



**DEUTSCHE
TV-PLATTFORM**

HYBRID TV WHITE BOOK

**German TV-Platform Working Group:
Hybrid End User Devices for
the Integration of Broadband and Broadcast**

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An Important Stimulus for New Digital TV

For two years, the new consumer electronic trend is “Hybrid TV”, which in many international markets is also known as “Connected TV” or “Smart TV”. Both modern TV screens as well as Blu-ray players and digital receivers facilitate “hybrid” use, whereby the devices are connected to the Internet via LAN or WLAN in addition to linear broadcasting reception. Across Europe and worldwide, the German market is seen as a pioneer in Hybrid TV with a monthly double digit growth for device sales and increasing usage. According to GfK, over 4.5 million hybrid end devices (including set-top boxes, iDTV and Blu-ray players) were sold in Germany in the first half of 2011. In June 2011, 35 percent of the TV sets sold were web-enabled; of the Blu-ray players it was even two thirds. Projecting the year end result based on the current trend, German households will have 6 million web-enabled TVs.



Apart from various systems developed by device manufacturers which are mainly built on the basis of standard programming language, the international standard of combining broadcast with online services “Hybrid Broadcast Broadband TV” (HbbTV) was established. HbbTV was standardised in June 2010 by the international standards organisation ETSI and is now in use by several TV programme broadcasters and device manufacturers.

Since May 2009, the dynamic market development has been the focal point for the Working Group “Hybrid End User Devices for the Integration of Broadband and Broadcast” within the German TV-Plattform. Its objective is to promote the development of the market for hybrid TV devices and corresponding services in Germany, taking into account the various business models of the complete value chain.



For the continued information of the public, the Working Group (WG) has developed the brochure “Hybrid TV”, being published for the IFA 2011 in the third edition. Apart from an overview and explanations for consumers and all interested in Hybrid TV, many members of the TV-Plattform concretely present their hybrid portals and devices in this brochure. In April 2011, a particular success was also the German TV-Plattform workshop “From Smartphone to Smart TV: Apps conquer the TV”, in the course of which developers, device manufacturers, research and content providers described the status of their projects and provided a forecast of the immediate future. Particular interest was given to the TU Ilmenau addressing the usability of hybrid content, which led to the TV-Plattform commissioning a further research project to them.

Right from the start, the WG concentrated on the so-called commercial requirements. Content providers and the device manufacturing industry should make clear to partners in the value chain exactly what their commercial requirements and demands are. Discussions in the Working Group have shown that there are certainly different views of the degrees of freedom to be applied to the use of content. Within the scope of the German TV-Platform, it is planned to promote a compromise in the so-called guidelines, which is to be documented in continuation of the White Book. For the time being the various viewpoints of public and private broadcasters, as well as device manufacturers will be documented.

This example is just one of many open questions that are to be addressed in this White Book. Work now continues for over two dozen representatives from the device manufacturing industry, infrastructure operators, TV broadcasters, universities and other institutions and we are in full agreement on one point: the Hybrid TV trend will sustainably change the consumption of audiovisual services and provide important impulses for the development of the market.

The development of the CE industry continues in ever-faster cycles and particularly the market for hybrid devices is still in the middle of a pioneering phase. This White Book therefore provides a topical snapshot of the market situation and the challenges and requirements of the market players. For this reason, the German TV-Platform will continue to observe and support the development of the market. An update of the White Book with input from the complete sector is therefore worth while doing and we warmly invite you to participate.

The first two year results from our WG are summarised in this White Book where it is not just intended to provide the reader with a comprehensive overview of the topics covered by the WG, but also beyond . This information is therefore complemented with statements about market conditions and trend forecasts, as well as a glossary.

We are confident that the trend towards “Hybrid TV” will both sustainably change the consumption of audiovisual services as well as provide important stimulus for development of the market.

Jürgen Sewczyk, Leader of the Hybrid End User Devices WG and board member of the German TV-Platform

1. Overview of Internet &TV

1.1 Web TV, IPTV and Hybrid TV

From Latin roots, the word “Hybrid” means, “blended, a cross between different species”; in other words, a combination of parts of various origin. Hybrid consumer electronics combine various transmission methods that were previously separated into one consumer electronics device. In this way, differing media content from various sources can be displayed on one TV screen. The basis of hybrid media services is the digitalisation of content and transmission technology that facilitates a combination of various standards from broadcasting and the computer world as well as new, convergent technologies.

The German TV-Platform understands Hybrid TV to be a reception device that can display broadcast programmes and services from traditional broadcasting networks as well as content from the Internet, so that both sources can be equally used as suppliers of information and/or entertainment. The technical prerequisites are offered by more and more TV devices with integrated digital receivers (iDTV), as well as digital receivers and Blu-ray devices.

Hybrid-TV as a linkage between Web and TV on one device is another level of convergence between TV and Internet. In a first stage, moving images from the World Wide Web reached computer monitors either as openly-accessible Web TV, as (paid) video services, or as real time online streaming. At the same time, IPTV services were offered similar to “classic” broadcast services, but on the basis of Internet Protocol (IP) which reaches the monitor via managed broadband networks (usually upgraded telephone lines). In the second stage of convergence, almost all device manufacturers are developing systems to make Internet services usable on TV screens, thus giving TV both an added diversity and a certain degree of interactivity. There are also more and more TV broadcasters that are offering Hybrid-TV in the form of video/teletext as well as the “Mediathek” media centres (catch-up Video on-Demand services mainly offered by public broadcasters). In addition, diverse non-broadcast companies and other organisations provide online content for Hybrid-TV devices. In Europe and worldwide, Germany is seen as a pioneer in the field of Hybrid-TV. Apart from high-definition TV (HDTV) and stereoscopic three-dimensional TV (3DTV) Hybrid TV is one of the dominating trends in consumer electronics.

The imprecise use or even mixing-up of the terms IPTV, Web TV und Hybrid-TV in the media often confuses consumers. These various services and types of audiovisual media delivery and use are simply thrown into one hat as being “Internet-enabled”. In fact a certain combination of Internet and TV is possible for all three, yet it takes place in ways that are entirely different.

IPTV denotes transmission of (mainly linear) broadcasting services via a managed broadband network. This means transmitting a signal encoded in Internet Protocol (IP) with broadcast programmes (TV and radio) via a special area within a broadband network (usually a telephone network) to provide guaranteed quality to a TV household. To display the transmitted content on a TV screen, an IPTV reception box from the provider is required, together with a service subscription. IPTV is in the process of establishing a fourth transmission method for linear TV in addition to cable, satellite and terrestrial antennas.

The term Web TV describes audiovisual media content that is distributed over the World Wide Web (“over the top”), whereby it is not transmitted with guaranteed quality and generally only displayed on PC monitors, laptops and tablet PCs or smart phones: i.e. not on large TV screens.

Originating from the consumers' desire to concurrently use moving picture content from the Web and other popular online media on TV screens, the CE industry developed Hybrid-TV devices. These are TV devices (including digital flat screens - iDTV, digital receivers and Blu-ray devices), that can receive and display broadcast signals via cable, satellite or terrestrial antennas, as well as content and services from the Internet (incl. WebTV). The integrated browser uses a broadband network via Local Area Network (LAN) or Wireless LAN, in order to display the content supplied via return channel exactly like TV programmes on the TV screen.

1.2 Consumer Electronics and Networking

Since early 2009, the first Hybrid-TVs have been available on the German market that allow both broadcast reception as well as Internet connection and optimal display of Internet services on the TV screen. Initially, this was almost exclusive to digital flatscreen TVs. In the meantime, ever more providers of digital receivers or Blu-ray devices are relying on the hybrid approach. The advantage: with a hybrid receiver, almost any TV can be upgraded to a hybrid device.

These Hybrid-TV devices also often provide the possibility of networking with other consumer electronics devices or the household environment. Thus digital cameras, MP3 players, home cinema, sound devices, DVD and Blu-ray devices and games consoles as well as modern mobile phones can be used on the TV screen. Part of the networking is also that TV device manufacturers permit control of the flatscreen via smart phones or tablet PCs – generally using apps. The content exchange between the consumer electronics devices and those of the communications and IT world is made easier with special software.

Some CE manufacturers even see their hybrid devices as the switching centre of a complete household network that can monitor and control house and household technology. So far, the possibilities for networking within and between sectors that were previously separate seems technically limited. Various developers are at least working on the adaptation of various technologies. However what will be decisive for the development of this market segment is what the consumers and users accept and what then succeeds in establishing itself in the market.

2. Types of Hybrid-TV

2.1 Overview of the various Hybrid-TV packages

Initially, it was several manufacturers of flatscreen TVs that drove the development of Hybrid-TV since 2009. Thus flatscreen TVs with various hybrid options for the display of web content on the TV screen were on offer in Germany. Some device manufacturers and content providers relied on variations of the Internet format HTML (Hyper Text Markup Language) for consumer electronics, which was known as CE-HTML. Others use IT solutions such as Java script for their hybrid portals. On the basis of formats that are company-specific, some services are offered to the viewers on the respective flatscreen TVs. For providers of services and content, this means that they each have to technically adapt their packages and come to an agreement with the respective device manufacturer about access to the portal.

Since 2009, a European consortium with the title HbbTV (Hybrid broadcast broadband Television) has been taking care of the harmonisation and further development of Hybrid-TV. All members of the German TV-Platform such as the Institut für Rundfunktechnik (IRT), Philips and Astra have participated as active founding members. And since 2010, the HbbTV specification has been

recognised as a standard by the European organisation ETSI. More and more companies, including many members of the German TV-Platform, support HbbTV technology (see 2.2.).

Despite several variations between HbbTV broadcast packages and manufacturer portals, there are few communalities. Apart from television reception via the classic broadcast infrastructures of satellite, cable and terrestrial, all hybrid end devices facilitate the use of services and content from the Internet and can use a return channel to provide genuine interactivity via the TV remote control. Here, the new hybrid devices in consumer electronics are certainly not intended to replace the computer, but to provide additional benefits and a new diversity to television. Ever more Smart TV devices even combine both: HbbTV functions with manufacturer-specific portals and multi-media networking.

2.2 HbbTV as a Standard: Origin, Application and Outlook

Why HbbTV?

Hybrid end devices do not represent a fully new concept. For years, there have been attempts by TV device manufacturers to also display Internet content on a TV screen via an integrated browser. But it is only now that Internet access is so widespread, offers high bandwidth and is cost-efficient with so many interesting media packages on the Internet, that a critical mass can be expected for a wider market introduction.

Almost all device manufacturers have introduced at least one TV device with Internet access to the market. For manufacturers there is the necessity to differentiate themselves in the ever-more-competitive market for flatscreen TVs and the feature of "Internet access" is used as a criterion here. On these devices, a "portal" can generally be started, from which various Internet packages can be accessed and of particular interest here are moving picture contents such as YouTube or the Mediathek services of the German ARD and ZDF stations. The concepts followed by the device industry so far have however caused various questions to arise.

The resolution of modern HD displays would permit any content from the Internet to be displayed and navigated. Nevertheless, the requirement to show content on a TV in the same way as on a PC seems questionable for several reasons. The relative viewing distance is generally greater with a television than with a PC, which is why most Internet packages in the domestic TV environment are displayed too small and seem to be poorly legible.

Internet content is optimised for navigation with a mouse cursor and keyboard and both input features seem to be poorly compatible. It is here that the classic remote control with cursor, buttons and coloured buttons is still dominant.

Commercial reasons speak against including hardware inside a TV screen or set-top box in order to deliver a full scope of services to match the flexibility of a present-day multimedia PC. Generally, Internet services are only available in a limited form for the current Hybrid-TVs or they have to be specially processed for display on the TV screen. This means that two problems arise from the viewpoint of the service providers:

- 1.** Each manufacturer of hybrid devices uses a different browser and supports varying streaming formats and protocols. This leads to the problem of needing to process content individually for various manufacturers and the heterogeneity represents a great hindrance for a dynamic service market.

2. In the case of hybrid devices, although they are using the same screen, the “worlds” of Internet and that of television are in fact separated. Switching between both areas is performed by means of buttons on the remote control and there is no referencing from the current programme in the Internet. This means losing substantial potential in the shape of the new-style content that can be referenced from both “worlds”.

For this reason, various market partners (ANT, APS, IRT, Open TV, Philips and the French HD, as well as later Samsung und Sony) got together to develop a uniform technical scenario that would allow the intelligent connection of universal functions and content from the Internet with that of the TV device using HTML as the basic technology. The objectives for the hybrid system to be developed were:

- * It was to be open and standardised in order to permit efficient development of content independent of single manufacturers or platform operators.
- * It was to be based upon open standardised technologies as far as possible.
- * It should only specify at least the minimal components and functionalities, so that the specification could be supported by as many market players as possible.
- * It should permit the combination of all broadcasting systems (satellite, cable, terrestrial) with all Internet access technology (DSL, cable, wireless).
- * It should permit connection between linear television content and additional interactive services.
- * It should also permit the use of the broadcasting channels for the distribution of additional services.
- * It should be suitable as a successor to the present-day teletext system.
- * It should not influence the integrity of broadcast programmes, i.e. not combine services from the Internet with the screen image in an uncontrolled way.

This means that in future, accompanying HTML pages would be able to be started from a TV programme. This also represents visibly better display options for teletext in the age of HD. Additional information, such as news tickers, can be laid transparently across the TV image and relevant information to the TV programme can be concurrently displayed, for example with quiz shows. But new functionalities also result in the HTML environment:

- * A smaller TV image can be integrated into HTML pages so that directly switching to another TV programme from this page is possible.
- * A substantial reason for using HTML is also the simple porting of packages that are already developed for the Internet. In this way, attractive packages can be brought to market quickly not just by the broadcast institutions, as is shown by the host of Internet services on hybrid television receivers now on the market.

The objective of finding a standard in accordance with the aforementioned general conditions was reached when the specification was submitted to ETSI at the end of 2009 and published in June 2010 as ETSI TS 102 796.

Technical Concept of HbbTV

The HbbTV standard defines the new technical elements as little as possible, but rather reverts to existing technical standards. In that respect, the specification is more a profile of what exists, rather than a new technological approach. This approach thus contributes vastly towards a quick implementation on devices. Essentially, HbbTV is mainly based upon the following standards:

The **CE-HTML standard**, that is currently available as a 2007 version, is based on W3C Internet standards and specifies an HTML profile for CE devices. This browser profile also represents the technical foundation of HbbTV. It is based on XHTML 1.0, DOM 2, CSS TV profiles 1.0 as well as ECMAScript-262 (“JavaScript”) and is optimised for the display on CE devices – i.e. generally TV screens – of corresponding HTML/Javascript pages that fulfil web standards as far as possible. It should be stated in particular that the XMLHttpRequest object is supported, so that application developers are given the opportunity to develop HTML applications that are comparable with current so-called Web 2.0 applications. This compatibility makes it possible for existing know-how, technology and experience deployed for contemporary web applications to be seamlessly used on set-top boxes while concentrating on the aspects of broadcast integration. Furthermore, the key codes for the most popular TV remote controls for example, are also included here.

CE-HTML does not, however, contain any elements that specify the connection to a DVB environment, as is the case with digital television.

This is fulfilled by the browser specification of the **Open IPTV Forum**, published in January 2009. While this specification was written for the application in IPTV networks, it contains APIs that can also be used for hybrid decoders. These variously include functions for integrating the TV image in HTML applications, for changing the radio or TV programme, for pre-programming recording and for access to DVB data. With the elements of both these specifications selected for HbbTV, the fundamental browser functions are defined.

Three important additional functions are provided by the **DVB standard** “Signalling and carriage of interactive applications and services in hybrid broadcast/broadband environments”, that was completed in March 2009 and is available as ETSI standard TS 102 809. The DVB standard first controls how applications that are started from a TV or radio programme provide a signal in the DVB-multiplexes. In line with the previous MHP standards this is performed via the Application Information Table (AIT), listed in the Program Map Table (PMT) of the respective program. The AIT of any program lists all applications that may run together with this program. Other applications may switch to this program but are stopped by the system. In this way it is ensured that the program is not “hijacked” by external applications and for example interrupted by external advertising.

One of the applications that is assigned to a program can be denoted in the AIT as a so-called “autostart application”. This application runs automatically when a change is made to the respective broadcast programme and usually displays a red button on the screen that then disappears after a brief period. This symbol is to indicate to the viewer that they can start an additional application by pressing the red button on the TV remote control. A further signalling option in the AIT is for applications that are designed to take over the present-day telefax service. This signalling can be connected to the teletext button by the device manufacturer so that a new teletext application can be started.

In addition to applications that are linked to a broadcast service via AIT signalling (broadcast-related applications), HbbTV also considers application that are not necessarily linked to a broadcast service (broadcast-independent applications). These can, for example, be programme guides from third parties or applications such as Flickr, YouTube or similar. HbbTV facilitates the change from

broadcast-related to broadcast-independent applications, but limits access by broadcast-independent applications to broadcast content.

Furthermore, TS 102 809 specifies the transmission of applications via the DVB broadcast channel. This option is interesting in the case of devices that have a browser, but are not connected to the Internet by the viewer. While the volume of data that can be transmitted via the broadcast channel is limited, it is adequate for simple services such improved teletext.

For transmission of the HTML applications, the BlueBook states that the DSM-CC will apply, which is also already applied to MHP.

The “stream events” with which small data packets are sent can be transmitted concurrently to the TV programme in the broadcast channel are also part of the DSM-CC standard. With this, for example, questions or answers can be transmitted at the right time during interactive quiz shows. Time synchronisation of the broadcast content via an Internet connection and interactive responses would only be possible with difficulty and the webserver would also be subject to a load of millions of concurrent connections. Using the broadcast channel is considerably more efficient for such applications.

In total, the **HbbTV Browser profile** represents a pragmatic compromise, that offers a flexible and universally-usable technical infrastructure for various service options on the one hand, while on the other hand can be implemented in hardware environments that are considerably less effective in the IDTV (Integrated Digital TV)/STB environment by comparison with the PCs that are generally used on the Internet today. A browser that complies with the HbbTV specification can be integrated into any end device as an independent component. Providers of complete middleware solutions can however also market this browser as an integral part of their product. Depending upon the requirements of individual markets, this browser concept can also be combined in the end devices with API systems that have already been introduced (such as MHP or MHEG).

The HbbTV Consortium today

As already mentioned, the “HbbTV” initiative initially consisted of loose cooperation between the companies ANT, APS, France Televisions, IRT, OpenTV, Philips and TF1, as well as Sony and Samsung from August 2009. At this time, the HbbTV partners announced the new initiative by means of a press release and established the possibility for further companies to participate as “supporters” and over 100 companies and institutions made use of this.

In April 2010, Philips, ANT, Sony, Samsung, OpenTV, SES Astra, IRT, TF1, EBU, France Televisions signed a consortium charter to regulate further cooperation, variously with the objective of opening up HbbTV to further members. In the meantime, this consortium is a legal entity as a company registered in Switzerland and over 40 companies already joined as members during the first weeks. In a series of working groups, the further technical activities are driven forward, which specifically include:

- * Reworking the first version of the HbbTV standard in order to remove errors and unclarities while going without the addition of new features.
- * The development of a test suite for testing with HbbTV devices. This test suite is intended to ensure a uniform and consistent implementation of HbbTV on all devices and reduce the expense of devices test.

- * The development of a new version of the standard whereby emphasis will be made upon the integration of “adaptive streaming” for an interim version. The further requirements are to be discussed in the autumn of 2011.
- * Discussion forums and workshops, in the course of which implementation questions and fault possibilities on the basis of previous practical experience will be discussed and know-how in all aspects of HbbTV built up.

Status of Market Development: HbbTV Services in Germany

Since the IFA 2010, all four major German FreeTV provider groups ARD, ZDF, RTL and Pro7/Sat1 offer HbbTV services. Emphasis here is given to the so-called “Mediathek” services provided by ARD, ZDF, arte, “Das Erste”, rbb, Radio Bremen and the Tagesschau, as well as various teletext packages and an EPG. In the case of private providers, there are vivid and multi-media processed teletext variations with photos, video clips and interactive advertising in the foreground; Pro7 already offers games and “voting” to some extent.

But also smaller programme broadcasters see HbbTV as a valuable extension feature to their programme activities. Thus Yavido, Sport1, HSE24, Dr.DishTV, BibelTV and AstroTV are in the meantime offering HbbTV packages. There are already applications in operation with which transactions such as booking or purchases can be carried out. There is no doubt that such applications will also be offered by all providers in future.

Status of Market Development: HbbTV Devices

At the end of 2009, the Humax iCord HD came onto the market as the first HbbTV set-top box for satellite reception. In the course of 2010, further manufacturers of DVB-S set-top boxes followed with VideoWeb, Smart and Inverto. At the IFA 2010, more major manufacturers such as Philips, LG, Toshiba, Loewe, Technisat and others followed, particularly with integrated TV reception devices (iDTV) that supported HbbTV.

In the meantime, practically all device manufacturers of note already have HbbTV-enabled devices on the market (at the moment some 20) or have announced market introduction for 2011. Based upon this comprehensive support of HbbTV by the device industry, it can be assumed that a large proportion of the newly-sold television devices will be equipped with HbbTV and that this system will soon be widely available in German households.

HbbTV by Various Communication Channels

HbbTV is a standard that can be very generically applied to all combinations of broadcasting networks and Internet access – i.e. also via DVB-T and mobile Internet. Here is a brief overview of the status of HbbTV in the various German DVB distribution networks:

DVB-S: Like many other new developments, this covers all aspects of digital television – the earliest market segment. All the aforementioned HbbTV services are available via satellite and most HbbTV devices available on the market exclusively support satellite reception.

DVB-T: At the Medientage München congress in October 2010, ARD, ZDF and Pro7Sat1 switched HbbTV signalling onto their terrestrial multiplexes and showed here their HbbTV packages on HbbTV prototype devices or with a DVB-T frontend. Virtually all of the HbbTV iDTVs from the major

manufacturers that came to market in 2011 also support DVB-T reception.

DVB-C: In cable, the HbbTV signalling for ARD/ZDF is already in all networks. Here, it is the same as with terrestrial: HbbTV- iDTVs from major manufacturers are generally also equipped with DVB-C tuners. Because of CI Plus, they can be used in all major networks. Apart from that, cable network operators have also started to integrate HbbTV into the set-top boxes that they market.

HbbTV can even be entertained in **IPTV networks**: the hybrid standard can be deployed here in the same way as in conventional DVB networks and in this segment too some IPTV providers have already started working on their HbbTV decoders. In this way, the “green light” has been given to permit HbbTV to become a universal standard for hybrid television across Germany.

Status of HbbTV in Europe and Worldwide

In respect of the market introduction of HbbTV, Germany has internationally a pioneering role. The French market had already played an important role in the development of the HbbTV standard and here, wide introduction is planned for October with coordination by the French “HD-Forum”. All broadcasters there have already developed HbbTV packages. In the field of HbbTV, Spain is also very active: Mediaset España (the broadcasters Tele5 and Cuatro) has announced HbbTV test operation via the Telefonica network. VeoTV has already started the HbbTV service “Mundo Interactivo” and Telecinco is already offering HbbTV services, while the public provider RTVE wants to support HbbTV.

The start of HbbTV services has been announced for Switzerland and Holland in 2011 and in further countries such as Austria, Denmark, Norway, Sweden, Denmark, Norway, Sweden the Czech Republic and Slovakia there is great interest in HbbTV; in fact preliminary decisions have already been made.

Even in England, where broadcasters generally rely upon the “YouView” platform that was specially defined for the English market but has not yet been started, the “Freesat” platform has in the meantime decided upon the integration of HbbTV. Only in Italy, the MHP standard that is already in use will provisionally be adhered to and complemented for hybrid use.

Various discussions at the IBC 2010 indicated that HbbTV is also arousing interest outside Europe and it would not be for the first time that European digital TV standards also enjoy international success.

2.3 Representation and Use of Web Services on Hybrid Devices

Originating from the consumers’ desire to concurrently use moving picture content from the Web and other popular online packages on TV screens, the CE industry developed Hybrid-TV. Initially, flatscreen TVs were equipped with the hybrid function. In the meantime, there are various devices on the market. Apart from flatscreen TVs these are, digital receivers and Blu-ray devices, that can receive and display broadcast signals via cable, satellite or terrestrial antenna, as well as content and services from the Internet (inc WebTV).

Often providers and manufacturers of hybrid end devices do not limit themselves to provision of the hardware, but also offer portals as an entrance into the diverse world of Web TV or further services that are not confined to TV.

The manufacturers' portals vary in design and in operation structure on the one hand and on the other hand in terms of content. Generally, the various manufacturers' portals offer services such as news, weather, games and social networks as well as a video-on-demand services and Mediathek services (public service broadcasters' catch-up video on demand services). The majority of the services available can be found on the various portals of different device manufacturers, for example "YouTube", "Bild.de" (popular German electronic newspaper services) or the "Mediathek" services run by the TV broadcasters. Among the manufacturer portals on which the services are often displayed as tiles in a gallery similar to the well-known "apps" from a smartphone environment, the user can access the service required by means of the remote control. It is possible that – depending upon the service– there are access prerequisites such as registration or payment. Other services are free of charge and immediately usable. The portals discussed are partly assembled by the device manufacturers and partly operated by an external service provider. Portals are offered both by TV manufacturers as well as by manufactures of digital receivers or Blu-ray players. The scope of the services offered in the portal varies by manufacturer. Generally it can be said that the manufacturer who has started early with the development of hybrid devices also makes a larger selection of content available. In general, portals offer users the possibility of sorting services according to their preferences, generate 'bookmark lists' and to independently search beyond the selection of widgets ("apps") on display among a type of "App gallery" and save these on the portal.

The services that can be reached via the portal can include the following types of services:

- Services with a indirect reference to the broadcasting programme, for example the Mediathek – the catch up services of broadcasters, in which all sorts of missed programmes can be watched, or a direct connection to a specific public appeal programme can be established ("Tageschau" news).
- Services with a direct connection to the broadcast programme e.g. the web portals of TV broadcaster groups or their commercial video on-demand portal, from where TV programmes can be exclusively downloaded in advance.
- Services that have no relevance to the broadcasting services, but contain audiovisual media services (moving image content), such as user-generated content like "YouTube".
- Services that neither have relevance to the broadcasting services nor to the moving image content e.g. electronic newspapers, social networks, online photo galleries, or telecommunications services.

With the variety of content and services that are available via a portal, the development is still in the early days.

Some portals additionally offer free Internet access via an open browser. With these devices the user can, for example, enter a random URL and go to any website desired via their TV device. An advantage of the pre-sorted services is to have the security regarding their optimal display and functionality on screen, as well as legal security by means of exclusion of illegal content, guarantee of youth protection and copyright protection.

Another way to access more content and service than the TV programme via a hybrid device is to access the packages of the TV broadcasters themselves.

The HbbTV standard connects the TV signal of a broadcaster with its content from the Internet and

in this way HbbTV facilitates a new interactive TV experience. On HbbTV-enabled devices, HTML pages are generally opened by the red button. In this way, any applications defined by the broadcaster, i.e. which are relevant to the current programme, can be realised. In compliance with the HbbTV standard, the TV broadcaster has control in respect of linking from the current programme and can – depending upon the programme – lead the viewer to various websites. These can, for instance be relevant to topics and can be in direct connection with the current TV programme being watched or link to a high-definition video text in modern display and with a comprehensive programme guide. Links to the navigation portals of the TV broadcaster or their company website are also feasible. With HbbTV, interactive involvement of the viewer is possible, for example online-voting in the case of live programmes or home shopping without media interruption. With the Mediathek services, films can be directly consumed via the Internet - depending upon the business model, registration or payment can be required for this.

It is in the nature of things that the link from the current programme can only be provided to the TV broadcasters that can be accessed by the broadcast transmission method available in the household. Technically, the link containing the EIT information is transported with the broadcast signal.

Infrastructure operators of broadcast services such as cable network operators, satellite operators and providers of terrestrial broadcasting networks offer access to web services usually in the form of portals that are similar in principal to those of the end device industry. Here the graphic display, the scope of the package and the diversity of the services also digress and many portals are still at the set up stage.

2.4 Business Models and Advertising Types for Hybrid-TV

The number of hybrid end devices in Germany is growing at a fast rate. All relevant device manufacturers have stated that their hybrid devices will offer series HbbTV support by the autumn of 2011 at the latest. The major groups of TV broadcasters, and also a growing number of smaller broadcasters, have already developed and launched HbbTV applications. At the same time, the information and entertainment offerings that TV viewers can access in the portals of their TV device manufacturers (so-called TV apps) are growing. Most market players assume that the combination of linear broadcasting reception and the Internet-based transmission of content will decisively characterise the TV market in coming years. After PC, smartphone and tablet computers, television will become a further highly attractive sales channel for new types of advertising and e-commerce or rather 'TV-commerce'.

Video Advertising

Whilst the HbbTV packages from the public broadcaster groups do not follow commercial interests but are rather intended to be a method of combining expanded teletext, EPG (Electronic Programme Guide) and free access to what are the partially very comprehensive Mediathek (Video on Demand) services, the proprietors of private broadcasting stations see HbbTV more and more as a possibility for new advertising formats. Apart from the well-known display ad formats from the online sector, video ads are increasingly being used in the shape of pre-rolls. For the providers of commercial TV apps in the manufacturers' portals, revenues in particular from video advertising are the substantial basis for refinancing today.

According to calculations by Goldmedia, the net advertising turnover for online video advertising will increase from 80 mill. EUR today to approx. 350 mill. EUR in 2015. The proportion that can be

attributed to Hybrid-TV is still relatively small, but according to the moving image marketer smartclip, providers of high-reach TV apps will be able to generate annual advertising revenues in the lower to middle six figure area with an increasing tendency, since the number and extent of audience's increases, as does the quality of apps.

TV-Commerce

On the other hand, paid content i.e. the offer of subscriber services, is hardly playing a role yet as a business model in the case of Hybrid-TV. While all major German TV device manufacturers have at least one video on-demand service in their app-TV portals, the actual number of videos watched is still marginal. In the USA, the situation is different. According to a survey published in December 2010 by the American market research company NPD Group, an average of 57 percent of all Hybrid-TV purchasers were already using the video service Netflix. In addition to that, at this year's CES computer fair, the major TV device manufacturers announced that they would be adding a Netflix button to the remote controls of their Internet-enabled CE devices.

According to a current study by the Munich consultancy company Mücke, Sturm & Company, a more intensive usage of available packages – also in this country – as well as further transaction-based business models in Hybrid-TV (home shopping, direct response TV, competitions, games, call-to-action campaigns etc. will only be realised when processes for customer-friendly and secure purchases have established themselves on the market. It is only when these exist that a part of the purchases made today via traditional television will migrate to Hybrid-TV. Apart from that, new players will come from the Internet that will use television as an additional sales channel, such as e.g. operators of e-commerce sites or shopping portals. In accordance with this study, goods worth over 1.8 bn. EUR will be sold in this way in five years time.

It should however be noted that the user scenario is different with television compared with PC and smartphone. The viewer examines TV offers in a "lean-back situation" and is not using a keyboard, but rather a remote control that is fitted with few keys. But in order to successfully establish the previously mentioned business models, a clear identification of the television viewer is necessary. On the Internet, this is generally performed by authentication of the user with the combination of user name and password.

With an increasing number of content or service packages that require registration and/or payment both on manufacturer portals as well with broadcasters, the necessity arises for a central authentication or single sign-on system (SSO) that conforms to television as a payment system for sellers and customers. The example of iTunes shows of what significance this can be for commercial success from the viewpoint of content providers, and the study by Mücke, Sturm & Company also confirms: "Entering user data and payment information is far and away the conversion killer par excellence for every sale via remote control."

In that respect, the announcements by several device manufacturers that they will be introducing their own authentication and payment systems are a basic step in the right direction, as they are designed to increase usability for customers, thus reducing inhibitions to purchase. Unlike in the case of the smartphone, no manufacturer so far has a dominant market position, so that content and service providers are forced to provide their offerings to as many manufacturers as possible. Adaptation of the service to the respective manufacturer's authentication and payment system (if at all available), provides sellers with complex adaptation and administration processes that block rapid market penetration.

One possibility is therefore to introduce special payment systems that are tailored to the HbbTV standard, since one of the decisive properties of the standard is that it combines the most varied CE devices (televisions, satellite receivers, Blu-ray players), so that services can be displayed uniformly independently of device manufacturer and type. One example of this is the TV-ID service offered by the teveo company. Similar to Facebook-Connect on the Internet, it offers customers on interactive television the chance to register with all connected services, irrespective of which device the customer is using the service on. In addition, the customer can also use paid content that is then billed via the TV-ID of the provider. For service providers, this means that they can use the same system on all devices with the same procedures, without having to adapt their services to each device. Another example is offered by the Ping 24/7 company, which presented its solution for TV-commerce to the German TV-Platform in April 2011 on a Smart TV (see chapt. 3.4).

New Types of Advertising

As soon as there is adequate penetration in the normal CE device market, new forms of advertising will develop from the possibilities of directly addressing the customer on television, where interactivity and close proximity to a purchasing decision are at the foreground. One possibility would be to personalise classic TV spots. For this, TV broadcasters or advertisers would provide anonymous profile data of viewers in realtime, whereby they would then be in the position of adding closely-targeted content and linking their spots to a specially-prepared website in order e.g. to use animations or stimulate impulse purchasing.

This direct contact to customers via television is also not limited to TV spots; it is equally possible that the broadcaster fades in a personalised display that is linked to the current programme. Advertising will particularly profit from the emotional framework that is provided by the linear television programme and in this way clearly increases the likelihood of customer reaction. This option goes far beyond the potential of purchasing within TV apps on manufacturers' portals, but sets high requirements on the simplicity of the checkout process (e.g. limiting entry of a central PIN to all transactions) at the same time as maintaining legal data protection provisions. As soon as these new advertising formats have established themselves on the market, the TV advertising market will clearly expand.

2.5 Over the Top TV: Important National / International Players

While it is the connection between linear TV programme and additional Web offers at the foreground with HbbTV, Over the Top TV (OTT-TV) seeks to place the entire World Wide Web at the disposal of the viewer. The pioneers of OTT-TV have their roots in the Internet sector, where the focus is not upon the provision or use of broadcasting offers such as films and shows. Thus these providers know their way around with services, the benefit of which go beyond television services and bring their experience with them from the broadband world of broadcasting. Generally, the service provider does not have to be involved with the provision of the services; all interested parties can develop their own apps and publish them under certain conditions. The users themselves do not have to stick to their lean-back position as TV viewers, but can actively use the entire range of online services in their full diversity.

Since OTT providers are generally single companies it is difficult to introduce general standardisation (end devices, incl. software). Every provider is encouraged to push their own proprietary solution onto the market in order to force competitors out. OTT-TV is a software-based approach and it is not necessary therefore for service providers to work in concert with device manufacturers who put the software into various DVD and Blu-ray players, set-top boxes, television devices or gaming consoles.

From this arises a further challenge for providers in reaching a monopolistic position: subsidised hardware should not be used by competitors. Typically, these devices do not require further cables, since they are fitted with integrated wireless connectivity via an existent wireless network. Without users needing specialist knowledge, devices collect adapted content from the Internet and deliver it straight to the television devices. Depending upon the system, the connection of a wireless QWERTZ keyboard and a mouse is possible in order to send mails and Tweets. Other systems even use voice recognition to change channels (Interactive Voice Response - IVR). To control TV devices, smartphones and tablet PCs are also used, as are apps.

OTT enables the Net-savvy consumer the seamless experience between linear content that is transmitted via the broadcasting network and the non-linear services (Catch-up TV and video on-demand), that are sent via the broadband IP network. What is yet to be clarified are questions of topics. Security against hackers and viruses, or youth protection. Quality of service in connection with OTT-TV is not generally guaranteed and a certain selection is performed on portals by the providers of the platform.

Google TV

In May 2010 Google presented its Android-based TV platform. With Google TV, Google is one of the largest representatives of OTT-TV and typically wants to transmit all service that the Internet offers to television devices, concurrently to the classic broadcast programmes. Users can seamlessly combine linear and non-linear moving images on their televisions. The platform offers a search function which is similar to those used by mobile end devices that use Android technology. In this way, a simple and quick search can be made for anything without great use of resources, Apart from that, Google offers functions similar to those of other Hybrid-TV providers. This includes the feature of personalisation, so that every viewer can create their own start page and get individual suggestions from the Net. Google also offers Picture-in-Picture mode, where web content and television are displayed at the same time and provides bookmarks in order to individually save favourite TV programmes and web pages.

Google TV uses the Android 2.1 operating system and the Google Chrome browser. In order to also see all moving images in the Net – especially videos and animations – a complete Flash 10.1 plug-in is integrated within Chrome. Furthermore, Google in the USA is working with some hardware partners of note: Sony produces a full series of TV devices and Blu-ray players that integrate GoogleTV. Logitech manufactures set-top boxes that are compatible with the platform and all of these products are supported by Intel Atom Chips and sold in Best Buy markets. The US Dish-Network mostly provides broadcast content and looks after advanced integration in existing set-top boxes. The start of Google TV in Europe has yet to be arranged and corresponding devices by partners such as Logitech and Sony are not yet available in Germany.

Skype goes TV

The Voice-over-IP software with instant messaging function: Thanks to OTT-TV, Skype has also found its way to television devices. In this way, news and calls can be enjoyed directly in the living room on the big screen. Skype is integrated by Oregon Networks into various TV devices. The Oregon media browser is an embedded software program for Internet and IPTV services. The device manufacturers Panasonic und Samsung supply the additionally required systems prerequisites: Skype compatible televisions and Freetalk TV cameras with special microphone system.

Yahoo! Finds its way onto TV

Yahoo! brings the platform for Internet television into a comprehensive palette of LCD television devices, set-top boxes and other forms of consumer electronics. Together with device manufacturers: LG, Vizio, Samsung, Sony and Toshiba, Yahoo! has announced that Connected TV will combine television viewers in over 40 countries in Europe. With new web-based development interfaces, TV viewers themselves can use the Yahoo! TV Widget Development Kit (WDK) to start and author widgets and TV apps. Since March 2011, the updated Yahoo! Widget Developer Kit v 1.2 is available free of charge. Use of Yahoo! Widgets does not under any circumstances preclude the use of the HbbTV standard. Vestel, for example, has decided to integrate both options into its devices and leave the choice to the user. The added value of Yahoo Connected TV by comparison with classic television comes from tens of thousands of films and TV-Shows that can be viewed (VoD) and all Internet content such as games, social networks, web video or shopping expeditions through the virtual world.

If it's on iTunes, it's on TV: Apple TV

With Apple TV, Apple is following another concept to Google or Yahoo! With Apple it is not a case of access to the free Internet and therefore no competition to Google or Yahoo! The TV viewer is allegedly already equipped with all possibilities to access the World Wide Web via television and would already have a notebook or smart phone at hand anyway.

On 1 September, 2010, Apple presented the 2nd generation of its Apple TV, a device to play iTunes content such as music, podcasts, videos, movies and your own photo collection. The small box is connected to the television or a screen and permits access to media content that is fed in from a local network or is saved on the internal hard disc. This means the synchronisation of PC and Apple TV and a further five computers can also transmit streaming data to the Apple TV, although these data can no longer be saved. The device is visually very slick and also features various connections and interfaces (HDMI, visual audio connection, Ethernet, integrated IR receiver, micro USB for service/support) and except for the remote control, it has no buttons. A training program is albeit integrated, so that various remote controls such as iPhone or iPad can control the complete home cinema. As mentioned at the beginning, the Apple TV has no TV receiver, which is why only content from the iTunes library can be played, although connection to an external USB TV tuner is possible.

3. Results of Hybrid End Devices Working Group

As one of its first tasks, the Hybrid End Devices WG took on the formulation of commercial requirements in 2009. Defining the following commercial requirements stretched over several months and was accompanied by lively discussion. In order to remain as close as possible to market development, the requirements referenced existing specifications and standards to as close a degree as possible, including the HbbTV specification. Taking into account the international significance of Hybrid-TV, these commercial requirements were worded in English from the beginning.

3.1 Commercial Requirements

The following table lists the main Commercial Requirements for Hybrid Broadcast Broadband TV devices which are regarded as the basis for the WG Hybrid End Devices of the German TV-Platform. They are compared to modules of a technical concept for such devices.

No.	Commercial Requirement	Realisation in HbbTV Specification
1	Technology must be based as far as possible on open standards and allow easy realisation of applications	State of the art browser technology: XHTML 1.0, ECMAScript-262, DOM 2, CSS TV Profile 1.0 (CEA-2014-A /Chapt. 5.4)
2	Access to and control of broadcasting service related (bound) applications shall be easily possible for the user	The “Red Button” functionalities and the application lifecycle function in HbbTV cover this requirement
3	Access to and control of non broadcasting related service (unbound) applications shall be easily possible for the user	HbbTV does not mandate any easy access mechanism to unbound applications and does not prohibit a device manufacturer to implement the system in a way that he is a gatekeeper for unbound applications. In “HbbTV Implementation Guidelines” the implementation of an easy URL entry (soft-keyboard or selection from a list of available apps) and the possibility of permanent storage of favourite apps should be mandated
4	The system shall allow the implementation of application platforms, where the system features, including application access and control functions for both bound and unbound applications are well balanced, especially also from a customer usability and convenience perspective	See 3
5	Starting and stopping of applications (including teletext replacement) triggered by DVB services must be possible	Signalling based on DVB BlueBook A133 detail clarification by HbbTV profile
6	Applications must be able to trigger a service change	A service change can always be triggered by the application (OITF-DAE / chapt. 7.4). If the application is not signalled on the new service, it will be terminated.
7	For users it shall be easily possible to terminate a running application	The concept of HbbTV is to avoid killing an application in the technical sense (this could be done via an EXIT key which is optional for the RCU) but to allow launching and hiding applications using the red button. This is part of the application guidelines.
8	The transmission of applications via the broadcast channel must be possible	Usage of DSM-CC object carousel according to DVB BlueBook A 137 (future ETSI TS 102 809) is possible for application transmission. DVB-SI has to be extended to allow the signalling of pure HbbTV data services.
9	Secure data exchange shall be possible	covered by HbbTV-Specifications (https server certificates)

10	The inclusion of one TV signal in the applications must be possible (picture in graphic). Some broadcasters have the requirement to control PiG their applications exclusively.	OITF-DAE / Chapt. 7.7
11	Applications must be able to use resident storage	OITF-DAE / Chapt. 9.1 minimum 100 Cookies; each 4 kByte
12	Access to EIT data (EIT present/ following and EIT schedule actual and other) must be possible by applications	OITF-DAE / Chapt. 7.9 HbbTV profile: restriction to EIT p/f (complete EPG data can be transmitted via IP) EIT schedule is optional
13	Synchronisation of interactive content and broadcasting services must be possible	1) Polling is possible 2) AJAX according to CEA-2014-A / Chapt. 5.5.2 3) DSM-CC stream events (DVB BlueBook A137)
14	Individual programming of PVRs by customers should be possible via trusted applications	HbbTV Annex A1: PVR API only for "trusted applications" (triggered by manufacturer or broadcaster) - HbbTV Chapt. 10.1.2: applications could read signs only from applications of the same domain. Manufacturer can create further dialogues (10.2.3.3)
15	Transmission of still pictures must be possible using state of the art encoding	GIF, JPEG, PNG (CEA-2014-A / Chapt. 5.4)
16	Streaming formats and protocols must comply to state of the art - unauthorised download of streamed content should not be possible	- HbbTV Profile (Minimum) Protocols: http (https), RTSP Container: MPEG2-TS/MP4 Encoding: H.264, HE-AAC - a full DRM system can be integrated (optionally)
17	There must be a defined common set of input keys for application control (red button, colour buttons, number buttons 0-9, P+, P-)	basis: CEA-2014-A / Chapt. 5.4.1 details: HbbTV Chapt. 10.2.2
18	Entry of short text (words) into HTML pages must be possible	HbbTV profile mandates manufacturer-specific solution
19	It shall be possible for EPG-applications (bound or unbound) to tune to a service selected by the customer. Furthermore it shall be possible with the permission of the content provider for an EPG application (bound or unbound) to present a preview of a service as a downscaled live video at any time without termination of the EPG application	HbbTV-Standard: only if the broadcaster allows the EPG Application
20	Applications must be able to tune to a service or select a (VOD) event delivered via both the broadcasting transmission path (DVB) or the Ethernet path (IP) This shall not be restricted to services provided by the channel list (tuning by frequency), but also cover e.g. VOD services via DVB or IP	Streaming video via IP is specified in section 7.3. of the HbbTV specification plus the referenced standards. Section 6.2.2.2 of the HbbTV spec. clarifies that tuning can also be done to VoD channels which have no SDT entry.

21	Applications (bound or unbound) shall be able to access to DSM-CC-carousel data. This would especially also allow applications for CPEs without or with not yet activated return channel capabilities	Section 8.2.2 of the HbbTV specification states that for accessing the content of DSM-CC carousel file, the XMLHttpRequest object can be used.
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3.2 Content Guidelines

Hybrid devices and the associated changes in use of media provide a whole range of challenges for the sector. Hybrid reception devices have the potential of making a lasting change in the user behaviour of TV viewers who are more and more becoming active media users and are in the position of putting together their media programme from various sources. Players from the “classic” broadcasting sector see themselves as being confronted with competition “from the Net”. The interplay of media fusing various methods of transmission on the TV screen has not yet been clearly solved. Previously valid regulation, such as the European Audiovisual Directive implemented into German law as the 13th Amended Interstate Broadcasting Treaty states a differentiation between linear on one hand and non-linear services on the other hand, for each of which there is a different degree of regulation. What is however not clear in view of the new technical possibilities of hybrid television is which rules apply to the interaction between linear broadcasting and online services. The new generation of TV devices also raises questions in the areas of copyright law and youth media protection. For this reason, the WG of the German TV-Platform variously discussed who should be given “priority” on the screen and with which prerequisites a coexistence of content and services of various origins can take place on the TV screen.

For this purpose, the private broadcasters coordinated by the VPRT (Association of private broadcasting companies), as well as the public broadcasting institutions and the device industry led by the ZVEI (German Electrical and Electronic Manufacturers’ Association), have each formulated their position in respect to handling content within the hybrid device framework and have contributed this to the WG. Despite intensive discussion and a partial approximation of the parties, a final consensus about handling the content has to date not been achieved in the WG.

The guidelines contributed by the ARD and ZDF are considered by the VPRT to be core requirements for all content providers. There are, however, additional requirements by the private broadcasters that have to be observed and are being discussed intensively in the WG.

At the time of going to press for the present White Book, there were renewed discussions between representatives of the public broadcasters and the end device industry, which have been chaired by ZVEI. According to both sides consensus is in sight after such discussions, which should be published as soon as possible as a joint paper in the German TV-Platform.

3.3 Perspectives: Smart TV, the Cloud and Mobile Devices

In the course of development of Hybrid-TV which has almost taken three years, it is not only the HbbTV standardisation that is an historical turning-point, but there are also further important technological trends that are becoming apparent. Thus the close coupling and combination of mobile end devices with Hybrid-TV to Smart TV on the basis of HTML 5 and cloud technologies will have

significant influence upon the future usage scenarios and markets. Whoever sees Hybrid-TV simply as HbbTV being a timely replacement for videotext that permits the integration of online 'Mediathek' (Video on demand) services and the iPhone as an improved remote control does not understand the dimensions of the change.

Technically, the Internet can be brought to the television in full bandwidth and performance with HTML5, HbbTV and Web Apps, which means much more than a complement to the linear programme. TV devices become platforms for applications in a similar diversity as on PCs, tablets and smartphones. Connected to clouds, these applications can use enormous computing power from the Internet and bring it to end devices. Hybrid applications will be correspondingly extensive and diverse.

Interaction between TV, Mobile, Cloud

In the interaction between the technologies and devices (TV, mobile, cloud) a particular role is assigned to mobiles. Smartphones and tablets are in the meantime the best-sold devices for accessing the Internet and their operation has been learned and practised. Their distribution and user-friendliness make them predestined for the control of demanding applications on the TV screen. Yet mobile devices as a powerful and omnipresent operation interface are just one of several application scenarios, since networking and convergence also work in the other direction, which is from the TV to the mobile device. Services, packages and content can be played and offered from the TV in mobile-optimised form to smartphones. For example as an extension of personalised TV as well as advertising content and further television services into the mobile web and its rapidly-growing users, or within the context of truly media- and device-independent packages that function equally well on TVs, PCs and mobile devices. This expands the horizon of feasible services, as it does the basis of recipients and the business models of the providers.

Hybrid multi-screen applications based upon HTML5 and cloud computing will end the current split between TV, mobile and Internet in favour of better packages for consumers and new markets for providers. The prerequisites here include open interfaces (APIs) by service and device providers and uniform development environments, as well as the distribution of appropriate technology standards.

Whilst there is still scepticism dominating here and there with regard to the integration of TV devices into the world of the cloud, smartphones and tablets, others are already seeing the bigger picture. HbbTV is therefore the door-opener to complex networking between TV screens and mobile end devices that are indeed already so close to one another that their direct connection is the next logical step. Early adopters and members of younger target groups are already using smartphones today as a constant companion when watching TV. Whether it is more convenient to have digital programme guides on the iPad, or to be socially active at the same time on the web and in social networks. The circle of friends, the community and the digital camp fire is shifting more into the cloud.

New application scenarios

Thanks to HbbTV, exciting applications and new services, audiences and business models are possible directly on Smart TV, but it is not until new technologies like HTML5, that the screens will

grow together. Initially, this will bring obvious and eventually fully new applications with it. Most debates about multiscreens and second screen are at the moment still concerned with areas of operation such as replacing remote control by a corresponding software app that can be adapted to its respective use context. Also the desire to “shift” the TV signal onto the iPad comes naturally, as does the reverse application scenario of “swiping” video signals from a smartphone to a television.

It is clear that the convergence of packages will continue such as the networking of third-party provider apps with TV devices which for example the agency CELLULAR is working on. But this can only be done in cooperation with programme providers, as well as device manufacturers in their roles as portal providers with the operators of social networks or other value-added services. Here the specific purposes are also obvious. The user will browse through digital programme guides on his tablet, promote them from there on social networks and watch them immediately on TV or later via Mediathek services. EPG apps as intelligent remote controls. The user expects applications with such a level of integration and will use services with avoidable media interruptions to a lesser degree. The example makes it clear to what extent market players in the hybrid market will have to rely upon openness and interoperability. The market regulations and prerequisites for success are similar to those of the smartphone and online business. Open interfaces (APIs) and platforms and universal technology standards, as well as attractive development environments for third-party providers are a prerequisite for success in the hybrid market. “Sealed off island solutions” should have their difficulties, since the Hybrid-TV users have by far more alternatives to choose from and evaluate than in linear programmes.

There are also apps in development for mobile end devices that provide personalised and context-sensitive content, whether it is a football match, game show or an advertising spot. While the programme is running, viewers can retrieve additional information from the programme provider and make use of advertised offers and value-added services. The respective packages or relevant metadata are a new and great marketing potential for the programme provider.

At the third stage, completely new apps will come into existence that give new life to the TV screen and they will play creatively with the networking possibilities, provide new content, sort, receive, bring together and edit. Such apps will be developed to the same extent for mobile end devices as for TV screens and the interaction and interoperability will be adapted to the respective device, but be seamlessly united in the cloud and transported in optimized format to the user’s respective device. The key technology “Multi device apps” is also HTML 5 in this case, which in the medium term will become a part of HbbTV, because there are already magnificent opportunities for the implementation of video and audio.

HTML5 is not yet an official standard but already in use to a wide extent in some areas. For example for the development of so-called web apps, that enable web pages in app presentation with touch functionality and that can run across systems on practically all operating systems. For providers as well as developers, these are seen as bridging the gap and as an efficient alternative to native apps that have to be individually programmed for iPhone, iPad, Android and other operating systems.

Essential HTML5 processes such as WebSockets, Canvas, WebStorage and Application Cache facilitate intelligent apps with completely new GUIs and interfaces that also function on the TV

screen and perform tasks that require a lot of time or computing resources in the “cloud”. This approach has seen its roots in Magic Cap technology with software agents that fulfil tasks “independently” on the Net for users. In this way, the market will experience new players and new alliances that together develop new business models.

3.4 Workshop “From Smartphone to Smart-TV: Apps conquer TV”

The new technology developments were at the forefront of the German TV-Platform workshop “From Smartphone to Smart-TV: Apps conquer the TV” on 6 April 2011 in the media city of Potsdam-Babelsberg. In the course of ten lectures and discussion groups, over 120 specialists discussed how Smart TV could provide real added value and a new television experience to viewers. The unanimous opinion was that, apart from attractive content and services, user-friendly navigation was also key. Uwe Welz, Manager of ARD-Playout Center described rules with which a combination of linear and non-linear television could be organised. He claimed that it would require further understanding by all market players. Rike Brecht from the Technische Universität Ilmenau promoted consistent operation concepts in devices and services for a better user experience. She made it clear using the navigation concepts of the major TV broadcasters today and how they varied and that there is still a requirement for operation optimisation in the case of Mediathek services and digital teletext.

Just how Hybrid-TV flatscreen televisions could become multimedia terminals was clarified by Matthias Greve from VideoWeb, who gave practical tips for HbbTV implementation in interactive end devices. Prof Claus Sattler, Managing Director of Goldmedia Innovation, does not see the development of consumer electronics stopping short at the TV screen. Seamless connection would also be made between Smart TVs and mobile end devices such as smartphones and tablet PCs. Dr Stefan Arbanowski from Fraunhofer FOKUS gave an overview of the introduction of the HTML 5 programming language and consequent opportunities for the CE industry and the TV sector, including the possibility of cloud-based apps. Volker Blume, Philips Consumer Lifestyle, presented the diverse possibilities of Smart TVs. Apart from a comprehensive media portal with access to content offers from the Internet and digital teletext from the TV broadcasters the devices offer an expanded interactive program use via the red button on the remote control. For the remote control of the Smart TV, Blume sees a future for either the smartphone or the tablet PC.

How viewers can soon go shopping directly via remote control on a Smart TV was explained by Carsten Urbanski from Ping 24/7. According to Urbanski’s forecast, homeshopping will enjoy a new significance with the connection between TV and Internet. What is required here is uncomplicated solutions for secure payment systems on Smart TVs. How well HbbTV is also suitable for B2B solutions was shown by Matthias Schwankl from Eutelsat Kabelkiosk, using Kabelkiosk Interaktiv as a White Label Portal for cable network providers on an HbbTV-Basis. Lars Friedrichs from SevenOne Intermedia outlined new advertising and marketing possibilities for commercial providers in a networked TV environment and announced new applications for ProSiebenSat.1.

3.5 Usability – Studies on Operation Concepts

With Hybrid-TV, there are new boundary conditions to be observed compared to those for the use of the PC/laptop/notebook. An essential aspect is for instance the size of the screen. In the case of PCs/laptops/notebooks, this is comparatively small, whilst television devices use screens that are as large as possible. There is a direct relationship with the typical use of these devices.

PCs/laptops/notebooks are primarily meant for a single user and the distance between viewer and screen is therefore relatively small. Television devices by comparison are designed as consumer electronics (CE) entertainment devices for more viewers and the distance to the screen is correspondingly large. There is also a substantial difference in operation. In this case, predominantly keyboard and mouse are used with PCs/laptops/notebooks, while it is generally the remote control for television devices.

The question arises as to how Internet use with a television device should be handled in order to achieve sufficient acceptance with users. Apart from their presentation during the German TV-Platform workshop, representatives of the Technische Universität Ilmenau have also spoken on the topic on several other occasions in the WG Hybrid End User Devices German TV-Platform. The following information is based upon these contributions.

In practice, the English term “Usability” dominates Section 11 of the standard DIN EN ISO 9241-11 “Ergonomic requirements for office work with visual display terminals” states the following definition:

“The extent to which a product can be used by specified users in a specified context of use to achieve specified goals effectively, efficiently and satisfactorily”.

The following guidance criteria must be fulfilled:

- * Effective solution of the tasks to be achieved
- * Efficient operation of the system
- * Satisfaction of the user

Fundamentally, users see Hybrid-TV positively because additional Internet use that is concurrent to television facilitates access to more content. This includes, for example, the Mediathek services, that are now available on the TV screen and which provide substantially more varied videotext, but also a greater number of apps from which a URL can be accessed without physical keyboard entry, but rather simply by clicking an icon. Either way, this involves the effective adaptation of visual content onto large screens. A further benefit is seen in all information being current and up-to-date because of the Internet connection.

The real joy of use will however only be experienced by users when usability is optimised. It is here that the user interface and operation processes play a key role. Here it should be noted that with Hybrid-TV, only the remote control is available. It offers fewer options for Internet usage compared to the keyboard or mouse that are known from PCs/laptops/notebooks.

The operating concepts for the remote control are confined to the following keys:

- * Numeric keys (0...9)
- * Cursor keys

- * OK key
- * Colour keys (red, green, yellow, blue)

Here, the expectations of users should not be overlooked and operation should be designed to be equally simple for children and senior citizens. This particularly includes the fact that the current system status and current actions are clearly displayed. Each operational action must lead to clear feedback. The user would also like to have his accustomed passive TV attitude (lean-back position) changed as little as possible and not change into an active position (lean forward) for the Internet. In the case of Hybrid-TV, the various usage possibilities of television devices should be taken into account. Thus there would have to be made a differentiation between the individual television use, a cosy TV evening in a small group, the transmission of a sports event with more viewers or other scenarios.. A very important requirement is in fact that the user does not want to lose reference to the current programme. Therefore a clearly indicated action must always show a quick return path to the previously visited content

Dipl.-Ing. Rike Brecht from the TU Ilmenau emphasises the fact that apart from the fundamental tasks, the specific tasks of the user must always be observed. The core features of an HbbTV package include:

- * Switching the HbbTV package on/off
- * Navigation to the home page
- * Navigation within the package
- * Selection of video text
- * Parallel television
- * Personalisation
- * Settings function
- * Help function

The diverse content is generally displayed in the form of menus and for that reason, it is important that swift access to information is supported by transparent navigation. This should always only feature a few single steps. The user must at all times have clear navigation links at his disposal to show how he can return to the start page of the Hybrid-TV package (home page) and this should be possible using just one operating procedure. The videotext that is now available on Hybrid-TV is substantially more efficient than the previous version. For the user however, no changes to the customer operation should be necessary.

Particularly in case of programme-related applications, there is often interest by users in watching these at the same time as a programme, which is generally depicted as parallel television. In order to do so, there should be various options. One would be to display the television image in the background. Another solution could be the concurrent display of application and programme each

on half of the screen which is known as “split screen”. Another popular concept is to display the television picture in small format in a corner of the screen. Switching back to the television programme in full format must in all cases be possible by means of a single operating procedure. Personalisation means nothing else than the possibility for all users to denote applications and/or programmes with individual recognition to permit targeted access. This requires bookmarks, favourites, and registrations to be made.

When settings are made, or the help function is used, then it is absolutely vital that instructions for the user are unambiguous and clear.

In all Hybrid-TV applications, special attention must be given to the legibility of text on the screen. Here, it is particularly the font size that is important, to take into account the typical viewing distance of 2.5 m to the television screen. In case of PCs/laptops/notebooks, considerably more text can be better displayed on the screen because of the substantially smaller viewing distance. Adapting to the Hybrid-TV situation leads to the following requirements:

- * Use a font of appropriate size
- * Avoid long texts and work wherever possible with sub-headlines
- * Reduce the horizontal extension of lines and rather separate into text blocks
- * Design text blocks so that they can be accessed individually
- * Avoid scrolling

These conditions for the layout on the screen correspond to the operational features offered by remote control with hybrid television. Their observation substantially influences user-acceptability.

The question arises as to how the requirements listed are fulfilled in practice and here there are still considerable deficits because the offer is particularly heterogeneous and the user interfaces show a large variety of structures. This affects user satisfaction to no small degree and also sets high requirements upon future standardisation in this sector.

For the aforementioned reasons, there is a permanent negotiation requirement in the harmonisation of user interfaces. This can be fulfilled by the following activities:

- * Definitely avoid long navigation strings
- * Ensure that returning to the home page of the full package or last programme selected is possible via a single operating procedure
- * Adapt the display size to the TV screen size.
- * Display each navigation feature using clear guides.
- * Ensure corresponding display of the system status and actions initiated by the user.

First tests and usability studies provide interesting indications – as does one study commissioned by the German TV-Platform from the TU Ilmenau (July-August 2011). This was carried out by the Institute for Media Technology by a team of scientists under the leadership of Prof Heidi Krömker. It concerned the usability of HbbTV red button applications. This involved HbbTV propositions from

German TV broadcasters that can be selected via the red button function. It was the objective of this study to identify the strengths and weaknesses of the HbbTV red button system, to identify the usability optimisation and to present style guide suggestions. As has been seen, the inconsistency in the operation concepts of various TV broadcasters (e.g. colour key layout), the slow reaction time of several HbbTV offerings that had to some extent poorly visible navigation confirmation and missing personalisation features that confronted users with unpleasant operational issues “As however – apart from the actual services and information – the usability of the operation concepts has substantially influenced the success and acceptance of HbbTV offerings, ergonomic guidelines should also be observed in design, as well as user-oriented development”, according to the style guide “Usability of HbbTV Red Button Offerings” by the TU Ilmenau. At the same time, there are concrete notes on navigation, displaying information, speed of response, media control, help and personalisation functions. The suggestions embrace generic usability guidelines as recommendations for developers and designers of HbbTV packages. Their intuitive operation has substantial influence upon whether the viewers like to use red buttons, as concluded not just by the Ilmenau researchers. A usability study by the ARD at the beginning of 2011 indicated that HbbTV packages “at their current state of development were already very positively accepted by potential users and seen as clear added value to existing digital television”. Increased acceptance could be achieved by better usability and particularly harmonisation of the operation concepts of the various TV broadcasters.

3.6 Open Questions about Hybrid-TV

Although the German TV-Platform WG Hybrid End Devices has discussed and answered many questions since 2009, there are still open discussion points or newly added ones. .

Term reference

In the WG and in publications essentially the term “Hybrid End Devices” has been used. In the meantime, a discussion about a more appealing and simpler name has arisen, whereby several members, including ZVEI, have used the term “Smart TV” as a hint about smartphones (“can do more than just making a call”). The WG will discuss this topic and attempt to find a standard wording.

Commercial Requirements and Content Guidelines

The commercial requirements of the German TV-Platform do not conclusively describe the available degrees of freedom in the use of contents. The already available Content Guidelines, provided by several interest groups, will serve as a guiding principle for further work to be done. The WG is planning to generate the smallest common denominator out of the currently presented versions of Content Guidelines from public and private broadcasters and device manufacturers. Points that are open or under dispute should then be regulated by bilateral negotiation.

Study on Content Usability

The simple operation and usability of content and applications are often key to the success of new devices and services. In the case of the smartphone market that has grown exponentially over the last two years, this became particularly clear: the providers of end devices succeeded in playfully

adding new functions and generating a user requirement that had never so far been seen. The German TV-Platform is of the opinion that Hybrid-TV devices (“Smart TV”) and interactive service from broadcasters have similar potential. For this reason, the TV-Platform had commissioned the TU Ilmenau to investigate the user-friendliness of several HbbTV services in July/August 2011. The complete results will be presented by the German TV-Platform in the course of the IFA 2011. Following availability of the results, the German TV-Platform will decide whether this topic requires further investigation.

OTT

“Over The Top” (OTT) content denotes all content that can be accessed from the free unmanaged Internet (in addition to linear television) and displayed on the television screen. The overview of this topic in the White Book should be seen as the current status. The WG Hybrid End Devices will be observing the national and international market development in this respect.

Home Networking

Because of hybrid end devices, home networking will gain greater significance for households. It is not just consumer electronics entertainment devices, but also the inclusion of white goods (kitchen, washing), security technologies, house and home technologies and their integration into the CE world that will be followed by the WG Hybrid End Devices.

Adding Value/Business Models

The pursuit of business models for Hybrid-TV is still its early stages in the market. The WG will be observing and analysing this development.

Hybrid Portals & Regulation

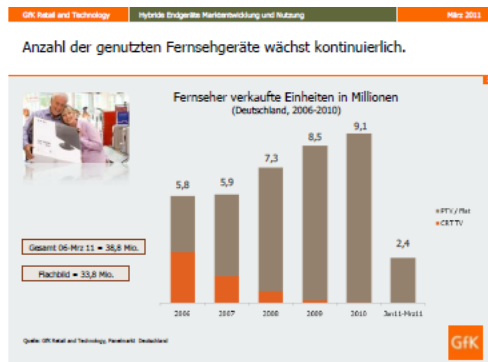
On Hybrid-TV devices, two services that were previous regulated to varying degrees come together: TV is subject to broadcasting law and web content to telecommunications law. Given the possibilities offered by hybrid devices, an examination of the regulatory treatment of the content will certainly be necessary. The German TV-Platform will participate in this discussion within the framework of its possibilities, taking into account membership heterogeneity.

4. Market situation & future opportunities

4.1 Device Sales, Turnover Development

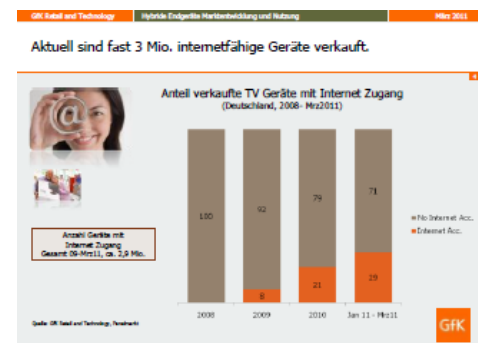
The figures from the trade panel of GfK Retail and Technology GmbH provide an overview of the relevant device penetration up to March 2011.

The number of devices sold increased compared to prior year, most of which are flatscreens (total of 33.8 mill.).



The number of devices with Internet access (iDTV) in the German market from 2009 to 3/2011 come to approximately 2.9 mill. (by 6/2011 approx. 3.4 mill.). The proportion of television sets with Internet access in the 1st quarter of 2011 already amounts to 29 percent of all TV devices sold (35 percent in June 2011) and continues at a high level.

This market development follows the sales increase of average screen size from the category “37 inches and larger” from 26 percent in 2006 to 50.4 percent in Q1/2011. At the same time, it becomes apparent that in Q1/2011, the proportion of televisions sets with Internet access from the 32 inch category already amounts to 21 percent, although the focus is significant at screen size 46-49 inches with 63 percent.



In addition, there are further devices such as digital receivers, DVD/ Blu-ray players/recorders with Internet access in the amount of some 0.9 million since 2009, whereby the proportion has clearly risen in Q1/2011 to 25 percent.

In summary, it can be said that portion of Internet-enabled end devices in the German market is increasing continuously and amounts to some 4.5 million in mid-2011.

The ZVEI – German Electrical and Electronic Manufacturers’ Association announced sales for 2010 of over two million interactive television devices and forecast an increase to five million for 2011. Actual figures from GfK Retail and Technology GmbH even hint at 6 million by the end of 2011.

4.2. HbbTV and Audience Acceptance

The German TV-Plattform supports open standards for digital television technology. In particular, the German TV broadcasters refer again and again to the necessity for a standard in interactive television. Within the framework of the German TV-Plattform Working Group, the development of an HbbTV specification was followed attentively from the beginning. Following its international standardisation in June 2010, the potential for market players became ever clearer.

We shall now discuss the promising HbbTV standard in some more detail. HbbTV is repeatedly referred to as “the better videotext” because it offers everything that was not possible with the old teletext technology. It is fast and thanks to the Internet connection, television becomes so interactive. Furthermore, HbbTV offers many possibilities for content of all types – starting from text through multi imaging through to high-resolution video.

Apart from the added value from more content and new usage features, HbbTV offer further benefits

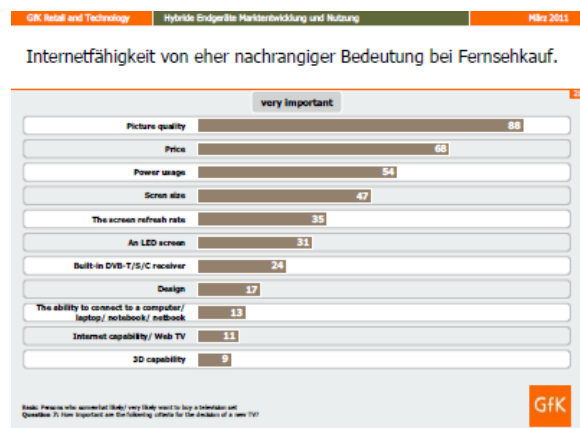
for providers and users.

- Many HbbTV-based services are free of charge except for the purchase cost of an HbbTV receiver.
- Because of its recognition by European standards organisation (ETSI), HbbTV is a standard system, whereby the likelihood of worldwide acceptance is high; so that a mass market can originate that will have a digressive effect on price per device.
- Via HbbTV a number of value-added services can be developed with high selling potential as well as modern usability and functionality.
- For the use of HbbTV-based services, no connection to an IPTV network is required. This however applies also to all services offered via hybrid end devices. The disadvantage here is that the quality of service (QoS) cannot be guaranteed (signal stability, uninterrupted real time transmission etc.).

A study performed by the GfK Consumer panel across five European countries in May/June 2010 showed the interest of users in functionalities that had previously been confined to IPTV users and could now be realised with hybrid end devices and HbbTV. This includes the electronic programme magazine, interaction i.e. voting during quiz shows, access to TV archives (e.g. Mediathek services) and online games.

Conclusion: Hybrid devices and HbbTV can provide users of classic satellite, cable and DVB-T with interactive television within the near future.

The level of consumer knowledge about the features of interactive television and Hybrid TV is still very low. The ZVEI (German Electrical and Electronic Manufacturers' Association) published a glossary in August 2011 to cover Smart TV and is reacting to the findings from the study that technical terms are not always consistent and comprehensible to consumers. Whilst "Web TV" (68 percent) and "interactive television" (57 percent) are still thoroughly commonplace, around half of the respondents were unfamiliar with the term "video on-demand". The more technical things become, the lower the level of awareness. To date about 86 percent of consumers do not know the abbreviation "HbbTV"



A further study by GfK Retail and Technology GmbH in March 2011 (see diagram) proves that Internet capability so far ranked lower when purchasing a television set. 88 percent evaluate picture quality and price (68 percent) as well as energy consumption (54 percent) as key buying factors. At the time of the survey, the Internet feature was only of consequence to 11 percent of the sample.

4.3. Trend Forecasts and Future Opportunities

Regarding the still young HbbTV technology, trend forecasts can only be made upon the basis of market figures to date, as well as estimates from various market players that can often be of a subjective nature. The following collection makes no claim of being complete:

The gfu – Gesellschaft für Unterhaltungs- und Kommunikationselektronik (Society for Consumer Electronics and Communications Electronics) assumes in its report about IFA innovations [“Trends in Consumer Electronics 2011”](#) that Smart TV still has a massive significance to gain. The fusion of television and Internet, which has been a growing market trend for two years, is seen by the gfu as “not just a technological trend, but also a shift of paradigm in the business models for the CE sector. The successful combination of fitting end devices with content offers, as well as cross-industries cooperation between companies from the hardware and content industry, will considerably influence business success in future.” At the same time, the gfu study indicates 50 percent of respondents are planning the purchase of a hybrid television within the next five years.

The chances of success for HbbTV as a standard platform for combining linear television with individual types of use were never more promising, announced the IRT (Institute for Broadcasting Technology) at the ANGA Cable 2011 trade show. The simple and quick access to content, the intuitive use of programme-relevant information without media interruption and changing devices, the market penetration of high-definition flatscreens and the growing number of broadband connected homes, as well the experience of consumers with individual media use could contribute to success. With HbbTV, new transaction opportunities for the Internet and advertising industries as well as portal solutions such as for instance hotel television. All major device manufacturers are supporting these developments this year, announced the IRT.

A further aspect becomes apparent in a study from 2011 that was performed by Facit Digital. The majority of the technically-savvy participants admitted the use of television, Internet and smartphones simultaneously. “In the industry, they are more and more speaking of “Smart TV” rather than HbbTV, according to Facit Digital. Over 70 percent will probably use HbbTV as soon as it is more widely available in the market. Key success factors are content, usability and design, with a special emphasis upon on-demand content. All of these are considered highly important for a successful market introduction of Smart TV.

By 2014, there will be a total of 23 million HbbTV-enabled flatscreen television sets in German households. This is the November 2010 forecast by the Munich-based consultancy Mücke, Sturm & Company (MS&C) in their study “HbbTV”. Prerequisite for the breakthrough would be three factors: an increasing market penetration of end devices with integrated HbbTV and high-end quality content, as well as user-friendliness. Because of the open standard, HbbTV has the best chances to win against company-based proprietary solutions such as Google TV and Apple TV. The study summarizes: “From end device manufacturers to broadcasters to online portal- and e-commerce providers, all of them benefit from the free market approach of HbbTV, An approach that advocates diversity”

In a further study by Display Search from June 2011, the market researchers ascertained that web-enabled television devices (Connected TV or Smart TV) were enjoying a healthy demand. In particular online videos and social networks are seen as driving growth. Worldwide, there are already 40 million Internet-enabled TV devices registered and a turnover volume of 60 million is forecasted for this year. Thus approx. 25 percent of all newly-purchased flatscreen television sets have Internet connectivity.

5. Glossary: Important Terms and Abbreviations

Ad(vertisement) Forwarding

Manual forwarding of advertising breaks within an audiovisual programme by fast forwarding within the course of the recorded programme.

Ad(vertisement) Skipping

Automatic jumping through advertising breaks within an audiovisual programme within the course of the recorded programme.

Android

Operating system of the Google Internet service. Apparently to be used for Google TV.

Application

see: application

App

Standard sector abbreviation for the term application

Application

A defined interactive service via the Internet for smartphones, tablet PCs and also Smart TV devices. Generally depicted as the logo of the service / provider in the form of a miniature 'tile'.

Authentication

Process of secure connection of a user to a system.

GUI

see: Graphical user interface

User Data

All relevant information about the user of service or applications.

Graphical User Interface

The arrangement and function of the operating elements for the user in devices and systems. The linguistically-correct term should albeit be operational interface.

Picture-in-Picture – (PIP)

Addition of a second picture in smaller format during the running screen display in large format. It can also be a case of two equally-large formats that are displayed beside each other on the screen (see split screen).

Bound Application

see: Programme-relevant applications

Broadband Access

Internet connection with a data transfer rate of at least 1 Mbit/s.

CE-HTML (consumer electronics hypertext markup language)

Version of the programming language HTML, that is used on the Internet adapted for use in consumer electronics devices.

Connect(ed) TV

A comparative market term for hybrid television.

Crossmedial

The deployment of various media for one purpose

Package (service)

A structured package of random information via the Internet connection for hybrid television devices.

Electronic Programme Guide

see: EPG

EPG (electronic programme guide)

Electronic programme guide that provides the user with detailed information about television programmes, radio programmes and screen services available to the user

Google Chrome

Browser of the Internet service Google Apparently to be used for Google TV.

HbbTV

The abbreviation stands for Hybrid broadcast broadband TV and has been a European standard since mid-2010 that defines the technical specification for the connection of TV and Internet packages.

Hybrid Television

In addition to broadcast content such as linear TV broadcasters, service from the Internet can be used on the TV device

Interactive Voice Response (IVR)

Bidirectional communication between user and system by means of speech input and speech output.

Interactivity

Bidirectional communication of the user of a system with the aid of a return channel.

Internet-capable TV Device

Television device that both has connection for broadcast signals (antenna, cable, satellite) as well as an Ethernet or WLAN connection for signals for the Internet and which can display these in correct format.

Internet TV

see: Web TV

Interoperability

The usability of an end device on various networks and/or for various applications.

Intuitive Operability

Self-explanatory operation of devices and systems, so that the user requires neither a manual or training for operation.

IPTV

Abbreviation for “Internet Protocol Television”. This denotes the transmission of television via a managed DSL network using the Internet protocol. Unlike Web TV, IPTV has a guaranteed signal quality so that programmes can be viewed on television. IPTV already established itself in 2006 as fourth broadcast transmission method beside satellite, cable and terrestrial.

Linear Television

Concurrent direct reception of running television programmes

Mediathek

An online video on demand service that provides a simple and clear access to various audio and video files available online. Generally refers to the catch-up TV offer by public service broadcasters

Media interruption

The deployment of various devices for using media.

Network/ Home Network

A connection of networkable home entertainment components (TV, Blu-ray players, gaming consoles, PC, data memory etc.) that is made into a private network either linked by cable or wirelessly in several rooms or throughout the house.

Non-linear television

Time-delayed reception of television programmes via intermediate storage or video on-demand. (see VOD).

OTT (over the top)

Service and content that are available over the free Internet.

Overlay

Overlaying image content on the screen by other content.

Personalisation

User-specific packages of programmes, services and applications.

PIP

see: Picture-in-picture

Bound application

An application that has direct reference to the current television programme.

Unbound application

An application that has no direct reference to the current television programme.

Proprietary

Technology that is only valid for one manufacturer or provider and generally developed by them.

PVR

Personal video recorder in the shape of hard drive, Blu-ray or DVD recorder or as a receiver/set-top box with integrated hard drive. Some televisions also have a hard drive for digital recording. Permits time-delayed recording.

“Red button” function

Signalling of programme-related applications by a screen prompt on the picture of the current programme and access to this by pressing the red button of the remote control.

Service

see: Service

Signal integrity

The consistency of the television signal received when reproducing it.

Signal protection

Measures against changes in the programme signal being transmitted

Smart TV

A market term for hybrid television that is comparable with devices that can be connect to the Internet. Referencing smartphones.

Split Screen

Separation of the screen for the concurrent display of a television programme and an application or the concurrent display of two television programmes.

Language recognition

The control of operating processes using speech input.

Streaming

The distribution of programme content that can be received over the Internet as a continuous data stream without first having to be downloaded as a video.

Timeshift

Also known as time-delayed television (see non-linear television). Permits the flexible pausing, repetition and continuation of the current TV programme. In the case of televisions with twin tuner equipment, the broadcaster can also be changed intermittently.

Fade over

To fully or partially cover a running picture by another one.

Unbound Application

see: Programme-independent application

Usability

A general term for the extent to which a device or system can be operated easily by a normal user.

USB (Universal serial bus)

Computer interface for connection to external devices. Today, many TVs and connectable devices such as Blu-ray players and gaming consoles have USB interfaces so that USB sticks or external hard drives can be connected.

Video on-demand (VoD)

Service, that makes it possible to receive a moving picture at any time from an available package. Differentiation is made between on-demand streaming (no download), near on-demand streaming (loop or carousel), download (saving facility) and podcast (download with subscription function).

Web TV

In the case of Web TV, random programmes that are freely accessible on the Internet can be use at any time and anywhere. The TV screen reception is not guaranteed, as is the case with IPTV.

Widget

Small programs that appear as icons on the TV screen (or PC desktop). With their aid, certain Internet services can be used such as E-mail accounts, current traffic and weather announcements or constantly updated news.

Viewer vote

Possibility for the viewer to immediately answer questions asked by means of the remote control.

Time-delayed television

see: Timeshift

Masthead

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