-128<sup>11</sup> containing a description of the method of producing and broadcasting TV programmes with balanced sound level based on the notions of loudness, loudness unit (LU) and loudness unit referenced to full scale LUFs.<sup>12</sup> The method proposed by EBU is a practical, complex, and easy-to-use tool, which has been applied in both the territorial (Europe) and institutional level (public service broadcasters). The EBU document contains elements based on ITU Broadcasting Standards.

This is all the more reason to consider initiatives by ITU, on the basis of European experience, to promote the process of unification of loudness normalization on a global scale<sup>13</sup>.

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<sup>11</sup> Loudness normalization and permitted maximum level of audio signals, August 2011.

<sup>12</sup> As defined in Recommendation ITU-R BS.1770-3 (2012), *Algorithms to measure audio programme loudness and true-peak audio level*.

<sup>13</sup> In January 2013, The National Broadcasting Council of Poland issued a directive about loudness normalization containing as a first step the requirement on balanced loudness between a programme and a commercial.

The UK digital TV regulator OFCOM highlighted the need for explicit metrics for access service quality as one of two priority areas at the CSI conference on digital television accessibility on 5 December 2012 in London and followed this up in a consultation document on quality metrics for live access services in July 2013.

## **A.8 Platform issues**

### **Interoperability and interworking**

This has been discussed in more detail in the input document on Interworking (FG AVA Technical Report Part 16).

### **Retransmission**

The cable and satellite platform operators are restrictively obliged to retransmit the complete content delivered by broadcasters and content providers, without any changes to the end users. This means that, aside from the main video stream and sound tracks, the additional sound tracks or video streams necessary to access services functionality should be transmitted. The operators should adopt, as soon as possible, the appropriate standards into the technical features of their equipment.

The commercial contracts agreed a few years ago between content providers and operators, both cable and satellite, contain an obligation to transmit main video and sound stereo (two tracks) only. These contracts will be in force in the next few years. In this situation, a considerable number of viewers are devoid of the possibility to receive audio description. In order to eliminate this kind of defect, the contracts should be re-negotiated as soon as possible.

The next problem is that some of the decoders delivered to the subscriber by operators are not able to mix the original sound track with audio description (receiver mix mode).

## **B. Second question:**

### **What is the vision for 2015 and 2020?**

**(i.e. how might developments like three digital television (3DTV) and the presence of a return channel in hybrid broadcast/broadband TV change the television experience?)**

Two or three scenarios produced in coordination with the FG AVA Working Groups H and I which explain how the needs and interests of persons with disabilities (in its broadest sense) would be addressed. These will include:

The *interoperability, or COPE scenario* in which television, film and video are created with the necessary access services so that they can be reformatted with minimum intervention to be delivered on multiple broadcast, Internet protocol (IP) and mobile platforms in different territories.

The *fragmentation scenario* in which access services for each television, film and video have to be crafted or adapted to meet the requirements of each platform and territory.

The interoperability scenario is the most compelling vision, but the fragmentation scenario serves to highlight the implications for accessibility of not including it in production and distribution strategies for media.

The storytelling of the scenarios should highlight:

- Getting started and scaling up-how change is managed.
- The design and production processes.
- The key production, broadcast and assistive technologies.
- The business models underpinning accessible digital media.

- The legislative and regulatory frameworks needed to support the vision of accessible TV.

**C. Third Question:**

**What are the barriers in 2011 that currently prevent these visions from becoming a reality?**

- Excessive dependence on public funding only.
- Managing change: lack of awareness of the e2e chain for planning, producing, delivering, using and benefiting from programmes that have associated access services.
- Lack of buy-in by key stakeholders, no consensus about the priorities among persons with disabilities and those with age-related functional impairments, perceived lack of resources to produce and distribute accessible TV, lack of clear metrics, etc.
- Barriers related to current design and production processes.
- Barriers related to current technologies.
- Barriers related to current business models for accessible digital media.
- Barriers related to current legislative and regulatory frameworks needed to support these visions.

The legal status of access services needs clarification:

- Need for changes in fair use provisions for persons with disabilities so that they can see subtitles with song lyrics.
- When introducing new services such as spoken captioning and audio description, broadcasters and platform operators (e.g. pay-TV operators) will need to add stipulations about these *derivative works* in their standard contracts in order to get prior approval from rights holders. Failure to do so could result in legal action in which the plaintiff would sue for damages for contravention of his moral rights (*droit moral*). DR in Denmark<sup>14</sup> reports that it is currently revising its standard contracts with third parties to request permission to include spoken subtitles (i.e., spoken captioning) to TV programming in languages other than Danish for which inter-lingual captions are available.
- Other barriers (conflicts between accessibility legislation/regulation and other legislation).
- The issues identified in Europe that apply to the digital video broadcasting (DVB) family of standards include the following:
  - TV is a global phenomenon and the US is a net exporter of programming. For this reason, standards for content exchange (the programmes and the associated access services such as captions and video descriptions as well as the metadata-information about the content) need to allow for the exchange and use of TV programming. This also includes a clear legal framework, i.e. the intellectual property rights associated with access services such as captions, so that access services can be exchanged and reused.
  - Digital TV standards are in place for the provision of access services to a multiplicity of persons with functional impairments.
  - **Awareness of these standards among key stakeholders other than the hardware manufacturers is often low.**

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<sup>14</sup> The Legal Department has produced a memo on the subject in Danish.

- **Access service requirements for digital TV receivers are often implemented in different ways that do not assure interoperability as such service requirements are rarely mandatory** (a case in point is video description (audio description in Europe) that is delivered using the receiver mix capability).
- With the exception of the UK and the Scandinavian markets, there is no **compliance testing of receivers** in free-to-air markets (unlike pay-TV operators that need to test that their receivers work correctly, also using some kind of conditional-access solution). For free-to-air broadcasting, compliance is currently confined to self-administered tests or a formal test for which the recipient pays.
- There seems to be little or **no formal end-to-end testing** to assure that access services actually reach their intended users in a form that they can use (a solution is only as strong as its weakest link). A good example is captioning of live programmes where the captions are delivered, but the delay of 5-15 seconds limits their usefulness to persons with hearing impairments or to persons who are deaf.
- **Regulators tend to focus on supply-side metrics** for their key performance indicators (quality of service, proportion of programmes with the service or targets in hours per week). Without some demand-side metrics (quality of experience (QoE)), providing services could be provided to benefit the intended users (the argument being that there is a need to look at the use of access services and also whether the intended users derive benefit from them).
- **The lack of an evidence-based approach to policy and regulation** leads to curious situations where access services comply with regulation yet do not necessarily deliver value to their intended users. A case in point are the metrics for captions, where the evidence suggests that captions of more than 150 words per minute have an excessive cognitive load on viewers who have poor reading skills and/or have hearing impairments. "Quality" and captions requires a considered trade-off between the need to provide a complete and faithful text tending of what happens on the sound track and the ability of the viewer to watch the programme and read the captions.

#### **D. Fourth Question:**

##### **What actions are needed to break down current barriers in order to make the 2015 and 2020 visions for television a reality?**

- International and local regulation.
- Change management actions.
- Actions related to current design and production processes. The main action involves further work on the issues associated with interoperability and interworking, given that television has developed from the delivery of linear content on terrestrial broadcast networks to multiplatform delivery on linear and non-linear content on a wide range of broadcast and IP-based networks, both managed and unmanaged, to a number of devices including television screens, computers, computer tablets and mobile phones. Interworking has technological, business process, legal and regulatory ramifications.
- Actions related to current technologies.
- Actions related to current business models for accessible digital media.
- Actions related to current legislative and regulatory frameworks needed to support these visions.

- Actions related to current standardization processes. Generally speaking, there is a need to change the optional nature of access service provision in digital television standards to mandatory (this is the case for NorDig where support for subtitles hard of hearing and AD/spoken subtitles are mandatory and PVRs have to be able to display all of the access services that are available in broadcasts).



## **Annex A:**

### **List of Abbreviations**

API	Application Programming Interface
BCD	Binary Coded Decimal
BDR	Broadcast Discovery Record (part of SD&S)
BER	Bit Error Ratio
BOOTP	Bootstrap Protocol
bslbf	bit string, left bit first
C/N	Carrier to Noise ratio
CA	Conditional Access
CAM	Conditional Access Module
CAT	Conditional Access Table
CATV	Community Antenna Television
CEA	Consumer Electronics Association (North American Association)
CENELEC	Comité Européen de Normalisation Electrotechnique
CI	Common Interface
CID	Content Identifier descriptor
CIF	Common Intermediate Format
CIP- CAM	CA-module that complies with the Common Interface Plus specification
CRC	Cyclic Redundancy Check
CRID	Content Reference Identifier
CSO	Composite Second Order
CTB	Composite Triple Beat
CVBS	Composite Video Baseband Signal
D/A	Digital-to-Analogue converter
DAD	Default Authority Descriptor
DAVIC	Digital Audio-Visual Council
dB	decibel
dBFS	dB (relative to) Full Scale
DDS	Display Definition Segment
DDWG	Digital Display Working Group
DECT	Digital Enhanced Cordless Telecommunications
DHCP	Dynamic Host Configuration Protocol

DSB	Double SideBand
DSM-CC	Digital Storage Media Command and Control
DTS	Digital Theatre System (audio codec)
DVB	Digital Video Broadcasting
DVB-C	Digital Video Broadcasting-Cable
DVB-CAM	CA-module that complies with the DVB Common Interface specification
DVB-data	Digital Video Broadcasting-Data Broadcasting
DVB-S	Digital Video Broadcasting-Satellite
DVB-T	DVB-Terrestrial
E-AC-3	Enhanced Audio Codec 3
E-EDID	Enhanced Extended Display Identification Data (regarding HDMI interface)
EBU	European Broadcasting Union
ECCA	European Cable Communications Association
ECL	EuroCableLabs, technical cell of ECCA
EICTA	European Information & Communications Technology Industry Association
EIT	Event Information Table
EITp/f	Event Information Table, present/following tables
EITsch	Event Information Table, schedule tables
EITp	Event Information Table, present table/clause of EITp/f
EITf	Event Information Table, following table/clause of EITp/f
EPT	Effective Protection Target
EPG	Electronic Program Guide (based on API)
ESG	Event Schedule Guide (without any API)
FEF	Future Extension Frame
FFT	Fast Fourier Transform
GAP	Generic Access Protocol
GOP	Group Of Pictures
GPRS	General Packet Radio System
GS	Generic Stream
GSM	Group Special Mobile
HbbTV	Hybrid Broadcast Broadband TV
HDCP	High-bandwidth Digital Content Protection
HDMI	High-Definition Multimedia Interface
HDMI ARC	HDMI Audio Return Channel
HDTV	High Definition Television

HE-AAC	High Efficiency Advanced Audio Codec
HTTP	HyperText Transfer Protocol
IDTV	Integrated Digital TV (IRD with display)
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
INA	Interactive Network Adapter
IP	Internet Protocol
IRD	Integrated Receiver Decoder
IMI	Instant Metadata Identifier
ISO	International Organization for Standardization
JTC	Joint Technical Committee
LCD	Logical Channel Descriptor
LCN	Logical Channel Number
LU	Loudness Unit
LUFS	Loudness Units (relative to) Full Scale
L-PCM	Linear Pulse Code Modulation
MAC	Medium Access Control
MPEG	Moving Picture Experts Group
MPTS	Multi Programme Transport Stream
MTU	Maximum Transfer Unit
NEM	Network Element Management
NIC	Network Interface Card
NIT	Network Information Table
NT	Network Termination in general
NVOD	Near Video On Demand
OSD	On Screen Display
PAL	Phase Alternating Line
PAPR	Peak-to-Average-Power Ratio
PAT	Program Association Table
PCM	Pulse Code Modulation
PLP	Physical Layer Pipe
PID	Packet Identifier
PMT	Program Map Table

PSI	Program Specific Information
PSTN	Public Switched Telephone Network
PCR	Programme Clock Reference
PVR	Personal Video Recorder, (same as PDR, Personal Digital Recorder, or DVR)
QAM	Quadrature Amplitude Modulation
QCIF	Quarter Common Intermediate Format
QEF	Quasi Error Free
QoS	Quality of Service
QPSK	Quaternary Phase Shift Keying
RF	Radio Frequency
RFC	Request For Comments
RMS	Root Mean Square
RoO	Rules of Operation
rpchof	remainder polynomial coefficients, highest order first
RS	Reed-Solomon
RST	Running Status Table
RTCP	Real-Time Transport Control Protocol
RTP	Real-Time Transport Protocol
RTSP	Real Time Streaming Protocol
S/PDIF	Sony Philips Digital Interface (for digital audio)
SAP	Session Announcement Protocol
SBR	Spectral Band Replication (regarding HE-AAC audio)
SCART	Syndicat des Constructeurs d'Appareils Radiorécepteurs et Téléviseurs
SD&S	Service Discovery and Selection
SDT	Service Description Table
SDTV	Standard Definition Television
SFN	Single Frequency Network
SI	Service Information
SMATV	Satellite Master Antenna Television
SNTP	Simple Network Time Protocol
SPTS	Single Programme Transport Stream
ST	Stuffing Table
STB	Set-top box (IRD without display)
SW	Software
TCP	Transmission Control Protocol

TDT	Time and Date Table
TFS	Time Frequency Slicing
TFTP	Tunnelling File Transfer Protocol
TOT	Time Offset Table
TPS	Transmission Parameter Signalling
TRS	Tip Ring Sleeve
TR	Tone Reservation
TS	Transport Stream
TV	Television
TVA	TV Anytime
UHF	Ultra-High Frequency
uimsbf	unsigned integer most significant bit first
UTC	Coordinated Universal Time
VCR	Video Cassette Recorder
VHF	Very-High Frequency
VHS	Video Home System
VoIP	Voice over IP
VPN	Virtual Private Network
VSB	Vestigial SideBand
xDSL	x Digital Subscriber Line
XML	eXtensible Markup Language

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