

# CHARACTERISTICS OF HYBRID BROADCAST BROADBAND TELEVISION (HBBTV)

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## ABSTRACT

This paper describes the working principle of hybrid broadcast-broadband TV (Hybrid Broadcast Broadband TV - HbbTV). The architecture of HbbTV system is given, the principle of its operation, as well as an overview of HbbTV specification standards that are in use, with their basic characteristics. Here are described the services provided by Hybrid TV. It is also provided an overview of the distribution of HbbTV services in Europe in terms of the number of TV channels that HbbTV services offer, the number of active hybrid TV devices, HbbTV standards which are in use and models of broadcast networks used to distribute HbbTV service.

**Keywords:** Hybrid TV, HbbTV, broadcasting networks, broadband networks, digital terrestrial TV, cable, satellite, IPTV.

## INTRODUCTION

The Internet has grown into a massive medium for delivering large amounts of data on various topics. Digitization of television, as second massive media, and the rapid development of the Internet lead to need to connect these two media. Hybrid broadcasting wideband television (Hybrid Broadcast Broadband TV - HbbTV) is a global initiative aimed at harmonizing standards for content delivery to the end user, while using, at the same time, the broadcasting (broadcast) and wideband (broadband) network via the linked TV devices (connected TV, Smart TV) and Set -Top-Boxes (HbbTV website, 2016), (Illinger, 2012). Actually, HbbTV is a technology that combines broadcasting services with services offered over the internet – all at one screen.

Unlike the traditional television, where the user is a passive observer, hybrid TV users can use interactive applications for entertainment or to obtain information.

A wide variety of additional services which Allows HbbTV can be divided into the following categories (Merkel, 2010):

- Voice subtitles, audio of other languages.
- E-Administration, "a digital counter" for the services of the national government or local authorities.
- "Super text" - an advanced teletext with a more attractive user interface with informations (news, weather, traffic, sports scores, stock market, etc.). Thanks to HTML (Hyper Text Markup Language) and connecting to the Internet, images, graphs, maps, and similarly can be displayed within the Super-text.

- Advanced Electronic Program Guide - EPG (Electronic Program Guides).
- Enhanced TV - Additional information on TV programs such as statistics in sports programs, adds with biographies, background events, etc.
- The vote, participation in TV shows, vote for candidates in shows and other.
- Additional services such as "catch up TV" - delayed viewing of the TV programs, restoration of the TV program, video on demand (VOD - Video on Demand), picture in picture and other.
- Direct access to additional TV channels which are not represented in cable systems, digital terrestrial or satellite television via live streaming (over 15,000 channels worldwide).
- Simple games on television.
- Home Shopping, courses, tele-education.



Fig. 1. HbbTV applications of RTL Germany.

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Fig. 2. HbbTV applications of France 2 TV.



Fig. 3. Advanced EPG within the HbbTV applications of German ARD.

In Fig. 1 (Heise website, 2016), Fig. 2 (Forumdesforums website, 2016) and Fig. 3 (Parabola website, 2016), is given appearance of applications HbbTV RTL, France 2 and ARD TV.

### ARCHITECTURE OF HBBTV SYSTEM

HbbTV uses two networks - broadcasting and broadband to deliver data and applications on hybrid devices (terminals). Typical hybrid devices are Internet-connected (Internet-connected) TV sets and Set-Top Boxes, computers with tuners and mobile phones with broadcast receivers. Today, many manufacturers of consumer electronics offer Internet-connected TVs and Set-Top-Boxes. There are different names for these solutions, such as Smart TV and NetTV (Clover, 2009).

Hybrid terminal has the ability to be connected to the two networks in parallel. On the one hand it can be one of broadcast DVB network (terrestrial DVB-T, DVB-S satellite or cable DVB-C). Through this broadcasting connection the hybrid terminal can receive the standard broadcasting A / V (ie. A linear A / V content), applications and signaling. Even if the terminal is not connected to a broadband network, its connection with the broadcasting network allows it to receive feasts applications. In addition, the signaling stream events in the application are possible via the broadcasting network.

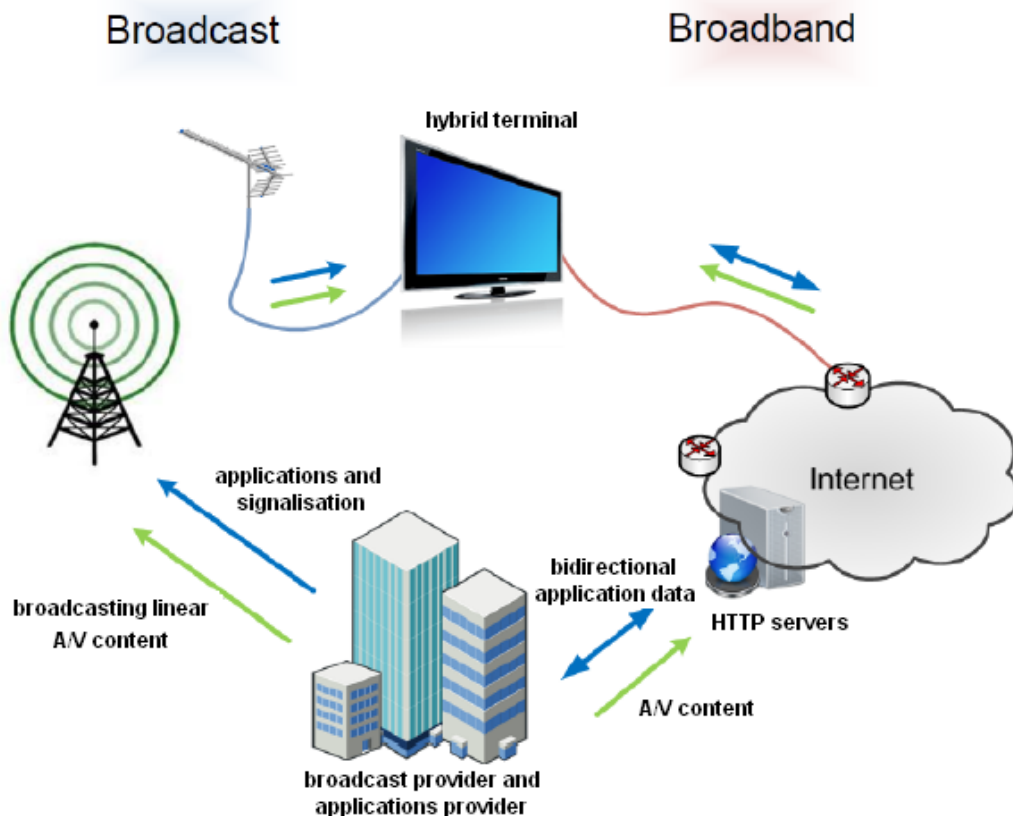


Fig. 4. Architecture of HbbTV system.

The hybrid terminal can be connected to the Internet via a broadband interface. This connection allows two-way communication with the provider applications. Through this interface terminal can receive the applications and the non-linear A / V content (e.g., streaming A / V content on the request). The hybrid terminal can support download A / V content is independent of the weather. Through broadband interface, the terminal can also be connected to other HbbTV terminals in the same local area network (HbbTV website, 2015).

Fig. 4 shows the architecture of a system with a hybrid terminal connected with the DVB-T network as an example of the broadcasting connection.

## HBBTV SPECIFICATIONS

HbbTV standards are developed by the HbbTV Association, and published by the ETSI (European Telecommunications Standardization Institute). HbbTV Association was established in February 2009.

First demonstration of HbbTV was in 2009 in France by France Télévisions and two makers of Set-Top-Box technology, Inverto Digital Labs, Luxembourg, PLEYO from France, during Roland Garros using DTT transmission and IP connections and in Germany using satellite Astra 19.2° east, during IFA and the IBC exhibitions.

In June 2014, HbbTV Association is connected to the Open IPTV Forum (IPTV Forum website, 2016), a similar industrial organization for Internet Protocol television (IPTV) services established in 2007, which has worked closely with the HbbTV initiative on specification network connected TVs and Set-Top Boxes. Activities of Open IPTV Forum are transferred to the jurisdiction of the HbbTV Association. This extended the jurisdiction of HbbTV Association includes defining specifications for providers services which make it easier to accelerate the implementation of IPTV services

HbbTV Specification Version 1.0 (HbbTV specifications, 2010), was approved by ETSI as ETS TS 796, in June, 2010. In Table 1, are given the lables of HbbTV specification standards and appropriate ETSI approvals (HbbTV website, 2016).

**Table 1.** HbbTV Specifications.

HbbTV specifications	ETSI approval	Year
HbbTV 1.0	TS 102 796 v1.1.1	June, 2010.
HbbTV 1.5	TS 102 796 v1.2.1	November, 2012.
HbbTV 2.0	TS 102 796 v1.3.1	November, 2015.

HbbTV specification is built on existing standards and web technologies including OIPF (Open IPTV Forum), Consumer Technologies Association (CTA website, 2016), DVB-Digital Video Broadcasting) (DVB website, 2016) and the W3C (World Wide Web Consortium website, 2016). Standard provides the

features and functionality which is required to meet the standards of good broadcasting and Internet services. By using the standards of Internet technologies, rapid development of applications is enabled.

HbbTV specification with label 1.5 provides the features and functionality needed to deliver a variety of services for broadcasting. HbbTV specification 1.5 introduces support for HTTP adaptive streaming based on MPEG-DASH specification, which improves video quality on too burdened or slow internet connections. Version 1.5 greatly improves access to informations which are related to the television program given by providers via EPG.

HbbTV Association has announced in 2015 a new HbbTV 2.0 specification. HbbTV Association expects that the manufacturers, broadcasters and operators will start to introduce a new generation of hybrid interactive TV service in 2016 (HbbTV website, 2016).

With HbbTV 2.0, consumers will be able to enjoy a wide range of new services, including (HbbTV website, 2016):

- Advanced user applications based on the HTML5.
- Watching video content via smartphone, PC and tablet devices.
- Advanced supporting applications about detailed review of the program, voting, games and more.
- Standardized delivery of Ultra HD content using HEVC compression standard.
- Improvement of services with better support for translation in multiple languages.
- Access to broadcasting content recorded on the hard disk of the receiver.
- Support for consumer privacy.

To achieve all these benefits, the new specification includes a series of new technologies, including support for HTML5, DVB CI Plus 1.4, HEVC video and TTML subtitles (Timed Text Markup Language). It also improves support for existing technologies, including MPEG DASH, DSM-CC (Digital Storage Media Command and Control) and synchronization applications on the TV. It is designed to ensure that HbbTV HbbTV 1.0 and 1.5 applications continue to work on the HbbTV 2.0 devices.

## HBBTV IN EUROPE

At the moment HbbTV is the most developed in Germany, France and Spain. HbbTV is started in the German public service broadcasters - ARD and ZDF and France - France Télévision. Other countries where the HbbTV services are regularly provided are: United Kingdom, Belgium, Netherlands, Switzerland, Austria, Poland, Czech Republic, Denmark and Finland, and since 2016, and Norway and Sweden (Girons, 2015). Fig. 5 gives the situation in broadcasting HbbTV services in European countries on 1 January 2016.



In Finland, the distribution of HbbTV services uses standard HbbTV 1.1 and HbbTV 1.5. HbbTV services are mostly represented in the digital terrestrial TV (DTT) (Sofiadigital website, 2015).

In Norway and Sweden HbbTV services will regularly begin with operations during 2016. Since 2014. They are in the test phase, and for distribution HbbTV services uses the standard HbbTV 1.5.

In Hungary HbbTV services are provided by Antenna Hungaria (Antenna Hungária website, 2016) in the digital terrestrial network, using standard HbbTV 1.0. In 2015, there were 200,000 active HbbTV devices.

Russia has been got in 2013., within the DVB-T2 network, the first HbbTV services. HbbTV services are available in some pay TV operators (RTS website, 2013).

In Estonia, the HbbTV services were launched in the beginning of 2015. in the context of digital terrestrial TV (RTS website, 2015).

In Italy is not in use HbbTV standard, for Interactive TV is used MHP (Multimedia Home Platform) Hybrid TV. It was developed by the DVB Project in 2000. MHP is a Java-based middleware system originally designed for telephone line with interactive channels. Fast internet now allows that potential of MHP can be fully realized. Interactive TV has been a fundamental element for the launch of digital terrestrial television in Italy and MHP was at the center of this offer.

## CONCLUSION

The introduction of the Hybrid Broadcast Broadband TV (HbbTV) enabled offering a wide range of interactive services to the end users. HbbTV provides a direct connection between the linear programs and online content. HbbTV is directly implemented at the so-called. "Connected TV" or appropriate Set-Top-Boxes, without purchasing additional equipment. Providers only need to develop applications in accordance with one of the HbbTV standard, instead of creating different versions of applications for each model of TV or for each model of Set-Top-Box. A large number of European countries included HbbTV services and the most common are in Germany, France, Spain, Austria and Poland. During 2015, more than 90% of all manufacturers of TV equipment have adopted the HbbTV standard (Gesellschaft für Konsumforschung website, 2016). It is estimated that in 2016 more than 50% of all TVs available in homes in Europe will be compatible for HbbTV.

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