

# Free-to-Air Television and other PVR Challenges in Europe

**EBU EICTA Joint Ad-hoc Group on PVRs**

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# FREE-TO-AIR TELEVISION AND OTHER PVR CHALLENGES IN EUROPE

## EBU EICTA Joint Ad-hoc Group on PVRs

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## 1 Executive Summary

This report discusses the likely impact of the personal video recorder (PVR) on the way audiences consume broadcast media. It proposes the adoption of an open Metadata standard, TV-Anytime, to facilitate the setting up of PVR services for free-to-air broadcasting audiences to complement those already available from Pay-TV operators. The report includes recommendations and actions for setting-up and running a PVR service in a given free-to-air market in Europe.

### 1.1 Television viewing and the PVR

Watching television in Europe is almost on a par with the time spent eating and drinking. In numerical terms, weekly television consumption has changed very little since the early eighties. From a market perspective, however, television viewing has evolved substantially since then for the following four reasons:

- *Viewers have more choice.* Until the eighties, viewers only had a handful of channels from which to choose. Once the tv set was on, it often stayed tuned to one channel. Not only has the number of television channels increased dramatically since then with the emergence of satellite and cable transmission, the number of hours per channel has also increased.
- *Technologies give the viewer more control.* Technologies have emerged to help viewers cope with more choice. The remote control device (RCD) and the Electronic Programming Guide (EPG) allow the viewer to see what is available and select a channel without leaving his seat. Affordable devices for recording broadcasts such as the videocassette recorder (VCR) and the DVD Recorder help the viewer get the full benefit from multi-channel TV.
- *Viewing has become both a group and an individual activity.* While the viewing of events binds families and friends together, family households often have two or three TV sets and watching television alone is increasingly common.
- *Viewers want convenience - "Anything, Anytime, Anywhere and on Any Device".* Young viewers in particular are part of an "a la carte" society used to consuming what they want, when they want and where they want.

Twenty years ago, there were predictions that the VCR would change television viewing and that time-shift would have a negative impact on the television industry. In fact, the impact of the VCR on television itself was minimal, as the time-shifted viewing of broadcast television has never

accounted for more than one to three percent of total television viewing. The impact of the PVR is likely to be far greater. The key differences are:

- *Viewer convenience.*
  - PVR devices are easier to use than VCRs.
  - the PVR is more than a mere device. It is an integrated service comprising an EPG, automated recording facilities that are accurate and reliable in ways that the VCR was not.
  - PVRs allow the viewer to access recorded Content without changing cassettes or disks.
  - PVR users with multi-channel television get to see more of the Content they like. Research on PVR use by early adopters shows that as much as 40% of their viewing is television that is time-shifted. When recording, PVRs do not necessarily include promos and adverts before and after the programme requested.
  - PVR users can skip programmes and fast-forward through adverts and promos to avoid Content that they do not like. They miss as much as 50% of the advertising - but still choose to watch adverts they enjoy or find useful.
  - User satisfaction with fully-fledged PVR services such as Sky+ or TiVO is extremely high. In markets with a large number of channels, it is dependent on a good EPG.
- *Viewer control.* A PVR user has all of the functions of the VCR and new ones, too. The user can:
  - Record and play back at the same time - both the same programme or something else.
  - Record the entire programme regardless of changes to the broadcast schedule.
  - Book the recording of an episode or a whole series using the trailer record function.
  - Organise recordings that are automatically labelled to facilitate retrieval and playback.

Most of these intelligent functions require Metadata that is useful and up-to-date.

The impact of consumer convenience and user control challenges the television industry to review current practice:

- *Channel visibility.* Increased viewer control in the form of time-shifted viewing for certain genre erodes channel branding in favour of programme branding. Channel branding, however, can be reinforced by using the trailer record and grouping functions of the PVR. Solutions also exist that remind the user of the channel from which the programme was recorded.
- *Advertising impact.* Viewing recorded Content means that adverts and promos are not seen to the same degree. Fast forwarding through recordings also has an impact on adverts and promos. Advertising pods\*, trailers and spots before and after episodes from popular entertainment series are most likely to be missed, whereas those around live broadcasts - genre such as news, sports and events - will fare better. The Digital Advertising Media Association (DiMA) argues that the consumer's ability to pause and control the ad Content that interests them is ultimately a benefit for advertising. The PVR should allow advertisers to create precise targeting of adverts and promos and greater relevance for consumers from the ads they do see. DiMA argues that new metrics of depth and duration need to be added to the time-tested metrics of reach and frequency. A TV-Anytime PVR service can offer targeted and context-sensitive adverts improving the standing of advertising in the eyes of the consumer.
- *Time shifted viewing via PVRs rather than purchasing Content.* In some quarters, there is concern that rights holders such as production companies and broadcasters could lose revenue from the sale of repackaged TV Content on distribution media such as VHS and DVD. There is no evidence to date of such a causal link. Even so, new business models for subscription-based PVR and network PVR offer new revenue streams and mechanisms for building loyalty.

## 1.2 Conclusions

- *Time-shifting will become widespread - attempting to stop PVRs for free-to-air television is therefore no longer an option.* Major manufacturers have ceased producing VCRs. In the UK, there are some 35 million analogue VCRs that will be largely redundant after analogue switch-off and which, anyway, need replacement by fully digital products. Examples are EPG-enabled DVD-Recorders with recordable or re-recordable disks, PVRs and media centre computers with TV tuners allowing the viewer to record television programmes on the PC hard disk. Time-shifted viewing is also emerging on broadband Internet through either on-demand services or peer-to-peer file sharing. In markets with strong satellite TV platforms offering a full PVR service, the lack of a free-to-air PVR puts that platform at a competitive disadvantage. The most cautious forecasts for the UK market indicate a household penetration of 25-30% by 2010, broadly in line with those for the USA and Japan.
- *Broadcasters who adopt a wait-and-see strategy risk losing visibility and control.* There are four main arguments here:
  - Free-to-air broadcasters risk losing market share as the result of Pay-TV operators having a head start in offering PVR services
  - Free-to-air broadcasters in the free-to-air television market lose visibility and control not only when present in Pay-TV offerings but also to other providers of PVR services in the free-to-air space
  - The lead-in time for introducing new Metadata services at broadcasters is years and not months. Fully-fledged services that may be required in 2007 and 2008 need to be initiated now.
  - Change management - to make a PVR service happen will require cultural changes within broadcasters as well as changes to their back-end systems
- *Stakeholders need to work together.* In a given free-to-air market, an end-to-end PVR service that is attractive to its users must offer consistent EPG and signalling Metadata across a critical mass of channels - good Metadata for one broadcaster is not enough. Such consistency requires the use of Metadata standards. The joint ad hoc group has evaluated four technology options currently available for the provision of a PVR Metadata service: TV-Anytime, XML-TV, DVB-SI + PDC and Enhanced Teletext. TV-Anytime and the associated DVB-GBS standards constitute the only realistic basis for a free-to-air PVR service in Europe. Collaboration of all stakeholders in the value chain is a prerequisite for the success of such a service using TV-Anytime and DVB-GBS.
- *A PVR service in free-to-air markets needs stakeholder endorsement.* For manufacturers to build open standard PVRs that provide an attractive and reliable service, they need to have assurances from key stakeholders that there will be EPG and signalling Metadata available for that market. The report therefore includes the Joint Working Group assessment of the benefits of a full PVR service to stakeholders such as programme makers, broadcasters, brand owners and advertising agencies, platform operators, EICTA manufacturers and consumer electronics retailers.

## 1.3 Recommendations

1. *Supply standardised EPG data.* Broadcasters need to assure the production and play-out of TV-Anytime compliant EPG and signalling Metadata to PVR devices in free-to-air markets. The service can be rolled out incrementally, but key functions need to be made available from the very start.
2. *Deliver Metadata together with the digital television channel.* Initially, free-to-air PVR service operators should consider distributing this Metadata in the secure environment of the broadcast stream as this allows for automatic, accurate and reliable recordings - the key user proposition.

Where regional or national circumstances dictate it, IP-based distribution for Metadata may be considered, as long as the issues of data security and consumer acceptability are addressed and are found not to constitute a major hurdle.

3. *Reach a critical mass of TV channels.* In a given free-to-air market, broadcasters must work together to achieve consistent Metadata for a critical mass of channels - those accounting for an audience share of, say, 90%.
4. *Aim for an open standard PVR service.* Manufacturers need to work with broadcasters across free-to-air markets in Europe. Only an open standard "commodity" PVR service can result in an attractive enough service at a low enough price, leading to the replacement of the VCR as the dominant storage device for television within a decade. As will be seen from the descriptions and assessments of the four technology options mentioned in section 4.4 and covered in depth in Appendix 6.4. TV-Anytime and the associated DVB-GBS standards constitute the only realistic basis for a free-to-air PVR service in Europe.

## 1.4 Actions to get started in a new free-to-air market

- *Broadcasters and free-to-air operators need to understand what TV-Anytime entails.* Broadcasters and their free-to-air platform operator need to fully understand the end-to-end workings of a TV-Anytime PVR service and what is required to make it a success. We are not just talking about a recording device and the provision of an EPG, but putting in place a fully-fledged service that adds value to all those involved, including the viewer.
- *Broadcasters need to fully implement TV-Anytime but can introduce functions incrementally.* They can begin by producing a minimal set of Metadata needed for the PVR service.
- *Manufacturers' devices need a standardised source of PVR-service Metadata in order to differentiate their respective products.*  
Manufacturers need clear and unambiguous information about the TV-Anytime compliant EPG and signalling data that the operator will play out in order to develop receivers that will be able to use these data appropriately and effectively.
- *Broadcasters, the platform operator and manufacturers need to assure commitment from consumer electronics retailers by involving them in the planning of PVR services.*



## 2. Television viewing and the personal video recorder (PVR)

This chapter focuses on television and the interplay between viewing behaviour, technology and broadcast programming. Based on empirical studies and on an historical perspective of innovation in broadcasting, the aim is both to explain how the personal video recorder (PVR) changes the way audiences consume television and how this will influence the TV industry.

From an industry perspective the central issues are:

- The increase in time-shifted viewing at the expense of watching television as it is broadcast
- How time-shifting changes the viewing of television programmes, adverts and promos
- What is the likely impact of these changes on the television industry and its stakeholders.

### 2.1 How has television viewing changed?

Television viewing has evolved markedly over the last seventy years:

Table 1: The Evolution of television viewing since 1930

Period	Characteristic aspects of viewing
1930-45	Viewers sitting close to small screens. One TV per household. Few channels. Limited channel changing. Viewing in groups. A TV set costs as much as a car.
1945-55	Screens still small. Group viewing around "the electronic hearth". People inviting family and friends to enjoy the new medium. A TV set costs more than a month's salary.
1955-75	Screens increase in size from 14" to 20", increasing the viewing distance. Limited channel changing. Viewing in groups. Colour TV emerges and new sets are still expensive.
1975-90	Cable, Satellite and SMATV* increase the number of channels available. The remote control device (RCD) and the VCR become widespread. VCRs used for recording TV, but much of this is not viewed. Family homes have more than one TV set. Group and individual viewing. Colour TV predominates.
1990-2000	Screens increase in size. Multi-channel TV is widespread in many national TV markets. VCRs now used for viewing pre-recorded Content. Games consoles and DVD players are connected to TV sets. Family homes now have TV sets in the kitchen and in bedrooms. Television viewing evolves into a broad range of group and individual behaviours. Broadcast media are immersive. Viewers multi-task while watching or listening to television as it no longer has their undivided attention for long periods of time.
2000-05	The PVR appears on the market.

Source: Adapted from Carey, John T. "The Evolution of TV Viewing" and "Can Radio Learn from Interactive TV?" (Radio Netherlands):

<http://www.bnet.fordham.edu/carey1/Evol%20of%20TV%20ViewingB.doc>

[www.rnw.nl/realradio/features/html/tv020626.html](http://www.rnw.nl/realradio/features/html/tv020626.html)

### 2.2 What has influenced television viewing?

Watching television in Europe is almost on a par with the time spent eating and drinking. From a market perspective, however, television viewing has evolved substantially since the fifties for the following five reasons:

- *Viewers have more choice.* Until the eighties, viewers only had a handful of channels to choose from. Once the set was on, it often stayed tuned to one channel. Not only has the number of television channels increased dramatically since then with the emergence of satellite and cable transmission, the number of hours per channel has also increased. Pay-TV has emerged as a

business model to complement public service broadcasting and broadcasting funded by advertising and sponsorship revenue.

- *Technologies give the viewer more control.* Technologies have emerged to help viewers cope with more choice: The remote control device (RCD) and the Electronic Programming Guide (EPG) allow the viewer to see what is available and select a channel without leaving his seat. Affordable devices for recording broadcasts such as the videocassette recorder (VCR), the DVD Recorder and the PVR all help the viewer get the full benefit from multi-channel television.
- *Viewing has become both a group and an individual activity.* While the viewing of events binds families and friends together, family households often have two or three TV sets and watching television alone is increasingly common.
- *Viewers want convenience - "Anything, Anytime, Anywhere and on Any Device".* Young viewers in particular are part of an "a la carte" society used to consuming what they want, when they want and where they want.
- *The television set has become the display device for other media.* Television still dominates, but increasingly has competition from DVD players, games consoles, digital cameras and home movies.

## 2.3 What is a PVR?

Put in simple terms, a PVR is a device that allows its user to watch television *when* and *how* he or she wants. Purists might prefer to use term personal *digital* recorder (PDR) to signal the time-shifted consumption of all kinds of audio-visual Content (analogue or digital) that is recorded digitally. In this report, we have chosen to retain the term PVR as it is the most widely used and understood. In the first instance, the PVR is about television. Ultimately it needs to offer solutions for radio and for other home media.

In this report, we make a distinction between a PVR and a *PVR service*. The latter involves the delivery of an EPG and signalling Metadata so that the viewer can find, record and view what he wants and when he wants.

Most PVRs involve the recording and playback of television programmes on a local storage device and require the viewer to plan his viewing before the programme is aired. To this end, a PVR provides the viewer with information about what is available to record or download (the EPG), and also offers an overview of the programmes that have been recorded (the Electronic Content Guide, ECG).

In contrast, the *Network PVR\** involves the centralised storage of programmes that the viewer can choose to watch, and a decision to see the programme can be taken after the programme has been broadcast.

In this report, the Joint Working Group has chosen to focus on PVRs for the time-shifted viewing of free-to-air digital television. This encompasses not only regional and national digital terrestrial television but also free-to-air channels offered by digital satellite, digital cable and Satellite Master Television, *SMATV\**. Over time, with the emergence of *television over IP\**, some of the distinctions will become blurred. At some point it will be reasonable to add streaming, IP multicast and peer-to-peer file sharing over broadband networks as the distribution of television moves onto broadband, but need not be covered in depth in this report.

There is a clear consensus within the group for initially narrowing the scope of its work to PVR services delivering EPG and signalling data together with the broadcast signal, so-called *in-band\** solutions.

There is less support within the group for early initiatives that simultaneously encompass other solutions for PVR services. Alternative out-of-band\* Metadata delivery channels - via a dial-up or broadband connection - have been discussed, as have PVRs that involve the recording of analogue

television signals, those using Metadata delivery in the vertical blanking interval and analogue triggering mechanisms such as PDC to ensure the accurate recording of programmes.

Given that Europe is currently in transition from analogue to digital broadcasting, we felt that it would be strategically ill-advised to suggest solutions that would impede digital switch-over and analogue shut-off.

Alternative solutions have thus been accorded a lower strategic priority by the Joint Working Group and are initially out of scope as far as our conclusions and recommendations are concerned.

Appendix 6.1 contains a description of PVRs and the associated PVR Metadata services for selected European countries. Chapter 3 and Appendix 6.4 give the rationale for focusing on TV-Anytime PVR for free-to-air digital television in the first instance.

## 2.4 What are the key differences between a VCR and a PVR?

Table 2 highlights the similarities and differences of using a VCR, a first-generation PVR using an analogue source and a digital PVR service based on the TV-Anytime phase 1 standard. It goes without saying that there are basic and high-end VCRs in just the same way as there are differences among PVRs.

As can be seen from Table 2, the main functions of both devices allow the user to select something to see, select something to record, make sure that the programme is recorded, make sure that the recording can be found again and ultimately to play the programme when and how the user wants. Advertising is also included.

The following table demonstrates that not only is a TV-Anytime PVR service capable of replacing a VCR, it both outperforms VCRs and 1st generation analogue PVRs:

**Table 2: Using the VCR and the PVR - key similarities and differences**

Proportion of devices capable of a given function	VCR	1st generation PVR	TV-Anytime PVR
<b>Selecting something to see</b>			
Using the EPG - Electronic Programming Guide	Some	Many	Yes
Using the ECG - Electronic Content Guide of programmes recorded	Some	Many	Yes
<b>Selecting something to record</b>			
Using the EPG - bookmarking from Electronic Programming Guide	Some	Many	Yes
Trailer record - bookmarking one episode/all episodes from trailer	No	No	Yes
Grouping - intelligent bookmarking of programmes with same genre	No	No	Yes
Personalised recommendations/suggestions	No	Some	Yes
<b>Recording functions</b>			
Manual recording - press record button	Yes	Yes	Yes
Programmed recording (channel, scheduled starting and finishing time)	Yes	Yes	Yes
Programmed recording shortcuts (ShowView, listings in barcodes etc)	Some	Some	Redundant
Accurate recording (actual broadcast starting and finishing time)	No	No	Yes
Automatic, accurate and reliable recording of a series using book marks	No	No	Yes
Record one channel while viewing another	Yes	Many	Yes
<b>Archiving functions</b>			
Manual "labelling" of recorded programmes	Some	Some	Redundant
Automatic "labelling" of recorded programmes (channel, date, time, title)	Some	Some	Yes
<b>Play-back functions</b>			
Time-shift viewing before the recording has finished	No	Many	Yes
Time-shift viewing after the recording has finished	Yes	Yes	Yes

Proportion of devices capable of a given function	VCR	1st generation PVR	TV-Anytime PVR
Picture-in-picture (time-shift viewing of programme with same programme live in small window)	No	Some	Yes
Segmentation: navigation among the segments of a programme	No	No	Yes
Advert and promo avoidance (zipping, fast forward)	Yes	Yes	Yes
Advertising functions			
Targeted advertisements	No	No	Yes
Context-sensitive advertisements	No	No	Yes

Source: Joint Working Group

## 2.5 What can the viewer do with a PVR?

PVRs are introducing new habits and even a new vocabulary in TV consumption. One of the key changes cover the term “time-shifted” viewing.

In current audience measurement systems such as the British BARB or the Danish TV-Meter, *time-shifted viewing*\* is added to the overnight ratings (reach and share) to compute final figures for all viewing of a given programme within 7 days of the first transmission date.

Figures for programmes viewed after 7 days are not registered.

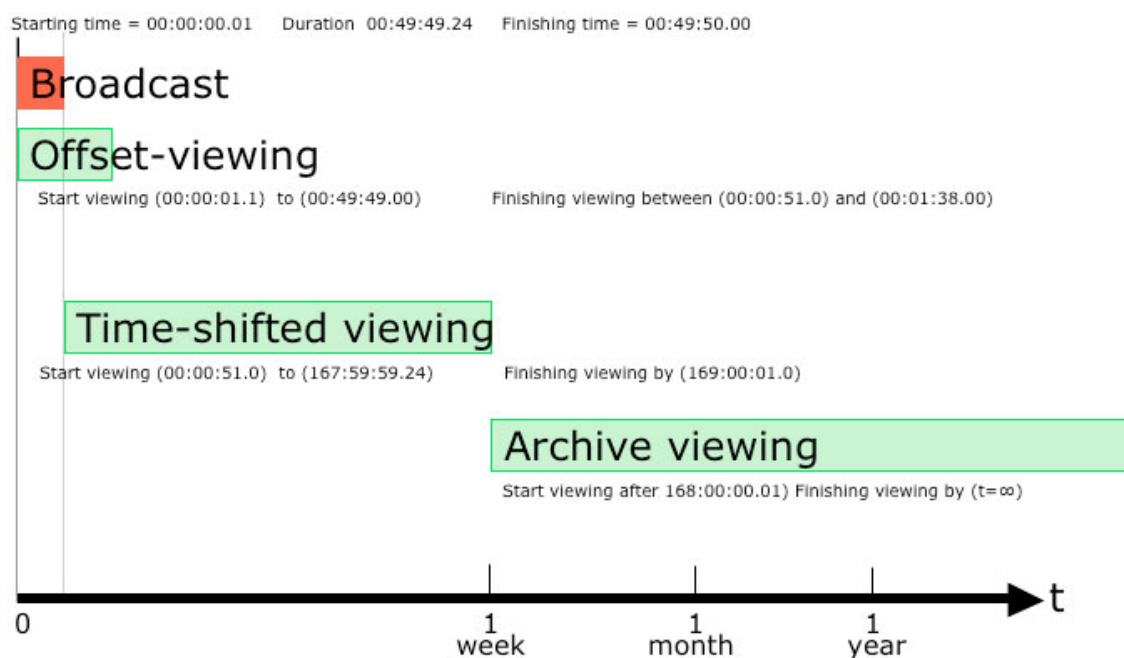


Figure 3: Time-shifted viewing

Figure 3 shows that PVRs expand the scope of time-shifting. They allow for *offset-viewing*\* where the viewer begins to watch the programme before it is over (a function not possible with the VCR).

The combination of automatic labelling, Electronic Content Guides and plenty of storage space make the PVR a key contender for the role of audio-visual archive in the home, allowing for *archive viewing*\*.

PVRs currently on the market usually contain at least two tuners. This allows for two key functions:

- Recording a programme while watching another

- Using the picture in picture mode to “time slip” - recording and viewing the programme with an offset while it is still being aired.

The first of these functions is common to both VCRs and PVRs, whereas offset viewing is only found in PVRs:

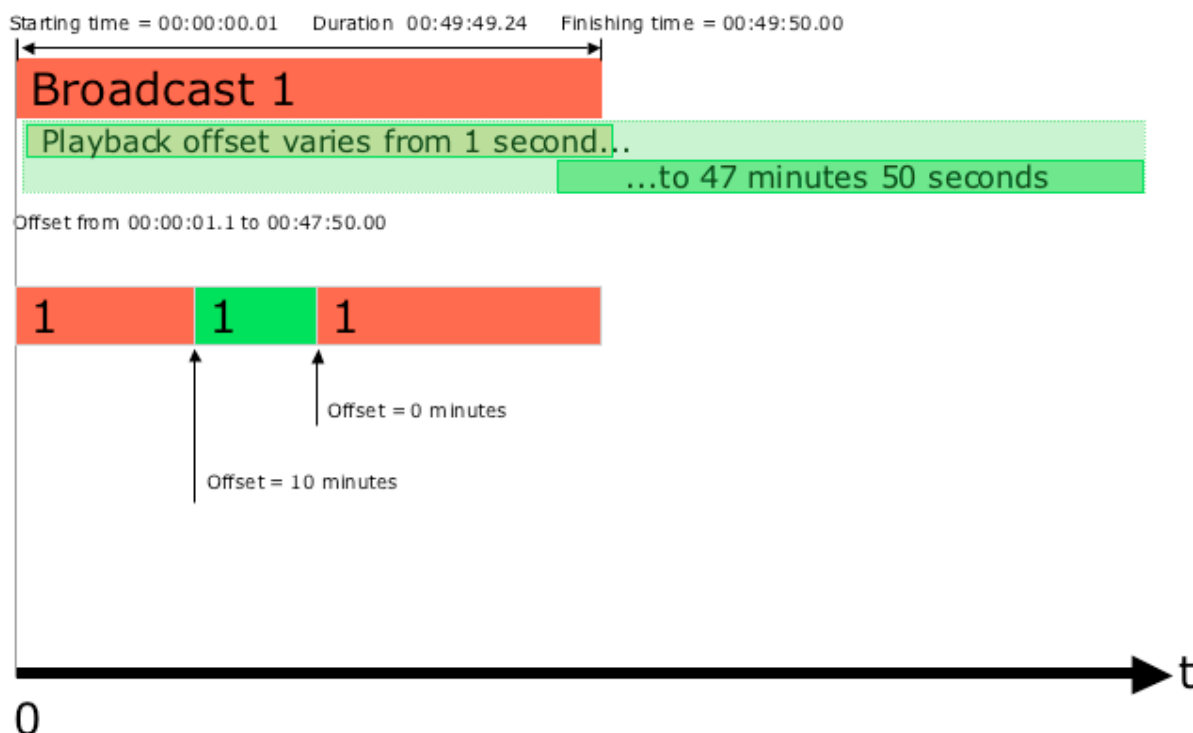


Figure 4: Picture in picture - offset or time-slip viewing

Research since 2002 on PVR use by early adopters indicates that the PVR allows for a greater range of viewing patterns. The following are based on an early qualitative study by the UK organisation Decipher<sup>1</sup>.

### 2.5.1 Buffering

A kind of planned offset viewing. Setting a programme to record and then starting to watch before it has finished: the best example of this is when a viewer starts recording a programme at, say, 20:00 hrs then puts the children to bed or has supper. At 20:20 they sit down and start watching the programme. When they reach a bit they find less interesting or irrelevant (very often the advertising break in commercial channels) they fast forward to the next part or the next interesting bit. After doing this several times they are catching up with the programme in real time.

### 2.5.2 Bookmarking

Also termed “series record” or TiVo’s “Season Pass™”. Using the series record or bookmark feature to book a number of episodes of a programme to record with a single command through the EPG or remote control. This functionality gives the viewer confidence that they will not miss an episode of a series, even if it changes position in the schedule or he is not available to view one day/week. It improves loyalty to series and serials.

<sup>1</sup> Decipher Five Features Media Programme, September 2002.  
<http://www.decipher.co.uk/latest/020903-PVR-Research.pdf> [25 November 2004]

### 2.5.3 Grazing

Similar to bookmarking. Because it is easy to record and find programmes on a PVR, viewers speculatively record a number of programmes and then sample them, by watching perhaps just the first few minutes. If in that time the programme has not captured their imagination, they delete it and move on to the next recording they made.

### 2.5.4 Stacking

In some quarters this is also referred to as “bingeing”. Recording a number of episodes of a programme and then watching them all at once in one session. This is most commonly done with comedy and drama and can be likened to the buying of a DVD of a series and making an event of watching it.

### 2.5.5 Compressing

Where a viewer becomes bored with part of a programme, or is short of time but wants to “find out what happens in the end” he will start to fast-forward through the programme and pick out what he perceives to be the important pieces. In a sports match such as soccer, he will follow the action in fast forward and switch to play when he thinks something looks interesting. In make-over shows, the common habit with a PVR is to watch the set up and final part, missing the “boring bits in the middle”.

### 2.5.6 Extending

The opposite of compressing. Where a challenging programme requires a lot of thought a viewer may rewind a bit to review a part to make sure they understand it. On a soccer match they may rewind the best bits to relive the action (generate their own replays in effect).

### 2.5.7 Pausing

A kind of ad hoc offset viewing. One of the most publicised functions of a PVR but one that is mentioned least in focus groups. This is the ability to pause live TV, perform some other activity and then pick up watching the programme from the point at which it was left, but timeshifted. (The difference from buffering is that this is unplanned).

### 2.5.8 Archiving

Some PVRs are equipped with DVD burners and can record to removable media, such as one of the recordable or rewritable DVD formats. This enables viewers to keep the Content they think is most important to them, even when the hard disk begins to fill. It also allows them (where the system allows this) to share recordings.

There is currently no standardised terminology with which to describe PVR functions and viewing behaviours. This is a key prerequisite for audience measurement systems to satisfy the needs of a variety of stakeholders, including commercial broadcasters and the advertising industry. Proposals for standardising terminology and new metrics for audience measurement are needed<sup>1</sup>.

## 2.6 How does the PVR affect viewing behaviour?

This section highlights four studies from the US and the UK, all of which are indicative of consumption patterns of early adopters of PVRs.

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<sup>1</sup> The Interactive Television Research Institute at Murdoch University is currently working on a series of articles containing proposals for terms and methods appropriate to PVR research.

In a recent study of TiVo and ReplayTV users by Ferguson and Perse<sup>1</sup>, PVR owners reported watching television, both live and recorded, with more enjoyment and greater control.

The most widely used PVR functions were those of fast-forwarding past commercials and recording and watching programmes scheduled at inconvenient times. They were significantly more commonly used than any of the other functions. The next most used PVR functions in order of the frequency of their use are:

- The on-screen schedule for choosing programmes to record.
- The on-screen programme guides.
- Skipping over unappealing programme segments.
- Pausing live programming to teach [the PVR the user's] programme preferences.
- Replaying programme segments.
- Fast-forwarding past unappealing people.

The slow-motion function was the least used function. Its mean was significantly lower than all the other functions.

Wood (2004)<sup>2</sup> contains references to research commissioned by BskyB covering the use of its Sky+ PVR. User satisfaction with the service is extremely high. Sky+ users are reported to see 20% more TV than Sky subscribers without a Sky+ PVR, but no mention is made of consumption patterns of Sky+ viewers before they acquired a PVR, making generalisations about the results difficult. Approximately 40% of viewing among Sky+ owners is time-shifted, with considerable differences according to Content genres. Live programmes and events are more likely to be viewed as they are broadcast than major series such as "The Bill", "Friends" and "CSI: Crime Scene Investigation". As the research is based on viewers' perceptions of their own behaviours, there are grounds to be cautious about generalising the results to other audience segments.

Bernoff (2004)<sup>3</sup> contains a survey of 588 users of all types of digital PVRs. The survey reveals that respondents appreciate their PVRs. Half said the device improved their enjoyment of life; the average respondent has already shown his PVR to seven other people. While today's PVR users are mainstream consumers, they have a higher take-up of satellite pay-TV and ownership of a wide variety of electronics than the US population at large.

PVR users currently express the most enthusiasm for the simplest benefits - recording programs easily, pausing live TV, and skipping commercials.

A report from the Yankee Group<sup>4</sup> covers advert avoidance in more detail and discusses the likely impact of the rising household penetration of PVRs. On page 7 of the report, the author suggests the following scenario: "We forecast almost 20 percent of U.S. households will have PVRs in 2007. If we assume 70 percent of all advertising during 80 percent of all programming is fast-forwarded, PVR households will miss 55 percent of advertising /.../ Again, assuming that all eyeballs are equally valuable to advertisers, 55 percent of 20 percent - or 11 percent of television advertising revenue - is wasted. This equals \$5.5 billion in network advertising revenue wasted due to PVRs."

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<sup>1</sup> Ferguson, Douglas A. and Elizabeth M. Perse. "Audience satisfaction among TiVo and ReplayTV users" *Journal of Interactive Advertising*, Volume 4, Number 2, Spring 2004. <http://jiad.org/vol4/no2/ferguson/#Introduction>.

<sup>2</sup> Wood, Mark (2004): Sky+ presentation at "Tomorrow's Media World", 21 September 2004, the British Museum, London. <http://www.carat-events.co.uk/download.htm> [25 November 2004]

<sup>3</sup> Bernoff, Josh (2004) "The Mind of the DVR User: Acquisition and Features DVR User Survey Reveals Infectious Enthusiasm" Pages 1-16. August 2004, Forrester Research, USA

<sup>4</sup> Kishore, Aditya. "The Death of the 30-second Commercial" *Media & Entertainment Strategies*, August 2003. The Yankee Group, USA

Taken together, the studies indicate that the PVR is initially used as a substitution technology for the VCR with users initially focusing on the functions with which they are already familiar. Qualitative studies such as the Decipher Five Features Media Programme do, however, suggest that the PVR is not just a mere digital VCR and that new viewing patterns will emerge to complement those with which the viewer is familiar from the VCR. Time-shifting will become more commonplace than with the VCR due to the ease-of-use, convenience and functions of the PVR. Time-shifting will have an impact not only on the scheduling of television programmes but also on adverts and promos.

## **2.7 What is the likely impact of changes in viewing behaviour on the television industry?**

As OFCOM pointed out in a report on the future of public service television in September 2004, "The growth in digital multi-channel television has significantly increased the number and range of channels available. This is creating a potential mismatch between the amount of Content available and the limited amounts of time viewers have to consume it. An important development, therefore, is likely to be technologies that enable viewers to consume television Content at a time and in a format that is convenient to them<sup>1</sup>". The PVR represents one of the most likely devices to facilitate this - the heir to the VCR.

### **2.7.1 Channel visibility**

On a PVR, the originating channel loses its importance. The viewer doesn't really care what channel brings them the latest episode of their favourite "soap", it's simply there. Text searches and advanced EPGs reduce the prominence of channels. Increased viewer control in the form of time-shifted viewing for certain genre erodes channel branding in favour of programme branding. channel branding, however, can be reinforced by using the trailer record and grouping functions of the PVR. Solutions also exist that remind the user of the channel from which the programme was recorded.

### **2.7.2 Impact on advertising and promos**

Traditional interstitial advertising (the 30 second spot) loses some of its impact when being fast-forwarded. Depending on the PVR model, viewers can either fast-forward or skip 30 seconds. Unlike VCRs, the PVR user may or may not see the video information while zipping\*. For PVR owners who use their PVR for time-shifted viewing, the advertising pods before and after the programme may not have been recorded.

Advertisement avoidance has existed since the beginning of television advertising. It can be physical (quitting the room for food or drink, visiting the bathroom), psychological (ignoring the ad and doing something else), social (discussing something with others who are watching the same television) or device-based (using the remote control to sample Content on other channels during the advertising pod).

While there is a variation in the estimates of PVR penetration, of ad avoidance and therefore of the likely drop of advert impact, we can safely say that the PVR will exacerbate existing advert avoidance trends, especially in territories where advertising may be as much as 13-15 minutes per hour. Advertisement avoidance will be greatest around genres such as popular entertainment series such as CSI, The Bill and Friends and less pronounced around events and live programming where viewing programmes as they are broadcast is expected to remain high. Appendix 6.2 contains examples of the 100 most widely time-shifted programmes in the USA on the TiVO platform (late 2003).

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<sup>1</sup> OFCOM: "Looking to the Future of Public Service Television Broadcasting", Section 2.20. (September 2004).  
<http://www.ofcom.org.uk/consultations/past/psb2/psb2/future/future.pdf?a=87101>



The avoidance of promos – spots and trailers for forthcoming programmes from a given broadcaster – also occurs today, albeit to a more limited degree than ad avoidance. The impact of conventional promos will also decline for the same kind of reason as conventional ads.

For commercial broadcasters in free-to-air markets the challenge will be to maintain advertising revenues possibly by increasing rates around and during “live” programmes and having to discount advertising spots before and after, but not during, current hits. There will be a need to optimise the balance between space for promos and normal advertisements. Research into new models of advertising is already underway both in the USA and in Europe.

In a recent DiMA report on advertising in digital media<sup>1</sup> the authors argue that the consumer’s ability to pause and control the ad Content that interests them is ultimately a benefit for advertising. The PVR should allow advertisers to create precise targeting of adverts and promos and greater relevance for consumers from the ads they do see. DiMA argues that new metrics of depth and duration need to be added to the time-tested metrics of reach and frequency.

To achieve these aims, the authors recommend the following five measures:

- Standard Digital Ad Formats & User Interface Functionality.
- Standard Ad Management and Reporting Structures.
- Ad Serving Structures that support Advertisers’ Integrated Marketing Needs.
- Consumer Privacy and Control.
- Interoperability between VOD systems, PVR based devices, and Broadband IP-based Networks.

Work done in a laboratory environment by Duane Varan (ITRI, Murdoch University) suggests that for certain kinds of advertising, interactive ads can compensate for changes in viewing behaviour by increasing the impact of a given ad by a factor of three.

An example of how advertising could develop is the Do-It-Yourself show on the QVC home shopping service on the Sky platform, Telewest and NTL (digital cable) in the UK. The show demonstrates the use of various products in a live TV show that encourages instant response to purchase the products demonstrated. It is claimed that the conversion rate of these product demonstrations is high; the turnover of QVC is claimed to be of the same order as Channel 4 in the UK.

The challenge of the PVR to licence-fee funded public service broadcasters is less daunting, as reach is at least as important as share. Time-shifted viewing only represents a potential threat inasmuch as it reduces the ability to promote a given programme or series, a threat that can be offset by the *trailer record* or “*season pass*” function.

Competitive scheduling to force viewers to stick with a given channel, coupled with “*hammocking*” programmes to try and get viewers to sample something new in between well-know shows, will lose its value in PVR homes where the viewer can decide to see what he wants.

### 2.7.3 Impact on secondary sources of revenue

In some quarters, there is concern that rights holders such as production companies and broadcasters could lose revenue from the sale of repackaged TV Content on distribution media such as VHS and DVD. There is no evidence to date of such a causal link. Even so, new business models

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<sup>1</sup> DiMA: The Digital Media Advertising Summit (DiMAS) Report. “An Analysis of Advertising Opportunities and Hurdles in Digital Media” April 2003. <http://www.dimagroup.com/report> [27 December 2004]

for PVRs and network PVRs, such as subscriptions for time-shifted Content and EPG services, offer potential revenue streams and mechanisms for building loyalty.

The QVC example mentioned above is also of relevance here. QVC looks for unique products that it can market and in whose development it is actively involved. By taking a stake in the products themselves, QVC strives for a higher degree of vertical integration than would commonly be considered.

### 3. Conclusions

While preparing this report, the most frequent question the joint working group received from those following our work concerned timing - Why do we need to take strategic action now, rather than in a few years' time?

This chapter presents four main arguments for taking action now in order to plan and implement a PVR Metadata service for free-to-air broadcasting in Europe.

#### 3.1 Attempting to stop PVRs for free-to-air television is no longer an option.

*Time-shifting will become widespread - attempting to stop PVRs for free-to-air television is therefore no longer an option.*

##### 3.1.1 What kinds of PVR are already on the market?

Major manufacturers are no longer producing VCRs. In UK there are about 35 million analogue VCRs that will be largely redundant after analogue switch-off and which, will need replacement by fully digital products. These will include EPG-enabled DVD-Recorders with recordable or re-recordable disks, PVRs and media centre computers with TV tuners allowing the viewer to record television programmes on the PC hard disk. Time-shifted viewing is also emerging on broadband Internet either through on-demand services or peer-to-peer file sharing.

##### 3.1.2 What is the competition in the free-to-air market?

In the free-to-air market, there is competition to replace the VCR on a number of fronts:

- DVD-recorders
- PVRs with EPG data provided by the manufacturer (especially via satellite)
- PVRs with an out-of-band EPG provided via a dial-up solution or in some cases an always-on broadband connection. The source of the programme listings is often "scraping" EPGs offered by broadcasters or Metadata aggregators on Teletext or the Web.
- Media centres - PCs with television tuners and EPGs provided by hardware or operating system suppliers or "scrapers".
- Subscription Network-PVRs such as the Danish TV2 Sputnik that offer the replay of selected Content from other TV2 channels where the Content and EPG Metadata are delivered via broadband and
- Handheld PVRs containing tuners that are used alone or in conjunction with media centres.

In many markets, Pay-TV operators carry free-to-air channels. Pay-TV PVRs are dealt with in section 3.1.4.

Taken together, the alternatives to a free-to-air PVR are already gaining momentum. In the case of Denmark, the household penetration of media centres with TV tuners jumped from 4% to 11.3% in the course of 2004. When seen in connection with n-PVR services, DVD-recorders and PVRs using hard disks, the household penetration of digital devices for time shifting - albeit small - is growing steadily.

##### 3.1.3 What are the current business models in the free-to-air market?

There are currently four predominant models in this part of the market:

- *Consumer electronics manufacturers deliver a proprietary PVR Metadata service to those who buy their products.* The cost of the Metadata is included in the price of the hardware. In the case of manufacturers who “scrape” Metadata, this is also the business model. This model tends to lead to a plethora of proprietary solutions not necessarily conducive to the emergence of a mass market.
- *Third parties provide a proprietary PVR Metadata service on a subscription basis.* This was the original model of TiVO that sold PVRs bundled with a subscription.
- *Media centre stakeholders (manufacturers and/or operating system suppliers) deliver a proprietary PVR Metadata service as a “loss-leader” for their other products and services.* Arguably this is a variant of the first model.
- *Broadcasters provide a free PVR Metadata service funded by their marketing departments.* The business model here is essentially defensive, both due to competition from other free-to-air PVRs and from Pay-TV operators.

### 3.1.4 Why are PVRs in the Pay-TV market a challenge to free-to-air broadcasting?

Pay-TV operators have been quick to establish PVR services on both sides of the Atlantic. In Europe, the early movers were digital satellite operators who usually also carry television channels available on free-to-air platforms. Early movers have established that an attractive PVR service increases subscriber satisfaction, reduces churn\* and may in some cases increase Average Revenues Per User (ARPU).

In territories where the Pay-TV operator has a PVR service, the lack of a comparable free-to-air PVR service represents a competitive disadvantage. Free-to-air broadcasters need to ensure that they do not relinquish control over the presentation of their programming to the Pay-TV operator whose gate-keeper potential is otherwise strengthened.

### 3.1.5 What are the current business models in the Pay-TV market?

The best-known Sky originally launched its Sky+ PVR service using a subscription model for the EPG and signalling Metadata. The subscription was later dropped for certain categories of Sky subscribers. The take-up of Sky+ reached 474,000 homes (2% of TV households) by the end of 2004<sup>1</sup>. The Pay-TV operator can choose to generate revenues from subscriptions, from improved net earnings from reduced costs as the result of a drop in churn, or both.

Broadcasters and broadband operators are also offering network-PVR solutions on a subscription basis. Here both the programmes and the EPG service are delivered over IP networks (ADSL or Fibre To The Home). Examples of this include TV-2 Sputnik in Denmark and FastWeb in Italy.

### 3.1.6 Legal constraints

To conclude, this section demonstrates that there is already an emerging market for PVR services. One of the strategic issues that broadcasters will therefore have to face is their position vis-à-vis PVR services from free-to-air and Pay-TV competitors. Although it can be tempting to try to withhold programme listings from third parties, recent changes in European Union legislation governing databases may make this difficult or in fact illegal. Programme listings have traditionally been given to the publishers of newspapers and weeklies. Making EPG and signalling Metadata through their own PVR service and at the same time providing third parties with TV-Anytime compliant Metadata in electronic form on non-exclusive terms and in a non-discriminatory way may

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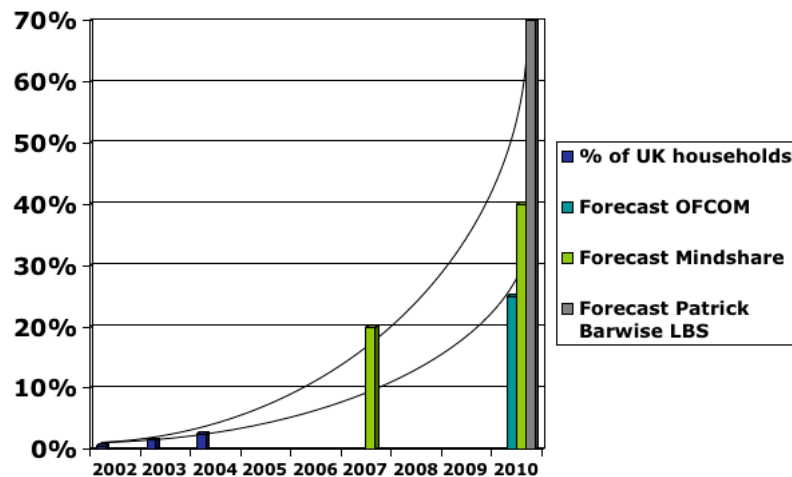
<sup>1</sup> Andy Fry, “Digital TV: Tomorrow’s TV World”.

[http://www.brandrepublic.com/mediabulletin/news\\_story.cfm?articleID=231559&Origin=MB04012005](http://www.brandrepublic.com/mediabulletin/news_story.cfm?articleID=231559&Origin=MB04012005)

constitute a mechanism for retaining indirect control as to how programming is described and presented to viewers.

### 3.1.7 What are the forecasts for PVR household penetration?

#### 3.1.7.1 The United Kingdom



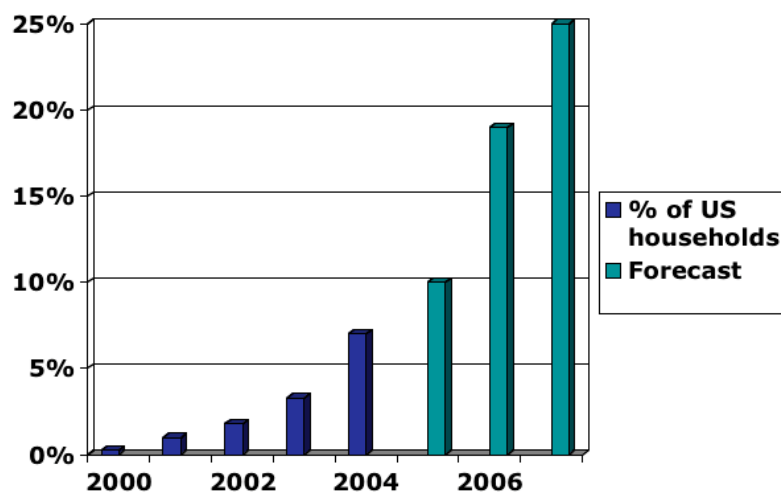
Source: OFCOM. Looking to the Future of Public Service Television Broadcasting. Section 2.20, page 26. 30 September 2004 <http://www.ofcom.org.uk/consultations/past/psb2/psb2/future/future.pdf#a=87101>

There are several forecasts for PVR penetration in the UK market, ranging from that of Patrick Barwise at the London Business School to the OFCOM forecast that is based on the most conservative measures. If we choose to use the OFCOM figures, household penetration will rise from its current 2-3% to 25% (6 million households) in 2010. If the Mindshare forecast is correct, household penetration will reach 40% (9.6 million households) by 2010.

#### 3.1.7.2 Other European countries

In this interim version of the report, the Joint Working Group has not been able to collect and collate comparable forecasts for European territories. We shall endeavour to remedy this omission if this is the wish of EBU and EICTA.

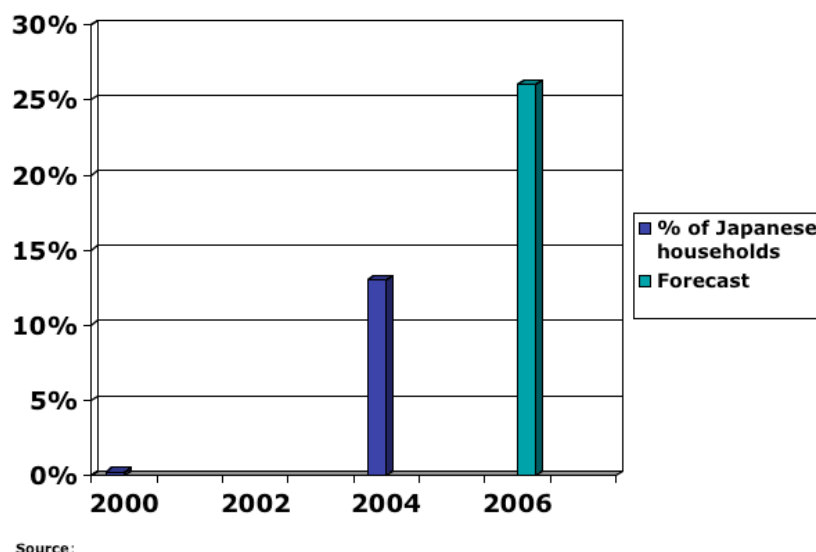
#### 3.1.7.3 The United States



Sources: Seitz, Patrick. Death Of The 30-Second Spot? INVESTOR'S BUSINESS DAILY Monday, December 27, 2004 <http://www.investors.com/editorial/managing.asp?v=12/24>; DIMAS for figures for 2000-2002

Forecasts for the US market are in broad agreement with each other for the next three years. Household penetration seems likely to be somewhat higher in the US than in the UK in 2007.

### 3.1.7.4 Japan



The data available to the Joint Group about the Japanese market is incomplete at the time of writing. New figures are expected by mid-February.

## 3.2 Broadcasters who adopt a wait-and-see strategy risk losing visibility and control

In section 3.1, we argued the case that Pay-TV operators and, to a more limited extent, manufacturers and third parties already offer 1<sup>st</sup> generation PVR services. In this section we reiterate the consequences of postponing a strategic decision.

### 3.2.1 What are the arguments for action now rather than in 3-4 years' time?

There are several key arguments for broadcasters to act now rather than later, one of which concerns the time-scale for new hardware products. Consumer product technologies to be launched in 2008 are already on the consumer electronics manufacturer design road map. For incremental improvements, the lead-in time is rarely less than 6-12 months. Broadcasters interested in mass market platforms such as a TV-Anytime PVR for free-to-air TV in 2008 will have to put in place change management and start to engineer their back office operations now in order to meet this target. More detail is given below in:

#### 3.2.1.1 Free-to-air broadcasting loses market share to Pay-TV

Postponing a strategic decision for a year or two gives the Pay-TV actors an additional period to establish and consolidate their position vis-à-vis free-to-air broadcasters.

#### 3.2.1.2 Broadcasters lose visibility and control in the free-to-air market

Broadcasters need to retain control over how their programmes are presented to the viewer regardless of the platform on which their channels are distributed. Broadcasters should not leave it to the platform operator or independent PVR service providers to direct viewing choices. This will be the risk if there is no free-to-air PVR service.

### **3.2.1.3 The long lead-in time for introducing new Metadata services**

A free-to-air market usually consists of a small number of national broadcasters funded by advertising or public revenue of some kind. In some countries there is also a regional market comprising a number of small or medium-sized broadcasters. What is frequently the case is that national, free-to-air broadcasters are among the oldest institutions in the industry. In the past, paradigm shifts in the industry have taken a decade or more. Such broadcasters have cultures and infrastructures that do not lend themselves to rapid change.

There is a great potential benefit in respect of the impact PVR technology on the viewing and listening behaviour of audiences in Europe of adopting a common strategy for enabling the PVR service provider and the advertisers to retain an effortless contact with the viewer. In the following section, 3.3, the Joint working Group argues that the best candidate for a common standard is TV-Anytime as its uniform approach better allows the Content identity to survive the transitions which the viewer will be making as they roam across an increasing range of delivery and presentation systems.

To implement this in one large step is not feasible – too many players and stakeholders would need to change their systems and operational processes at the same time. However a staged and gentle evolution towards establishing a foundation service based on a clear understanding of the Metadata schemas and the signalling which can be used would be highly possible.

Logically the evolution starts at the centre of the trio of key actors – the PVR service provider, the manufacturer and, of course, the viewer who pays for all of this.

### **3.2.1.4 Change management – not just technology but organisational culture**

The time line for taking action should start now for most broadcasters and PVR service operators. This reflects the practical nature of managing an evolutionary change in as least violent a way as possible. Expanding a PVR service in increments has advantages not only for the television industry but also for the consumer who needs to follow a steady but not too steep learning curve.

For many broadcasters, the workflow changes required to produce the programme and signalling data constitute at least as big a challenge as the concomitant changes in their back-end systems. The lead-in time for a fully-fledged system using TV-Anytime is not months but years, especially in markets such as the UK that are grappling with complex legacy issues. Many of the required changes overlap other Metadata requirements in digital production and archiving.

Not changing will be for many stakeholders an indication that they may be too comfortable in their current business and this is a signal to third parties, Pay-TV operators and even actors in the broadband market that there is market share to gain by providing a service for PVR owners that will allow them better to enjoy the products which manufacturers have been designing.

## **3.3 Stakeholders need to work together in free-to-air markets**

In a given free-to-air market, a PVR service that is attractive to its users must offer consistent EPG data across a critical mass of channels – good Metadata for one broadcaster is not enough. Such consistency requires the use of Metadata schema and signalling standards. The Joint Working Group has evaluated four technology options currently available for the provision of a PVR Metadata service: TV-Anytime, XML-TV, DVB-SI + PDC and Enhanced Teletext. TV-Anytime and the associated DVB-GBS standards constitute the only realistic basis for a free-to-air PVR service in Europe. Collaboration of all stakeholders in the value chain is a prerequisite for the success of such a service using these standards. The arguments for this position are to be found in appendix 6.4.

### **3.3.1 Establishing a viable business model**

Unlike the Pay-TV market where the operator has a clear-cut case for a bundled or subscription-based PVR service and can thus take the necessary steps to commission the Metadata play-out

system and a (proprietary) PVR to go with it, the free-to-air market has to reach agreement in the whole value chain, as none of the stakeholders stands to derive such substantial commercial benefits as is the case for a Pay-TV operator.

The need for schedule and signalling Metadata is taking place at a time when many of the necessary prerequisites are already being considered elsewhere within broadcasters. Among the areas that spring to mind are the digitalisation of production and archive systems where the buying, selling, repurposing and transmission of Content already requires the streamlining of Metadata for rights management reports to collection societies (already widespread in radio), for the provision of programme listings to newspapers and weeklies and for providing external bodies and regulators with accurate data to facilitate public service accountability. They are complementary demands, and synergies of working holistically with both programming and Metadata do exist.

With careful planning, a financial case can be made for timely action on the implementation of a full PVR system when the implications of proactive and reactive scenarios - "Do something now" or "Do something later" - are calculated.

### **3.3.2 Implementing a full PVR service based on TV-Anytime**

Figure 2 in section 2 demonstrates clearly that there is a window of opportunity for a PVR service based on TV-Anytime. Although a few services such as Sky+ and TiVO rival TV-Anytime on a number of counts, the overall consumer proposition of TV-Anytime is still the most attractive one.

The key consumer benefit is the automatic, accurate and reliable recording of individual programmes and series, combined with the convenience of the trailer record function. Arguably, only the Sky+ service comes close to this.

Using the metaphor of an apple tree, the apples being the functions on offer, an incremental implementation of the TV-Anytime phase 1 standard could start with the most interesting, low-hanging fruit (functions with considerable consumer appeal and of low cost and difficulty to implement). The next stage would be to pick the apples that can be reached by standing on a wooden box (considerable consumer appeal, more expensive and technically more difficult). Depending on the circumstances of the stakeholders, the increments could be monthly or quarterly, or take a more leisurely pace.

## **3.4 A PVR service in free-to-air markets needs stakeholder endorsement**

A PVR service in free-to-air markets needs stakeholder endorsement. For manufacturers to build open standard PVRs that provide an attractive and reliable service, they need to have assurances from key stakeholders that there will be schedule and signalling Metadata available in a standardised format for that market. Here again, TV-Anytime is the only realistic option in the opinion of the Joint Working Group.

### **3.4.1 Benefits for programme makers**

Those who produce Content catering to specific tastes or audiences - in particular one-off programmes - stand a better chance of reaching their audiences through personalisation mechanisms that make use of programme genres and group recording functions.

### **3.4.2 Benefits for broadcasters**

#### **3.4.2.1 Advertising**

To date, the focus of the PVR debate has been on advert avoidance and the potential decline of the impact of advertising for fast moving consumer goods (FMCG). What is clear is that advert avoidance has always taken place but that the PVR has the potential to exacerbate the situation. Commercial broadcasters can take immediate remedial action and review the programming mix in



favour of live rather than pre-recorded programming and look carefully at working on the relevance of a given advert to its audiences. Interactivity and the PVR, in the form of targeted ads and context-sensitive advertising, have the potential to improve the relevance (and ultimately accountability) to brand owners and advertising agencies of adverts; the adverts that *are* seen work more effectively and efficiently.

### **3.4.2.2 Licence fee supported public service broadcasters**

The major challenge of the PVR to public service broadcasters is the increased effort that will be required to ensure the visibility of new programming, given that trailers and promos will also be affected by time-shifting. For broadcasters not reliant on advertising, it is less critical when a viewer sees a given programme as long as there is an audience measurement mechanism that establishes that viewing has taken place and that the viewer recognises the value of the public service proposition.

Public service broadcasters stand to benefit from shifts in viewing behaviour. Viewers with specific Content preferences will have better opportunities to see Content that at present suffers from competitive scheduling. TV-Anytime functions such as trailer record, grouping, segmentation\* and linking to other Content all support the three core qualities of the Reithian conception of public service – to inform, educate and entertain.

### **3.4.2.3 Sponsorship**

PVRs provide new mechanisms for offering additional information that is non-intrusive as far as the flow of the programming in a given television channel is concerned.

### **3.4.3 Benefits for brand owners and advertising agencies**

As we have previously mentioned, a TV-Anytime PVR service can offset the impact of potentially disturbing viewing behaviour that stems from time-shifting and fast-forwarding. When used with new metrics such as depth and duration, the PVR offers a delivery mechanism with the potential for improving the relevance of adverts and thus a change in how advertising *per se* is perceived. All these changes ultimately lead to improvements in accountability, establishing more clearly what works and what doesn't.

### **3.4.4 Benefits for platform operators**

There are clear direct and indirect benefits for Pay-TV operators offering “free” or subscription-based PVR Metadata services – new revenue streams and cost savings through reduced churn. For free-to-air operators the business model is not as compelling. The benefit has to be justified in terms of incremental benefits over and above the increased infrastructure and operational costs to all the stakeholders.

### **3.4.5 Benefits for EICTA manufacturers**

The VCR is in decline and there is no clear “heir” in terms of a device for time-shifting. PVRs, both stand-alone or built into large flat-screen displays, represent new market opportunities. Products with a clear added value can command higher margins than commodity products, so initially a TV-Anytime PVR represents a commercial “window of opportunity” if the necessary commitment from all the other free-to-air stakeholders can be assured.

### **3.4.6 Benefits for consumer electronics retailers**

The PVR is a device that – initially at least – commands a higher margin and is therefore more attractive to promote than high-volume products with low margins. This commercial potential has

an associated commercial risk that can only be reduced if there are solid commitments from other free-to-air television stakeholders.

## **4. Recommendations**

### **4.1 Supply standardised EPG data**

Broadcasters need to assure the production and play-out of TV-Anytime compliant EPG and signalling Metadata to PVR devices in free-to-air markets. The service can be rolled out incrementally, but key functions need to be made available from the very start.

### **4.2 Deliver Metadata together with the digital television channels**

Initially, free-to-air PVR service operators should consider distributing this Metadata in the secure environment of the broadcast stream as this allows for automatic, accurate and reliable recordings – the key user proposition.

Where regional or national circumstances dictate, IP-based distribution for Metadata may be considered as long as the issues of data security and consumer acceptability are addressed and are not found to constitute a major hurdle.

### **4.3 Reach a critical mass of television channels**

In a given free-to-air market broadcasters, in particular, must work together to achieve consistent Metadata for a critical mass of channels – those accounting for an audience share of, say, 90%.

### **4.4 Aim for an open standard PVR Metadata service**

Manufacturers need to work with broadcasters across free-to-air markets in Europe. Only an open standard “commodity” solution can result in an attractive enough service at a low enough price, leading to the replacement of the VCR as the dominant storage device for television within a decade.

As can be seen from the descriptions and assessments of the four options mentioned in Appendix 6.4, TV-Anytime and the associated DVB-GBS standards constitute the only realistic basis for a free-to-air PVR service in Europe.

## **5. Actions to get started in a new free-to-air market**

The Joint Working Group proposes the following four actions to initiate work to set up a PVR service based on TV-Anytime.

At the time of writing, the ETSI standards based on TV-Anytime phase 1 work had only recently been approved and the related DVB-GBS standard had not been finalised. No end-to-end TV-Anytime implementations are known to exist but work on the implementation issues concerning the UK Digital Television Group TV-Anytime Testbed has begun.

Over and above the four actions listed in this chapter, Appendix 6.5 contains detailed analysis as to how to approach PVR Metadata service implementation. It should be noted that the appendix addresses the challenges from a UK perspective. The digital terrestrial television stakeholders in the UK have the added challenge of dealing with the legacy issues of a transmission infrastructure that went into operation in 1998.

### **5.1 Broadcasters and free-to-air operators need to understand what TV-Anytime entails**

Broadcasters and their free-to-air platform operator need to fully understand the end-to-end workings of a TV-Anytime PVR service. We are not just talking about a recording device and the provision of an EPG, but putting in place a fully-fledged EPG and signalling Metadata service that is of value to all those involved, the viewer included.

It will be necessary to establish clearly who is responsible for what - and who actually does what throughout the Metadata production and delivery chain.

One of the challenges here is the recognition on the part of each broadcaster that the PVR service-provider has to cover all broadcasters. Early collaboration will be needed among broadcasters (who are each other's competitors in the television market) to ensure that the PVR service is all-embracing, accurate, reliable and therefore attractive to the viewer.

### **5.2 Broadcasters need to fully implement TV-Anytime but can introduce functions incrementally**

Broadcasters need to begin by producing a minimal set of schedule and signalling data needed for the PVR service. Manufacturers will need access to this data well in advance to assure that their products can receive this data and act accordingly. The data sets required can initially be produced from the existing scheduling systems. In most cases, to get started requires the fine-tuning of existing workflows and production systems rather than building something completely new. In the meantime, work on Metadata creation and play-out can be carried out in tandem so that the PVR service can become a fully-fledged one, ultimately offering a full range of TV-Anytime functions to viewers.

### **5.3 Manufacturers' devices need a standardised source of PVR-service Metadata in order to differentiate their respective products**

Manufacturers need clear and unambiguous information about the TV-Anytime compliant schedule and signalling data that the operator will play out in order to develop receivers that will be able to use these data appropriately and effectively.

This allows the individual manufacturer to differentiate its product range and also differentiate its products from those of competitors. Certain issues - perhaps the use of the Yellow button to initiate PVR related functions analogous to the Red button for interactivity in the UK - will require agreement that overarches the interests of individual stakeholders.

### **5.4 Broadcasters, the platform operator and manufacturers need to assure commitment from consumer electronics retailers by involving them in the planning of PVR services.**

Consumer electronics retailers are also key stakeholders in the successful launch of a PVR service.

There are clear parallels to the launch of DTT at regional level in Germany, where in many respects the step-by-step launch was well conceived and competently managed. In one respect, however, it was problematic, in that no set-top boxes using the API\* of the platform were available at launch from retailers in Berlin-Brandenburg.

Consumers were largely unaware of the services requiring an MHP set-top box available from many of the broadcasters primarily because they did not have the wherewithal to use them.

In much the same way, regardless of the API in use, consumer electronics retailers have to be involved in the planning of the proposed PVR service. There needs to be an understanding of the

issues involved in implementing and running a PVR service and some sort of incentive to market a free-to-air PVR.

## 6. Appendices

### 6.1 What is a PVR? a description of PVRs and the associated EPG services used to power them from selected European countries.

The earliest consumer electronic product that allowed for time-shifted viewing was the VCR. Recordings of television programmes required the viewer to press the record button at the beginning of the programme or to pre-programme the VCR to make use of an in-built timer to start and stop the recording. The VCR owner needed a source of programme listings in order to pre-programme the VCR, typically a printed programme guide. Having made a recording, the user needed to manually identify the programme by writing a sticky label to attach to the videocassette.

In recent years, the VCR has been joined by other consumer electronics products that also allow consumers to time-shift.

Programmes are recorded digitally on hard disks, recordable DVDs or both. The recordings themselves are made with the aid of an Electronic Programming Guide (EPG) within the television signal itself (*in-band\** solutions using Teletext\* or "*Now and Following\**" information from digital television) or delivered separately by the hardware manufacturer or service provider (*out-of-band\** solutions using Metadata over the Internet or delivered via satellite).

In this report we have chosen to use the term PVR throughout. Others such as the TV-Anytime Forum make a distinction between Personal Video Recorders (PVRs) and PDRs. From their perspective, PVRs are first-generation devices that use an analogue television signal as the source of their Content, whereas the PDR can be regarded as an integrated viewer service that uses a digital television signal to provide the programmes and in-band Metadata to provide information about the programmes and the times at which they are broadcast.

There are already a number of PVR products available "off the shelf":

- Analogue PVRs using DVD recorders, hard disks or both
- Integrated Digital Television sets (IDTVs\*) or Set Top Boxes (STBs\*) with a complete EPG
- Analogue or digital television tuner cards in PCs allowing for the recording and viewing of television programmes on the computer screen
- Handheld hard disk recorders with built-in television displays and PVR functions.

#### 6.1.1 Examples of PVRs currently on the European market



Philips HDRW-720	Analogue	Guide+ (GemStar)	HDD & DVD-recordable
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Pioneer DVR-720H	Analogue	Teletext	HDD & DVD- recordable
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Panasonic DMR-E95	Analogue	Teletext	HDD & DVD- recordable
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FAST TVS 200	Analogue	ttv	HDD, Remote programmable via Internet (via VBI, no phone line or BB required)
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Archos PVR AV420	Analogue	?	HDD
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Fully-fledged PVR services are to be found on the market, primarily as part of Pay-TV packages by operators such as BskyB, Sky Italia, Canal Satellite and Canal Digital. These typically combine a STB with two tuners and a hard disk recorder in the same box. There is no major difference between Pay-TV and free-to-air PVRs, with the exception of a Conditional Access (CA) unit required to de-encrypt the Content. Fibre To The Home (FTTH) operators in Scandinavia and Italy offer network PVRs, although their market penetration is currently very limited.

EPG-data for PVRs is usually provided via public or private data services in broadcast streams. The distribution channel for all major EPG data services is currently broadcasting via satellite, cable or terrestrial transmission. The following table contains a summary of EPG services using analogue transmission:

### 6.1.2 Available EPG services – analogue transmission

Service	Type	Main purpose	Distribution channel	Supplier	End user costs	EPG-engine	Remarks
Teletext	VBI	EPG	Satellite Terrestrial Cable•	Broadcasters or operators	Free	Teletext / VPT engine (HW/SW)	Proven, old system for Programme Information, also offering Recording (VPT). EPG data for only 2 days
GemStar	VBI Private data	EPG and Recording	Satellite Terrestrial Cable•	GemStar - company	Free (one-time payment included in price of device)	EPG-engine provided by GemStar (must be used!)	Buy service for CE- vendors if they do not want to establish their own service. EPG data for 1 week.
Tvtv	VBI Private data	EPG and Recording	Satellite Terrestrial Cable•		Free (one-time payment included in price of device)		Buy service for CE- vendors if they do not want to establish their own service. EPG data for 1 week.

•Cable TV is currently the major distribution channel in the analogue domain

### 6.1.3 Examples of PVRs currently on the European market



Panasonic TU-HMS3	DVB-S	Uses P. private data	HDD
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Samsung DSB-9691C	DVB-C	Uses DVB SI/EIT	HDD
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Technisat Digicorder S1	DVB-S	Private data + DVB-SI/EIT	HDD, „SiehFern-EPG data“ + SI/EIT, when no „private“ information available
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Humax DTT4000	DVB-T	DVB-SI/EIT	MHP
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Topfield	DVB-T	DVB-SI/EIT	
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**Not only STB's + HDD (PDRs), but also IDTVs with Record Control:**

Panasonic TX-32DTX30C	DVB-T	DVB-SI/EIT	EPG/Recording: Controls external recording devices
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The range of EPG services for digital PVRs is far more diverse than for analogue receivers.

The following table (6.1.4) covers EPGs currently available in-band on digital transmission systems while the table in 6.1.5 includes examples of EPG services for PVRs on broadband:

#### 6.1.4 Available EPG services – digital transmission

Service	Type	Main purpose	Distribution channel	Supplier	End user costs	EPG-Engine	Remarks
Teletext	VBI via DVB	EPG and Rec. (VPT)	Satellite Terrestrial Cable	Broadcasters	Free	Teletext / VPT engine (HW/SW)	Analogue Service in the digital age.
Event Info.	DVB SI/EIT	EPG and Recording	Satellite Terrestrial Cable	Broadcasters	Free*	Manufacturer's individual EIT/SI engine	Up to 8 days, quality and reliability differs from BC to BC
TV-Movie	DVB private data	EPG and Recording	Satellite	Bauer-Press	Free	MHP	Independent, MHP based Online TV-Magazine
Hörzu	DVB private data	EPG	Satellite	Hörzu TV magazine	Free	MHP	Independent, MHP based Online TV-Magazine
GemStar	DVB private data	EPG and Recording	Satellite Terrestrial (?) Cable (?)	Gemstar-Company	Free (one-time payment at device buying)	EPG-Engine provided by GemStar (Must-use!)	Buy service for CE-vendors if they do not want to establish own service.
tvvtv	DVB private data	EPG and Recording	Satellite Terrestrial(?) Cable(?)	tvvtv (Fast/Sony)	Free (one-time payment at device buying)	EPG-Engine manufacturer individual, data format by tvvtv.	Buy service for CE-vendors if they do not want to establish own service.
Various private data services	DVB private data	Recording	Satellite	CE-manufacturers	Free for vendor's devices (no access for others)	Manufacturer specific	Guiding services of PVR vendors to improve Rec. scheduling

#### 6.1.5 Available EPG services – IP networks

Service	Type	Main purpose	Distribution channel	Supplier	End user costs	EPG-Engine	Remarks
BB-VOD portal	IP	VOD selection	ADSL	Deutsche Telekom	Free	HTML/Java (Browser)	VOD Service for PCs
Media-center	IP	PVR service	Broadband (ADSL)	Microsoft (UK, France)	Free	HTML/Java (Browser)	PVR service for Media Centre

There are, however, service providers delivering EPG-data via dial-up or broadband Internet, either as a listings-only service (eg. TiVo in the US and UK) or integrated n-PVR or Video On Demand (VOD) services. Figure 6 can be extended to other territories if deemed necessary by the EBU and EICTA.

## 6.2 The 100 most time-shifted television programmes on the TiVo platform

TiVo Season Pass Top 100 (autumn 2004)

Below is the list of top Season Pass shows sampled from 20,000 anonymous TiVo households and does not include any personally identifiable viewing information.

Also available for viewing are the Top 25 TiVo Ratings.

<u>Rank</u>	<u>Title</u>	<u>Rank</u>	<u>Title</u>
1	The Apprentice	51	Dr. Phil
2	CSI: Crime Scene Investigation	52	That '70s Show
3	Desperate Housewives	53	The Real World
4	Lost	54	Stargate SG-1
5	Survivor: Vanuatu, Islands of Fire	55	The Amazing Race 5
6	Joey	56	Entourage
7	ER	57	Father of the Pride
8	The West Wing	58	Crossing Jordan
9	CSI: Miami	59	Two and a Half Men
10	The Sopranos	60	Last Comic Standing: The Search for the
11	Will & Grace	60	Curb Your Enthusiasm
12	CSI: NY	62	JAG
13	Law & Order	63	Deadwood
14	Oprah Winfrey	64	Charmed
15	Las Vegas	65	Arrested Development
16	Six Feet Under	66	Judging Amy
17	Nip/Tuck	67	North Shore
18	Scrubs	68	60 Minutes
19	Law & Order: Special Victims Unit	69	The King of Queens
20	24	70	American Dreams
21	Without a Trace	71	The Shield
22	Queer Eye for the Straight Guy	72	NCIS
23	Everybody Loves Raymond	73	Newlyweds
24	American Idol	74	The Wire
25	Enterprise	75	Fear Factor
26	Saturday Night Live	76	Everwood
27	Law & Order: Criminal Intent	77	Mythbusters
28	The Simpsons	78	The Dead Zone
29	Monk	79	Wife Swap
30	Alias	80	Da Ali G Show
31	Cold Case	80	Big Brother 5
32	Smallville	82	Days of Our Lives
33	The Bachelor	83	Jack & Bobby
34	Sex and the City	84	Hawaii
35	NYPD Blue	85	Seinfeld
36	The Daily Show With Jon Stewart	86	Family Guy
37	Rescue Me	87	The 4400
38	Chappelle's Show	88	The Ellen DeGeneres Show
39	Extreme Makeover: Home Edition	89	Blue Collar TV
40	Boston Legal	90	Reno 911!
41	Friends	90	Trading Spouses: Meet Your New Mommy
42	Joan of Arcadia	92	America's Next Top Model
43	LAX	93	Malcolm in the Middle
44	South Park	94	7th Heaven
45	Third Watch	95	Navy NCIS
46	Stargate Atlantis	96	General Hospital
47	Medical Investigation	97	Airline
48	Gilmore Girls	97	dr. vegas
48	The O.C.	99	The Casino
50	American Chopper	100	Dead Like Me



## 6.3 PVRs in Italy, Portugal and Spain

### 6.3.1 Spain

#### 6.3.1.1 Market overview

The Spanish market (14 million households / 26 million TVs) is basically configured by:

- Analogue Terrestrial (~99,5%. ~80 as main reception)
- Digital Satellite (~23%)
- Analogue & digital Cable TV (~7%)
- Digital Terrestrial (still marginal. ~1%)
- ADSL TV (marginal.) Service available only in Madrid, Barcelona and Alicante.

#### 6.3.1.2 DVB-T

##### *DTT timeline*

- May 2000: DTT starts as a pay-TV service named QuieroTV. Quiero TV uses 3 and ½ multiplexes.
- April 2002: free-to-air national broadcasters start simulcasting their analogue services. The 5 main broadcasters (TV1, TV2, Antena3, Tele5 and CanalPlus) share a single multiplex. No bandwidth is available for better video, extra audios or any interactive service.
- June 2002: The remaining ½ not used by QuieroTV is used by Net TV and Veo TV (two “digital only” TV stations)
- July 2002: QuieroTV collapses
- Some regional TV stations (Madrid, Catalunya, Basque country) have also started simulcasting of their analogue TV services.
- 2010: Analogue switch-off.

Nothing has happened since 2002 and DTT is frozen for two major reasons:

- 1) As there has been no multiplex re-assignment for the national broadcasters, they can offer no new or enhanced Content neither do they want to spend a single extra euro on their DTT signal.
- 2) As the offer on DTT is less interesting than on analogue terrestrial TV, consumers are not attracted by the DTT. Several zappers and MHP receivers are available on the Spanish market.

Multiplex 1	Multiplex 2	Multiplex 3	Multiplex 4	Multiplex 5
Still not assigned	Still not assigned	Still not assigned	Still not assigned	TV1
Still not assigned	Still not assigned	Still not assigned	Still not assigned	TV2
Still not assigned	Still not assigned	Still not assigned	Still not assigned	Antena3
Still not assigned	Still not assigned	Still not assigned	Net TV	Tele5
Still not assigned	Still not assigned	Still not assigned	Veo TV	CanalPlus

The Spanish Administration has now (30 Dec 2004) published new DTT regulations in order to break the current situation. It is expected that up to 14 new TV services will be available by autumn 2005.

Under the current scenario it is not surprising that the available EPG data is very poor or even non-existent.

There is no regulation concerning EPG data in Spain. Broadcasters are supposed to follow the DVB specifications that require, as a minimum, the availability of the EIT p/f table.

#### **EIT tables national broadcasters**

- TV1, TV2, Antena3, Telecinco, Net TV and Veo TV do not provide any EIT data at all
- Canal Plus provides EIT p/f only



#### **EIT tables regional broadcasters**

- Televisió de Catalunya (TVC) agreed to provide EPG data (and an EPG application) when they were given the digital license. TVC is currently broadcasting EIT p/f and 72-48 hours in advance of EIT scheduled tables.
- ETB (Basque Country regional broadcaster) has EIT p/f and the EIT scheduled for today and the next day
- TeleMadrid and La Otra provide EIT p/f from time to time. EIT sch. is not used.

Among the broadcasters using EIT schedule tables nobody is really taking care of the proper use of the event\_id.

Retevisión (the main Spanish network operator) is providing an API to the broadcasters to input EIT p/f and EIT scheduled to their services. This feature is not currently used by anybody.

The broadcasters inside the Technical group of the Spanish DTT Forum agreed a document describing the EIT tables: Content, maximum text length, genres, etc. The document is final but it has neither been formally approved nor adopted by anybody.

#### **Teletext on digital TV**

Teletext service is widely implemented by the Spanish broadcasters and people is really used to it on the analogue TV world. Doing a fast test on the available DTT signal in Barcelona:

- TV1 and TV2 share the same teletext. It includes the schedule for today and tomorrow for TV1, TV2, TVE-Internacional (satellite service) and several national public radio stations. Extended information for movies is also available.
- Tele5 publishes the schedule for today for all the national and regional broadcasters. Additionally they provide extra information for their movies and TV-series.
- Antena 3 service is not very stable and the TV schedule pages were broken at the moment of the test.
- Net TV, Veo TV and Canal Plus do not provide Teletext services.
- Televisió de Catalunya has the schedule information for the following 2 days, only for the TVC channels and radio stations. Special pages host information about movies and soap operas. A special service on the TVC teletext is on the page 333 (What's on), an EIT p/f like service with most of the teletext page transparent.



### TV listing websites

Browsing on the official websites of the TV stations shows that the schedule information is widely available:

- TV1 and TV2 (<http://www.rtve.es>). Schedule for today. Website is very poor.
- Tele 5 (<http://www.telecinco.es/>). Today and tomorrow schedule is available. Links to independent websites for other channels schedule.
- Antena 3 (<http://www.antena3tv.com>). Two days of schedule are available. Links to independent websites for other channels schedule.
- NetTV or VeoTV do not provide any schedule.
- TVC, (<http://www.tvcatalunya.com/>) has EIT p/f like information on “what's on now on TV”.



The user can also find all TVC's schedule one week in advance for any of the TVC channels (<http://www.tvcatalunya.com/ptvcatalunya/tvcProgramacio.jsp>).

AHIR	AVUI	DIMECRES	DIJOUS	DIVENDRES	DISSABTE	DIUMENGE	DILLUNS
MATÍ. DE 07.00 A 14.00	TARDA. DE 14.00 A 19.00	VESPRE. DE 19.00 A 23.00	NIT. DE 23.00 A 07.00				
TV3	K3 33	3/24	3/24	TVCi			
19:40 Totes aquelles cançons	(cont) Esports 33 Motor a fons	(cont) Blocs 3/24	19:15 Bèsties L'òliba 19:40 Totes aquelles cançons				
20:30 Telenotícies vespre	20:30 Castells Concurs de Colles Castelleres		20:30 Telenotícies vespre				
21:25 El temps 21:35 30 minuts Trenta minuts			21:25 El temps 21:30 30 minuts Trenta minuts				
22:20 Gol a gol	22:00 Silenci? 22:30 Karakia Dolç espai de memòria - 2		22:20 Gol a gol				

- Telemadrid, Euskal Telebista and other regional broadcasters also provide TV schedule information ranging from one day to one week in advance.

Several independent TV listing websites are also available:

- <http://www.teletexto.com/> (3 days in advance)
- <http://www.t-p.wanadoo.es> (current week schedule until next Sunday)
- <http://www.elsemanaltv.com/> (1 week in advance).

It is worth mentioning that the details of TV programmes are often not available more than 4 days in advance on the independent sites, but you can usually find the details on the broadcasters official website.

### XMLTV

As reported at <http://membled.com/work/apps/xmltv/>, at present there are backends grabbing TV listings for Canada, the USA, the UK, Germany, Austria, Finland, Spain, Italy, the Netherlands, Hungary, Denmark, Japan, Sweden, France, Norway, and Romania.

Grabber for Spain - Analogue Terrestrial/Cable (tv\_grab\_es) [no].

XMLTV seems not to be a popular subject in Spain yet. A search for “XMLTV españa” returns very few results.

### **Conclusion**

EPG information is somewhere inside the IT systems of the free-to-air terrestrial broadcasters and/or 3<sup>rd</sup> parties but it is not currently being delivered using the DVB service information specified mechanisms.

As already mentioned, Retevision is offering an API to the broadcasters but broadcasters have not invested the time and resources to complete the Service Information integration.

### **6.3.1.3 DVB-S**

#### **Free-to-air**

The free-to-air digital satellite market in Spain is small. Some national (Antena3, TVE, etc.) and regional TV stations broadcast a single TV service (best-of-breed internal production) on Astra and/or Hispasat satellites: TVC Internacional, ETB Sat, Canal Canarias, Andalucia TV, etc.

Television Española (TVE), the national public broadcaster, is the only exception by broadcasting several TV services: TVE Internacional, Canal Clásico, Canal 24 horas, Teledporte, Canal Nostalgia and Grandes documentales.

FTA Spanish channels list can be found at <http://www.lyngsat.com/freetv/Spain.html>.

Even though these are FTA channels they are usually offered inside the Pay-TV platform package and they can be found inside the platform EPGs.

These are TV services with few live programmes so the TV schedule is very static. The information can be found at:

- Interactive services
  - Miniguide (present/following)
  - EPG (up to 7 days in advance)
- EIT
  - EIT p/f standard
  - EPG data for OpenTV(Hispasat) using proprietary format for 3 days in advance.
  - EPG data for Mediahighway(Astra) was reported to use standard EIT sch. for 7 days in advance.
  - A test with a FTA Samsung DVB-S receiver failed to collect any EIT scheduled tables on the Spanish channels operating via Astra satellite.
- Some terrestrial teletext services are also broadcasted on the satellite service. Few of them contain information about the satellite schedule.
- Broadcasters websites: <http://www.antena3tv.com/internacional/>,  
<http://www.tvcatalunya.com/ptvcatalunya/tvcSeccio.jsp?seccio=tvci>
- Digital+ (payTV platform) website. Weekly schedule per each of the channel contained in their offer: [http://www.plus.es/codigo/television/rejilla\\_dia\\_dia.asp](http://www.plus.es/codigo/television/rejilla_dia_dia.asp)
- Monthly paper magazine for the Digital+ subscribers.

**Pay-TV**

In 2003 the two pay-TV digital satellite platforms merged into a single platform:



Digital+ has 2,5 million subscribers (~23% penetration). The platform's target is to reach 3 million households by the end of 2005, with a penetration of ~35%.

As in other pay-TV platforms you can get their TV listings via:

- Monthly magazine
- Interactive services as mentioned above
- Official website ([http://www.plus.es/codigo/television/rejilla\\_dia\\_dia.asp](http://www.plus.es/codigo/television/rejilla_dia_dia.asp)). It contains information up to 1 week in advance for each of their channels.

Regarding PVRs, Digital + had two different projects before the merge:

- Via Digital: They were developing a PDR box. Several thousands boxes were even installed at subscribers households.
- Canal Satellite Digital: PilotTime (Thomson G2 Box). Already in use in France.
- After the Via Digital/Canal Sat. merge and NDS(XTV technology) acquiring Canal Plus Technologies it is still unclear the future plans of Digital+ platform regarding PVRs.

**Websites**

Several websites provide detailed information about the available satellite TV services. The best example is <http://www.lyngsat.com/>

Additionally some websites grab the available EIT information from satellite feeds and publish it:

<http://www.eurotv.com>

<http://www.satmania.com/eng/tvguide/now> (EIT p/F)

<http://www.satmania.com/eng/tvguide/weekly/> (EIT sch)

Complex searches can be performed <http://www.satmania.com/eng/tvguide/search>

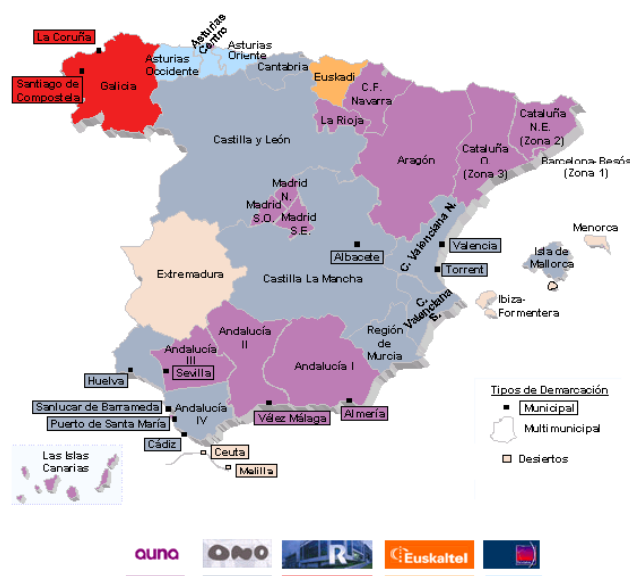
**XMLTV**

The information of Digital+ can be gathered using:

Grabber for Spain - Digital Satellite (D+) (tv\_grab\_es\_digital) [no].

**6.3.1.4 DVB-C**

Spain has been divided into several regions allocated to different cable operators.



Cable operators provide mainly analogue TV services. At least, AUNA and ONO are “digital only” for new subscribers but remain analogue for the old ones.

Cable TV is not very popular in Spain, figures from late 2003 reported around 858.000 subscribers as a global figure. The offer of cable TV channels ranges from:

- Analogue: 20 to 44 channels
- Digital: 50 to 150 channels.

Countries	Major cable operators	N. of cable channels available (~)	N. of subscribers		basic		premium		VOD
			hh	% of TV HH	price	no of channels	price	no of channels	
Spain	ONO	41	858.380	6%	€ 14,9	20	€ 53,9	154	€ 3,0
	AUNA Telecomunicaciones				€ 18,0	44	€ 33,0	52	€ 3,0
	Retecal				€ 15,0	35	€ 21,3	39	€ 3,0
	Euskaltel				€ 12,4	32	€ 29,6	49	€ 3,0
	Telecable				€ 15,0	32	€ 25,0	na	€ 3,0
	R Cable				€ 15,2	37	€ 25,7	44	€ 3,0
	Tenaria				€ 16,2	40	€ 25,0	43	€ 3,0

This study concentrates on AUNA and ONO only, the leading Cable-TV operators.

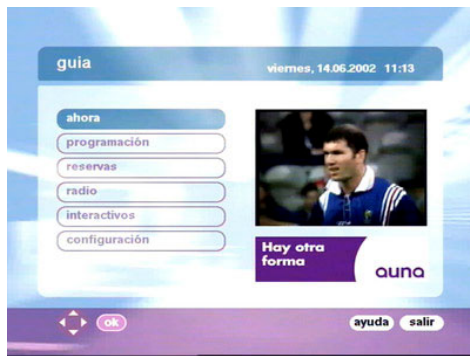
### TV listings information

#### Analogue services:

- Ono: On the teletext information. Today and tomorrow
- Auna: No information is provided at all on the analogue cable.

#### Digital services:

- Ono: Standard EIT p/f and EIT sch. are used. The available data covers 12 hours in advance.
- Auna: Provides two interactive services. Miniguide (what's on) and an EPG. The data used to feed these applications is DVB compliant (EIT p/f and EIT sch.) providing 3 and a half days of information in advance.



### Websites

<http://tu.auna.es/>

- TV listings are available for the next 7 days on all the channels
- Special listings offer cinema and football for the whole current month.

<http://www.ono.es/default.asp?p=01&o=03&s=11Dsas>

- TV listings are available for the next 30 days in some of the channels (FOX) but other only contain 1 week in advance (regional TV stations like TVC)
- Special thematic listings are available for cinema and football.

Independent websites (<http://www.elsemanaltv.com/>) do not offer cable-TV listings.

### 6.3.1.5 Broadband (ADSL/PLC)

#### Penetration

- Telefónica Spain has heavily invested on ADSL, both at a technical and at a commercial level.
- As a result the number of installed ADSL lines is bigger than 2 million. Around 25% of the people that use the Internet has an ADSL line installed.
- Around 14-15% of the households with TV have ADSL lines installed.
- Although the speed of the ADSL lines was doubled on 1<sup>st</sup> Oct 2004, Spanish ADSL lines remain a bit slower than other European ADSL lines.



PROVEEDOR	TIPO DE TARIFA	PRECIO EN EUROS SEGÚN LA VELOCIDAD DE DESCARGA				
		256 KB	512 KB	1 MB	2 MB	4 MB
	PLANA	no	38,95 €	74,95 €	119,95 €	149,95 €
	ONDULADA	no	31,50 € DESDE LAS 16 H Y FIN DE SEMANA 19,95 € + tiempo*			
	PLANA	32,90 €	36,00 € INCLUYE LLAMADAS			
	ONDULADA		39,00 € SIN LLAMADAS			
	PLANA		29,90 € DESDE LAS 18 H Y FIN DE SEMANA	74,98 €	120,00 €	150,57 €
	ONDULADA		42,04 €			
	PLANA		35,90 € (4 horas al día)**			
	ONDULADA		29,95 € DESDE LAS 18 H Y FIN DE SEMANA			
	PLANA		39,07 €	74,98 €	120,00 €	150,97 €
	ONDULADA		Pendiente de aprobar			
	PLANA	no	37,05 € (TARIFAS CON EQUIPOS DEL CLIENTE)	39,00 €***	114,00 €	161,50 €
	ONDULADA					
	PLANA	29,90 €	29,95 € ESTOS PRECIOS ESTÁN SUJETOS A LA DISPONIBILIDAD DE COBERTURA PROPIA	33,95 €	44,95 €	59,95 €
	ONDULADA					
	PLANA	no	39 €	74,95 €	120,00 €	149,95 €
	ONDULADA					
	ADSL	32,90 €	39,00 €	75,00 €		
	Cable	35,00 €	29,90 € DESDE LAS 18 H Y FIN DE SEMANA			
			39,00 € (600 KBPS)	45,00 €		

\*Máximo: 39,95 € \*\*Máximo: 45,00 € \*\*\*Precio de los tres primeros meses. Después, 43,20 €

### Power Line Communications (PLC)

The PLC commercial offer (Auna and Iberdrola) is very limited and is only available in selected areas of Madrid, Barcelona and Zaragoza. It is a very expensive option compared with cable and ADSL offers.

### Imagenio

Telefonica Imagenio

(<http://www.telefonica.es/tol/imagenio.html>) is offering TV over the ADSL connection. The offer is only available at some cities: Barcelona, Madrid and Alicante, so the number of subscribers is very small (4000 at the moment). They want to expand the services to more cities and reach 20 000 subscribers by the end of 2004.



22 TV channels are available along with some NVOD films and VOD Content like TV-series, music clips, etc.

Being non DVB compliant the service information is offered using interactive services (HTML + Javascript based).

A very limited TV listing is available at the Imagenio website but the users can receive up to 7 days for all the channels.

The national regulator (CMT) said late September that Imagenio service operated by Telefónica Cable is illegal, or at least it should not be operated by "Telefónica Cable" [http://www.cincodias.com/articulo.html?xref=20040915cdscdiemp\\_14&type=Tes&anchor=cdssec](http://www.cincodias.com/articulo.html?xref=20040915cdscdiemp_14&type=Tes&anchor=cdssec).



### TVC over Internet

TVC is about to release in public a branded multimedia player to be used by broadband users:



- Access to the digital library of the Catalan Corporation of Radio and TV(CCRTV)
- Boost the broadband penetration
- 500 new videos each week
- Modes: live TV and VOD.

A lot of Metadata is managed but it is neither TV-Anytime nor DVB compliant.

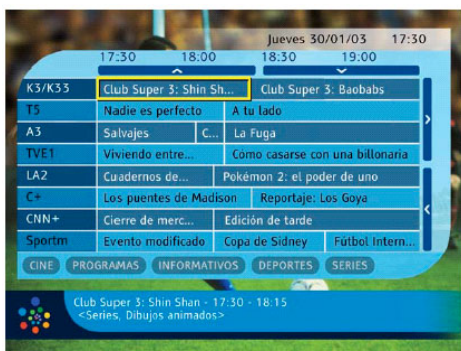
### 6.3.1.6 Other solutions

#### InOut TV

InOut TV is a PVR/DVD/MP3/etc. product "made in Spain": <http://www.inout.tv>. The project is backed by the most famous Internet pioneer in Spain, Eudald Domènech.

#### a) First generation (Full Home Media Center)

The InOut TV first generation product offered a self-feed TV guide that provided only 1 week in advance TV listings of the free-to-air and Digital+. It claims to be "the only" synchronized guide with very deep information detail. The guide can be run as an interactive service resident in the STB: <http://www.inout.tv/SincroGuia/index.php>.



The system has a special download channel on Astra to feed the EPG and other data. They claim to use TV-Anytime compliant information but more detailed analysis should be carried out to confirm this point.

*"Each reference file included in this guide has been produced by the InOut TV editorial team, in accordance with the TV-Anytime Forum standard. The information is therefore provided in a uniform, informative and comprehensive style."*

The end-user must subscribe to the EPG data service, and the InOut TV product has not been a commercial success so far.

### **b) Second generation**

InOut has developed a scaled-down version of the original product that will be sold for around 300€. It is a DVB-T PDR with an external hard disk (USB, they offer a HD for 99€). It also has an Ethernet connector that can be used to browse Content stored on a networked PC or even to use the hard disk of this PC as a storage medium (thus saving 99€).

InOut has rented some bandwidth on a multiplex with national coverage to deliver the EPG data (7 days in advance). The user requires no subscription to receive this data. The data can be updated in real time (few seconds delay) so the scheduled recording can adapt to new programme schedules, over-runs of live sports programmes etc..

The format of the data is unknown but should be close to the TV-Anytime standard.

During the night, extra available bandwidth is used to push video Content to the boxes (movie trailers, extended commercials, etc.).

The first PDR product from this second generation will be Carrefour branded and available in the top 50 Spanish Carrefour malls by Christmas 2004. The product plans to start an European wide expansion soon.

### **6.3.1.7 Available products**

#### ***PC based***

You can construct your own PVR product using a PC together with a PCI card or USB device to receive analogue and/or digital TV.

Suitable devices include:






- Hauppauge WinTV-PVR-250, WinTV-PVR-250MCE, WinTV-PVR-250BTV or WinTV-PVR-350
- Hauppauge WinTV-PVR-usb2 Model 941 (with version 1.4 or later)
- Hauppauge Roslyn (Blackbird) card (SageTV V2 or later)
- AVerMedia M150 (Blackbird) card (SageTV V2 or later)
- Yuan MPG600 (SageTV V2 or later)
- Prolink Pixelview PlayTV@P7000 (SageTV V2 or later)
- ATI eHome Wonder (SageTV V2 or later)
- Ips BSRV2 (DVB-S, VES1893 based)
- stv0299 based tuner modules
- Grundig 29504-401 (DVB-T, L64781 based)
- Grundig 29504-491 (DVB-S, TDA8083 based)

A variety of 3rd party software is available to enhance the PVR experience:

<p><a href="http://www.cadsoft.de/vdr/index.htm">http://www.cadsoft.de/vdr/index.htm</a></p> <ul style="list-style-type: none"> <li>From linuxtv.org.</li> <li>EIT grabbing</li> </ul>	
<p><a href="http://www.mythtv.org">Http://www.mythtv.org</a></p> <ul style="list-style-type: none"> <li>Linux Open Source</li> <li>XMLTV based</li> </ul>	
<p><a href="http://www.showshifter.com/">http://www.showshifter.com/</a></p> <ul style="list-style-type: none"> <li>Windows. Commercial</li> <li>XMLTV based</li> </ul>	
<p><a href="http://www.freytechnologies.com/">http://www.freytechnologies.com/</a></p> <ul style="list-style-type: none"> <li>Windows. Commercial</li> <li>XMLTV based</li> </ul>	

**STB products**

In some of the Spanish websites of the major CE manufacturers it is posible to find:

<p>Philips HDRW720/00</p> <ul style="list-style-type: none"> <li>• Guide Plus+. Feed via teletext or teletext like service</li> <li>• <a href="http://www.europe.gemstartvguide.com/uk/media/factsheets2.html">http://www.europe.gemstartvguide.com/uk/media/factsheets2.html</a></li> </ul>	
<p>Panasonic DIGA products.</p> <ul style="list-style-type: none"> <li>• Highlighted on the main page of the website</li> <li>• DMR-E500 star product. 400 GB. Not yet ready for Spanish market</li> <li>• <i>EPG function available on the DMR-E85 and DMR-E500. To use this function, you have to connect your DVD recorder to a TV antenna, or cable TV feed and receive broadcasts that include EPG data in the transmission.</i></li> <li>• <i>In Canada, TV GUIDE is a registered mark of Transcontinental Inc., and is used under license by Gemstar-TV Guide International, Inc. TV Guide On Screen, G-LINK, VCR Plus+ and PlusCode are registered marks of Gemstar-TV Guide International and/or one of its affiliates.</i></li> </ul>	
<p>Sony RDRHX900S (among other models)</p> <ul style="list-style-type: none"> <li>• ShowView</li> <li>• VPS/PDC</li> </ul>	
<p>Kiss DP 558 DivX</p> <ul style="list-style-type: none"> <li>• KML-language based (Kiss patent pending). 3rd parties are developing KML pages/services too.</li> <li>• <i>The EPG covers all the TV stations available in Europe.</i></li> <li>• In a forum it was said that the EPG contains 19 Spanish channels (national and regional major broadcasters).</li> <li>• I don't know if it is ready for Spain, Italy or Portugal.</li> </ul>	
<p>Sigmathek PVR 800 DivX 80GB</p> <ul style="list-style-type: none"> <li>• Analogue tuner</li> <li>• Removable HD</li> <li>• No info about the EPG. TV recording seems not to be a main feature.</li> </ul>	

More links:

- <http://www.tododvd.com/>
- <http://www.dooimagen.com/>
- <http://www.milar.es/>
- <http://www.pixmania.com>
- <http://www.elcorteingles.es>

For PVR product reviews visit:

[http://www.ecoustics.com/Home/Home\\_Video/Digital\\_Recorders/](http://www.ecoustics.com/Home/Home_Video/Digital_Recorders/).

## 6.3.2 Italy

### 6.3.2.1 Market overview

In Italy, television is primarily distributed via terrestrial analogue to 20 million households. Channel occupancy is very close to spectrum saturation.

- Digital Satellite. Sky Italia ( 5 million subscribers. ~25% hh)
- Digital Terrestrial (1 million MHP STBs at the end of 2004. ~5% hh)
- ADSL TV (300K subscribers. ~1,5% hh).

### 6.3.2.2 DVB-T

The new law on the Radio/TV and media sector in Italy boosted the DTT launch (Dec 2004) with a fast market penetration due to an aggressive campaign and the subsidy (150€) for the MHP boxes (offer limited to the first 900.000 units approx. / 120M€ total).

The current DTT offer, to reach 50% of the population at the end of 2004 and growing.

Programmi televisivi e radiofonici trasmessi dai MUX con copertura superiore al 50% della popolazione – situazione al 30 aprile 2004.

#### TV e radio nazionali

Multiplex Nazionali	Canali ricevibili anche in terrestre analogico	Nuovi canali terrestri	Radio
Dfree	Canale 5 Italia 1 SI Dfree	LCI Dfree Radio Italia tv	
LA7/MTV	LA7 MTV ITALIA		
RTI	Rete 4	24ore.tv Class News Coming Soon BBC World VJ TV	
Mux A - Rai	RaiUno RaiDue RaiTre		
Mux B - Rai		RaiSportSat RaiNotizie24 Rai Edu 1 RaiUtile RaiDoc	Radiouno Radiodue Radiotre FD auditorium

Programmi televisivi trasmessi da MUX di emittenti nazionali – situazione al 30 aprile 2004.

Multiplex	Canali ricevibili anche in terrestre analogico	Nuovi canali terrestri	Copertura
Home Shopping Europe Broadcasting	Home Shopping Europe	Canale civico di Lucca	Province Lucca, Pisa e Livorno
Elefante TV Telemarket	Elefante TV Telemarket		Bologna

Regione	Emittente locale	Copertura	Nuovi canali
Piemonte	TLT Spa Telecupole	Comune Torino e dintorni	
Emilia Romagna	Sesta Rete Italia7 Gold Nuova Rete Rete Otto	Città di Bologna	
Lazio	Super 3 Spa	Comune di Roma e provincia	
Sardegna	Videolina TCS	Cagliari Cagliari	
Toscana	RTV 38 Spa	Firenze, Arezzo, comuni Val d'Arno, Orvieto e Pesaro	TV: _RTV38 News _Hit Channel  Radio: _RTL 102.5 _Radio Blu

Regional multiplexes. 30 April 2004

DGTV (non-profit association) was created to promote the launch and development of DTT in Italy. From <http://www.dgtvi.it> you can download the attached D-book. In the EIT chapter it is stated that:

- EIT p/f are mandatory
- EIT sch. remain optional.

It is expected to cross-carry EIT among the main national multiplexes.

At the moment, Mediaset is providing p/f information on all its channels (Italia 1, Rete 4, Canale 5). These channels are carried on 2 different muxes. While Rete 4 is carried on RTI mux (owned by Mediaset), Canale 5 and Italia 1 are carried on D-Free Mux.

Rai broadcast EIT p/f for all its channels on DTT both those in simulcast and those that are new on the DTT.

Analogue teletext is available on digital channels too and it contains listing of all the analogue channels (those in simulcast) but not of the DTT new channels.

No information regarding the regional multiplexes was available.

Mid terms plans are to create, within the DGTVi, specs for a common national EPG that will get data from every single channel. Format of these data is still under discussion.

### Websites

RAI offers a comprehensive website (<http://www.rai.it/guidatv>) including TV listings information for their main 3 channels. The fact is that the new "DTT only" channels are not available on their website.

The same applies for Mediaset (<http://www.mediasetonline.com/guidatv.jsp>), providing information for Canale5, Italia1 and Rete4.



per avere la versione per la stampa

CANALE 5	ITALIA 1	RETE 4
Mattina	Mattina	Mattina
06.00 TG5 - PRIMA PAGINA	06.00 STUDIO APERTO - LA GIORNATA	06.00 LA MADRE
07.55 TRAFFICO	HAPPY DAYS - UNA SITUAZIONE IMBARAZZANTE	06.30 IL BUONGIORNO DI MEDIASHOPPING
07.57 METEO 5	06.10 HAPPY DAYS - UNA COPPIA DI INVENTORI	06.40 INNAMORATA
07.58 BORSA E MONETE	06.35 FRANKLIN - FRANKLIN E LA FATINA DEI DENTI	07.15 PESTE E CORNA E GOCCE DI STORIA
08.00 TG 5 - MATTINA	07.02 I PUFFI - L'ULTIMO CESPUGLIO DI	TG 4 - RASSEGNA STAMPA
08.50 VERISSIMO MATTINA		07.20 HUNTER - IL RUSSO - I PARTE
09.30 TG 5 BORSA FLASH		07.40 VIVERE MEGLIO
09.33 TUTTE LE MATTINE		08.45 SAINT TROPEZ -
11.30 SECONDO VOI		
11.40 GRANDE FRATELLO		
12.27 TRE MINUTI CON MEDIASHOPPING		
12.30 VIVERE - 1282		

Regarding other channels broadcasted on DTT, some provide scheduling information on their own websites (<http://www.24oretv.ilsole24ore.com/frP.htm>) but other offer very poor information (<http://www.vjtelevision.it/>).

SkyItalia is offering a detailed 1 week TV guide on <http://www.skytv.it/GuidaTv/>.

### **XMLTV**

tv\_grab\_it - XMLTV-grabber for Italy.

It is not known if this contains any information about the new digital only TV services.

### **6.3.2.3 DVB-S**

- In 1996 DVB-S started with RAI offering FTA channels on Hot Bird 2 and Pay-TV services provided by Tele+ and Stream.
- In 2003 Sky Italia becomes the unique pay-TV platform. Tele+ is not using its DTT mux.
- Today more than 5 million satellite dishes are installed for the reception from Eutelsat and Astra.

Sky Italia is providing a 7 day EPG to their subscribers but a test with a FTA DVB-S receiver failed to collect any EITs, so it seems they are using non-standard formats to feed their boxes.

Free to air DVB-S TV in Italy is important <http://www.lyngsat.com/freetv/Italy.html>.

Testing with a FTA DVB-S receiver, we had different results:

- RAI is providing a very complete set of information (EIT sch. for several days) on Astra but just EIT p/f on Hotbird
- Canal 5 was not providing any information at all.

### **6.3.2.4 ADSL TV**

There is no DVB-C operator in Italy since the only cable provider active in Italy, Fastweb, is in fact using a video over IP proprietary standard for television that has nothing to do with DVB. They provide 7 day schedules too.

### **6.3.2.5 Available products**

By this time, there are very few PVR models on the Italian Market and very few of them were sold.

### 6.3.3 Portugal

#### 6.3.3.1 Market overview

In Portugal there are around 4 million households. The market configuration is:

- Terrestrial - Analogue (67,2%)
- Cable - Analogue & digital (27%)
- Satellite - Analogue & digital (9,3%).

#### 6.3.3.2 DVB-T

DVB-T legislation is in place since 2000. Portugal's only DTT licensee lost its licence in 2003. So, DVB-T will not start for now in Portugal.

#### 6.3.3.3 DVB-S

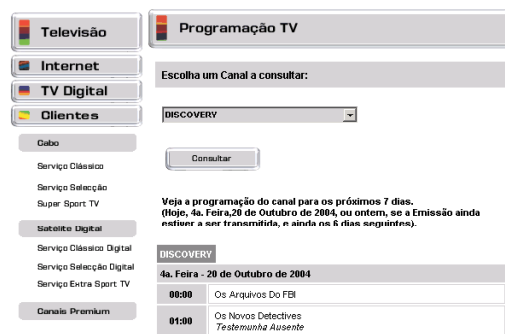
TV Cabo has around 323 000 subscribers (7%).

TV-Cabo reported that EIT p/f is provided in all their channels. EIT scheduled for 7 days is provided in the IPPV channels (6 channels).

Free to air DVB-S TV in Portugal is not very important

<http://www.lyngsat.com/freetv/Portugal.html> (just 7 DVB services available).

RTPI is providing a detailed TV listing using EIT schedule on Astra but no information is provided on their Hotbird signal.



#### Website

TV Cabo website provides 1 week in advance information for all their satellite and cable channels.

#### 6.3.3.4 DVB-C

12 operators are authorized but only TV Cabo(1 334 000 subs.) is digital at the moment.

TV-Cabo reported that EIT p/f is provided in all their channels. EIT scheduled for 7 days is provided in the IPPV channels (6 channels).

Cabovisao (250.000 customers) is analogue at the moment, but they are planning switch to digital and use DVB EIT sch to cover 1 week of TV programming in advance soon.

#### Website

TV Cabo website provides deep and detailed information. On the other hand at the Cabovisao website I have only found highlights of the week on different channels.

#### 6.3.3.5 XMLTV

Grabber for Portugal (tv\_grab\_pt).



### 6.3.4 Extra comments

- Should we comment something regarding the local TV stations? That are a very important TV industry in Italy and Spain at least.

PSX sony:

- <http://www.sony.net/SonyInfo/News/Press/200310/03-1007E/>
- Terrestrial analog(VHF1-12ch,UHF13-62ch,CATV13-35ch)
- BS satellite analog(1,3,5,7,9,11,13,15ch)\*10
- DESR-5000 160GB / DESR-7000 250GB.

Vaio Type X:

- <http://www.gizmodo.com/archives/sony-vaio-type-x-super-tivo-launches-022727.php>
- Sony's Vaio 'Type X' - the Japanese giant's so-called Tivo-killer - launched recently. A 3.60GHz Pentium 4 comprises the heart of this PVR, with 1Gbyte of DDR and 1Tbyte (4x250Gbyte RAID 0) of storage standard. You can simultaneously record up to seven programmes at once and store so many of them that you'll likely deplete national bon-bon supplies.



## 6.4 Technology options for the provision of Metadata services

Preceding chapters of this report have shown that Europe's Free-To-Air broadcasters and their partners in the value chain have already entered a period of significant technological disruption.

The greatly increased choice arising from multi-channel broadcast television and new forms of screen-mediated entertainment and usage (from games to shopping) and the increasing ability of users to exercise control over the ways in which they view (including asynchronous viewing enabled by local and remote storage), are forces that cannot be ignored.

Broadcasters who avoid prompt action in response to the challenge of these emerging technologies risk paying a very high price in terms of lost visibility to viewers (i.e. lower viewing figures than necessary starting right now, and getting worse as time goes by), and higher catch-up costs in the future.

In 2003, the EBU BMC Project Group B/ITVA, which received inputs from equipment manufacturers as well as broadcasters, identified the first signs of these challenges (BMC 877 at the end of this appendix).

The conclusions of the working group are all reinforced by the statistics for the subsequent period, and updated projections for the future that are contained in this report.

The main conclusion was that "the delivery of listings data for EPGs in a standardised, open format is vital to the successful introduction and growth of digital television services".

Similarly, the urgency to act on the previous working group's recommendations (BMC 867R1 at the end of this appendix) has also been reinforced.

The key technical recommendations are that EBU members should:

- Adopt "a common approach to the provision of EPG information using TV-Anytime description and signalling data".
- Promote "adoption of an EBU 'basic' profile ... as a common position [with support by manufacturers] for the introduction of digital services that support TV-Anytime functionality [for PVRs]". Indicative "intermediate" and "advanced" profiles were also suggested for adoption in subsequent stages of implementation.
- Consider "the alternative provision of listings data via broadband Internet, based on solutions developed in TV-Anytime and DVB-IPI".

In this appendix we review the appropriateness of TV-Anytime in the light of developments since the earlier report and compare and relate it to other Metadata formats that have emerged in the intervening periods.

### 6.4.1 TV-Anytime

#### 6.4.1.1 A standard for a Metadata schema

TV-Anytime is an open standard for describing and efficiently transmitting description and signalling data needed by PVR services. The standard has been developed by an international consortium of electronic device manufacturers, software solution providers and broadcasters including:

- |   |                                |
|---|--------------------------------|
| • BBC - British Broadcasting Corporation    | • NDS Ltd.                     |
| • DR - Danish Broadcasting Corporation      | • onTV Europe Ltd.             |
| • ETRI (Electronics & Telecomm. Res. Inst.) | • Philips Consumer Electronics |
| • Expway                                    | • Sagem                        |

- France Telecom
- IRT (Institut für Rundfunktechnik)
- Nagravision SA
- Sony Corporation
- Tokyo Broadcasting System Inc.

TV-Anytime has been standardised by the ETSI and has been adopted by the following standardisation bodies:

- DVB (Digital Video Broadcasting)
- ATSC (Advanced Television Systems Committee)
- ARIB (Association of Radio Industries and Businesses)
- IPTC (International Press Telecommunications Council).

#### **6.4.1.2 An extensible format**

TV-Anytime uses XML, the eXtensible Markup Language, as the common representation format for Metadata. This widely used format offers interoperability, extensibility, and allows separation between data and presentation.

In addition, powerful XML tools such as XML Schema Validation, XSL (XML Stylesheets), X-Query, and native XML repositories are widely available to process and manage XML data.

#### **6.4.1.3 An efficient format**

As the XML textual format tends to be rather verbose, TV-Anytime uses an optimised binary encoding mechanism, based on MPEG-7 BiM, to reduce the bandwidth needed to transmit TV-Anytime information.

The compression ratio of BiM compared to the textual XML representation is about 12 to 15 times, allowing more data to be transmitted more often.

TV-Anytime provides a fragmentation and updating mechanism to allow changing a particular description in the EPG without interfering with the descriptions that are still relevant.

#### **6.4.1.4 Network independent**

TV-Anytime is independent of the transport layer. The DVB standardisation organisation has specified the transmission of TV-Anytime information over satellite and digital terrestrial broadcast networks. Ongoing specifications are standardizing the carriage of TV-Anytime over IP and Mobile networks.

TV-Anytime is suitable for transmission in both unidirectional (broadcast) and bi-directional (online) architectures. A unique format fits all.

#### **6.4.1.5 Middleware independent**

TV-Anytime is independent of the middleware, the application, and the presentation layers. It can be used in thin and fat clients, on any system, set-top box, computer or cell phone.

#### **6.4.1.6 Addresses both live and on demand Content**

TV-Anytime allows the description of live TV (and radio) programs as well as video on demand or near video on demand, providing a unified solution for consuming Content, whatever its form of availability.

#### **6.4.1.7 A rich set of descriptors**

TV-Anytime documents are composed of several descriptive elements that can be chosen among a rich set of descriptors, most of which are taken from the MPEG-7 format, and support multiple languages. Available descriptors include:

- programme title (short and long)
- synopsis (short and long)
- keywords, genres, groups
- scheduled time, duration
- channel description, icon, jingle
- cast list (actor, director, etc.), possibly using identifiers to avoid multiple spellings of the same person's name
- pricing information
- parental guidance
- audiovisual features (subtitles, number of audio channels, screen format, colour / B&W)
- reviews, ratings, awards and many more...

#### **6.4.1.8 Separation between descriptions and locations**

TV-Anytime features separation between programme descriptions and programme locations (i.e. on what channel and at what time it is scheduled, or on what VoD servers it is available). This prevents redundancy (a programme that will be broadcasted several times needs to be described only once) and allows users to choose their preferred recording or viewing time.

#### **6.4.1.9 Designed for PVR**

TV-Anytime has been designed for Personal Video Recorders. It enables the search, selection, acquisition and rightful use of Content from both broadcast and online services.

The grouping feature, as well as the separation between description and location allows a user to select the recording of all programs of a given series or group, or to select a programme that has not yet been scheduled at a precise time.

It supports PVR-aware programme promotion by broadcasters, by allowing a viewer to order the recording of a programme having viewing its trailer.

#### **6.4.1.10 A set of advanced features**

TV-Anytime provides unique features that will change the way users watch TV:

- grouping of related items of Content (for example all the episodes of a series, a group of recommended programs, the week's top 10) allows enriched navigation.
- programme segmentation information allows non linear navigation, play lists, and division of a programme into chapters, as in a DVD menu. The segmentation information may be provided along with the Content or at a later time (for instance for live broadcast).
- user preferences and history which allows filtering and search preferences, language preferences, parental guidance filtering. These descriptions are closely correlated with media descriptions, and thus enable users to efficiently search, filter, select and consume desired Content.
- location-independent Content identification (easy and reliable Content acquisition - especially series).

#### **6.4.1.11 Assessment of TV-Anytime**

TV-Anytime continues to be the only “standardised, open format” that is capable of meeting immediate end-user (B2C) Metadata requirements of all kinds as well as those specific to PVRs with a wide range of functionality (including the EBU “basic”, “intermediate” and “advanced” profiles). The unparalleled semantic richness of the TV-Anytime Metadata specification gives the possibility to down-translate to many other formats including print media and web formats that are currently in widespread use.

In addition to its current Phase 1 functionality, new functionality will be available when Phase 2 is completed in mid-2005. This will open the door to the description of richer forms of Content service (including, e.g. interactive services) and Content that is networked within the home.

The key disadvantage of the ETSI TV-Anytime specification is its complexity, which is an unavoidable consequence of the complexity of the requirements that it is designed to satisfy. Hence the need for a commonly agreed stepped approach to its implementation. The basic, intermediate and advanced profiles that have already been recommended by EBU Members could be usefully supplemented by a minimal Level 0 “launch” profile that would enable any broadcaster to make an early commitment to provision of Metadata in the TV-Anytime format without addressing PVR-specific requirements from day 1.

### **6.4.2 XML-TV**

#### **6.4.2.1 Background**

XMLTV is a XML-based TV-listings format and a set of associated utilities for scraping data off websites and for presenting data to end users in EPGs. It is the work of an ongoing open source web-based project. Active participants seem to be mainly end users, rather than broadcasters or others in the television value chain. No special attempt has been made to provide PVR functionality and there seems to be little awareness in this community of the work of TV-Anytime (“TV-Anytime is some kind of industry consortium - apparently they have developed an XML format for feeding listings data to PDRs.” - quote from home page).

#### **6.4.2.2 PVR functionality – compared with TV-Anytime**

XMLTV is a simple, general-purpose format for the presentation of TV and radio listings information. It is not intended to provide functionality specific to PVRs. It does not support location-independent Content referencing or any other means of ensuring reliable identification and recording of individual programmes or of series of programmes.

Its Content description capabilities are not very rich (e.g. very little support for the parental guidance and accessibility features increasingly required by regulatory bodies).

Its programme classification capabilities are rudimentary with very few standardised terms.

There is no way to describe groups of programmes (such as series) or segments of programmes (such as the financial or sports items in a news bulletin). There is no support for asynchronous advertising.

In addition, it is DTD rather than XML Schema based - and consequently has very simple data types and validation is of limited usefulness.

Complexity, then, is a feature of life and the skill of manufacturers is to ease the navigation and use for the viewer. Any other approach that attempted to enable viewer flexibility would have to engage a similar complexity. Thus, before too long an XMLTV flat file would suddenly be seen to sprout proprietary (and non-interoperable or inter-mappable) extensions in order to create their own identity. And yet the past 5 years of global intellectual consideration has produced TVA schema.

### 6.4.2.3 Implementations

The XMLTV user community has developed and maintains scrapers for acquiring listings data for personal use from the web (including sites in the UK, Germany, Austria, Finland, Spain, Italy, the Netherlands, Hungary, Denmark, Japan, Sweden, France, Norway, and Romania) and several open source EPGs that accept data in XMLTV are available.

### 6.4.2.4 Assessment of XMLTV

There is no strong rationale for broadcasters to author Metadata in the XMLTV format – and, as far as we are aware, none do so at present. There is, however, a strong rationale for adopting the proposed EBU “basic” TV-Anytime profile, which would provide better-than-equivalent functionality, and to provide a conversion filter (e.g. using XSLT) to generate XMLTV format data for legacy applications and IP-connected devices.

## 6.4.3 DVB-SI + PDC

### 6.4.3.1 Background

This is the approach adopted in the Finnish DTT market where the NORDIG agreement makes backwards Teletext compatibility mandatory. This solution was discussed in depth at the second meeting of the Joint Working Group. The consensus was that supporting this solution as a complement to TV-Anytime would be a short-term palliative and perhaps undermine the case for digital television in certain markets.

### 6.4.3.2 PVR functionality – compared with TV-Anytime

The DVB-SI Metadata model for Content description is less rich than that of TV-Anytime, it has no groups or segmentation, and does not take into account advertising. It is bandwidth intensive compared to binarised TVA.

PDC provides more reliable Content capture than published time information, but less functionality than location-independent Content referencing (e.g. no equivalent to group CRID for series recording).

### 6.4.3.3 Implementations

Although DVB-SI has been widely implemented in Europe, broadcasters have, for the most part, only realised a small part of the potential of its descriptive Metadata (not necessarily an indictment of SI, but possibly a lesson for any initiative to replace it).

### 6.4.3.4 Assessment of DVB-SI

DVB-SI, if extended to carry CRIDs, could provide a transitional mechanism that works with legacy devices as well as PDRs (at the cost of relatively inefficient bandwidth utilization). Whatever the implementation scenario, DVB-SI is too inefficient and has too limited functionality to provide an enduring solution. The Content description components of DVB-SI all have semantic equivalents in the TV-Anytime specification, so adoption of the latter could open the door to better utilization of the potential of SI as a transitional measure

## 6.4.4 Enhanced Teletext

While regarded as some as a “sunset technology” approaching the end of its useful life, Teletext is still the most widely used electronic delivery mechanism for “push” services. In the Nordic countries, more than 90% of households have Teletext and more than three quarters of them use it on as regular basis. The Joint working Party felt it necessary to discuss this platform in depth for this very reason.

#### **6.4.4.1 Background**

In many countries in Europe viewers are accustomed to making viewing decisions based on teletext services. These services were developed before the advent of PVRs and were not designed to meet PDR-related requirements.

#### **6.4.4.2 PVR functionality – compared with TV-Anytime**

Teletext provides a format for the delivery of Metadata, but does not include a specification for the Metadata itself, resulting in considerable inconsistencies between providers (other than at the base level of channel, published start time and title). It is also page-based and lacks a simple click-to-record mechanism for actionable items within a page (based on a reliable, standardised Content referencing mechanism).

#### **6.4.4.3 Implementations**

Teletext has yet to be implemented in ways, beyond publishing PDCs, that adapt to the new requirements posed by PVRs.

#### **6.4.4.4 Assessment of Enhanced Teletext**

Current implementations of teletext are based on an essentially channel-by-channel linear viewing model. If it is to be useful in a PVR world, teletext will need to supplement/replace this with Content-based navigation (e.g. All My Sources -> Sports -> Football -> Today's Matches...), and would greatly benefit from standardization of Metadata (including CRIDs rather than PDCs; preferably with some way of clicking to select-to-record). Whether paged text can provide an acceptable and competitive means of providing PVR-supportive functionality remains to be demonstrated.

## 6.4.5 BMC 877: Conclusions and Recommendations of Project Group B/ITVA

BMC 877  
B/ITVA 014

24 October 2003

### Conclusions

- Project Group B/ITVA believes that the delivery of listings data for EPGs in a standardised open format is vital to the successful introduction and growth of digital television services. We believe this has not been fully recognised by broadcasters operating in horizontal platforms. (In contrast, it is well understood by successful vertical market operators.)
- B/ITVA has identified a 'Basic' profile of features that we believe should be supported as the basis for encouraging a common approach to the launch of services. More advanced features could be added later. The essential objective at introduction should be to ensure that broadcasters' programme listings are available to viewers, and that recordings can be made easily and accurately.
- Content is king, and context is queen! In a multi-channel environment the ability to provide viewers with appropriate information about programmes is no longer a luxury, it is crucial to the visibility and the future survival of public service Content in a competitive world.
- The indications are that well-conceived PVRs will change time-shift from being an activity of marginal significance to one that could lead to a radical re-positioning of business models, in particular for advertising supported channels. It will therefore be necessary to consider new business models taking account of this trend.
- Manufacturers that have taken part in discussions with B/ITVA are unanimous in expressing a strong preference for listings information to be transmitted by broadcasters in an open format.
- Manufacturers are supportive of the 'basic' profile proposed by B/ITVA as a common approach to the launch of services, but they would wish this to become adopted widely both by public and private broadcasters. That being the case, we could expect manufacturers to 'deliver'.
- Broadcasters may have only a small window of opportunity to develop a strategy to ensure they continue to play a direct role in influencing how viewers will select Content in future. This window would seem to be open for a matter of months, but not for years.
- The commercial pressures on manufacturers to offer an accessible, accurate and full EPG are considerable. This is the case even for basic digital receivers; for PVRs it is critical.
- B/ITVA believes that the time has come to move forward beyond SI for delivering schedule information. Implementing TV-Anytime will be critical to the future success of digital and is offers better efficiency and much greater potential for exploiting the capabilities of PVRs.
- The provision of a full EPG schedule using TV-Anytime description and signalling data requires a high degree of co-operation between all players, but the potential benefits to broadcasters in the medium to long term would seem to justify this.
- If broadcasters on a horizontal platform are unable to provide 'open' solutions then manufacturers will find other means of delivering listings information to PVRs. This could mean that:
  - The information will be compiled by third parties and broadcasters will lose direct control over how their programmes are described to viewers potentially leading to weakening of channel and programme brands.



- A variety of 'alliances' could form between different manufacturers and third party listings providers/service providers, resulting in duplication and fragmentation.
- The legacy of non-interoperable devices employing proprietary solutions in a fragmented market may well hinder the later introduction of attractive features such as segmentation and trailer recording that must be managed directly by the broadcaster.
- In a territory with both horizontal and vertical markets then market share may be lost to vertical markets better positioned to deliver a coherent and attractively presented proposition.
- A viable alternative may well be for broadcasters to collaborate with listings providers in order to maintain a better degree of control over the way in which their Content is described, selected and viewed.

### **Recommendations**

1. Highlight to the importance to the success of digital broadcasting in horizontal markets in general, and to EBU members in particular, of a common approach to the provision of EPG information using TV-Anytime description and signalling data.
2. Seek to raise awareness among broadcasters and encourage the necessary co-operation between all players on horizontal platforms.
3. Promote adoption of an EBU 'basic' profile as identified by B/ITVA as a common position for the introduction of digital services that support TV-Anytime functionality for PVRs.
4. Encourage implementation of the mechanisms developed by DVB (via DVB-GBS) as a bandwidth-efficient solution for transporting TV-Anytime data over broadcast channels.
5. Consider the alternative provision of listing data via broadband Internet, based on solutions developed in TV-Anytime and DVB-IPI.
6. Consider how to support EBU members in the acquisition of associated tools and skills required for the rapid introduction of TV-A

## 6.4.6 BMC 867R1: B/ITVA Profile Set for TV-Anytime Implementation

BMC 867R1  
B/ITVA 009R1

24 October 2004

Version 1.1 October 2003

### INTRODUCTION

This document has been prepared by EBU BMC Project Group B/ITVA. It describes an approach to the implementation of TV-Anytime functionality from the broadcasters' point of view, taking into account the anticipated evolution of delivery media, Content and device capabilities.

The primary purpose is to describe the characteristics of a 'Basic profile' of features that should be supported as the basis for encouraging a common approach to the launch of services.

Other possible profiles, offering more advanced features of increasing complexity, are shown in the Appendix, but are for indicative purposes only.

The essential objective at introduction should be to ensure that broadcasters' programme listings are available to viewers, and that recordings can be made easily and accurately.

Typical introduction scenarios can be expected to include:

- functionality equivalent to a basic analogue VCR
  - this must be perceived to be at least as good as the analogue device it replaces.
- either a twin tuner device or an additional device with storage to complement an existing digital receiver.

### DVB and TV-Anytime

The Level 1 'Basic' and the indicative Level 2 'Enhanced' B/ITVA profiles are well covered by the commercial requirements identified by DVB, with the possible exception of parental control signalling. B/ITVA therefore believes that the DVB solution for the transport and delivery of TV-Anytime data should be able to satisfy the requirements of the Basic profile identified by B/ITVA.

However, further discussion will be required on the features that viewer/parental control signalling might need to convey - this is outside the scope of B/ITVA. In the meantime, the incorporation of basic viewer/parental control mechanisms in receivers should be encouraged.

#### 'LEVEL 1': BASIC PROFILE

##### 1.1 Context

- Horizontal retail and free-to-air service markets
- Content: SDTV (4:3 or 16:9), radio, interactive applications (both programme-related and unrelated)
- Unidirectional digital terrestrial television services (no return path)
  - Data delivery and management constraints

1. managed provision of EPG across multiplexes (each multiplex contains data relevant to the services carried on all other multiplexes within the same platform).
  2. bouquet-centric EPGs i.e. an EPG for a particular group of related programme services (e.g. within a multiplex, from a particular service provider).
  3. programme-related and operator managed Metadata (e.g. for trailer recording).
  4. in relevant markets, account should be taken of the possible reception of service information/Metadata services from other sources (e.g. from a multiplex received from a neighbouring country) on other DVB compliant platforms.
- Transmission bandwidth: limited capacity
  - User target platforms: STBs with local storage (e.g. hard-disks), PDRs. Low-cost STB's with limited (cache only) or no storage (but possibly designed to trigger recordings on a separate VHS recorder)
  - Receiver constraint: cache memory
  - Time constraints: UK Free view market (urgent need to identify system features in mid-2003).

A range of products of differing capabilities is likely to exist. Features have been identified that may be described as either 'essential' or 'desirable'. The introduction of TV-Anytime should be capable of supporting all the features listed in both of these categories.

#### 1.2 Level 1 - Essential features (in no particular order)

1. On-the-fly (i.e. 'record now') recording for time-shift viewing (private copy)
2. Timed channel recording (analogue VCR-like programming - basic VCR functionality: play, pause, stop, FFW, FRW)
3. EPG with current event, next event and minimum of 7 days (14 days may be desirable) forward-looking schedule
4. EPG updating (including partial) mechanisms
5. EPG-based programming and recording for time shift-viewing
6. Ability to schedule recordings via trailers
7. Group recording (i.e. all episodes of a series) / recording of related programmes (e.g. all programmes in a particular genre)
8. Viewer/parental control mechanism (to be devised according to regulatory requirements)
9. In relevant markets, ability to select the appropriate language audio and appropriate country language EPG
10. Ability to record essential related streams - subtitles, audio description
11. Include genre information (e.g. from TV-Anytime classification scheme)
12. Include ability to indicate programmes with subtitles/audio description/signing.

#### 1.3 What additional desirable features? (Implementation issues)

- A1. Common recording stream format for interoperability and Content exchange between user devices (private copy) - desirable but not essential - for manufacturers to consider

- A2. (analogue) VCR-like functionality and trick modes (over and above those specified in 1.2.2)
- A3. Live pause and play to augment the time shift viewing experience
- A4. Instant replay (e.g. of last minute to watch e.g. a sport action like a football goal)
- A5. Storage & Content management assistance (replace, delete, etc.) - necessary for devices with storage
- A6. Analogue or digital interface with long-term private copy management (e.g. transfer to tape)
- A7. Indicate presence of 16:9, surround sound.

#### 1.4 Who should do what and when?

##### Broadcasters / transmission providers

- B1. Deliver accurate schedule information with respect to programme times
- B2. Deliver reliable and if necessary authenticated programme description Metadata (programme information, schedule information, broadcast event, service information) and resolving Metadata (Content referencing ID - CRID - and locators) using DVB SI and or TV-Anytime
- B3. Offer a consistently good quality of service e.g. providing the Metadata necessary to sustain services developed by broadcasters and/or manufacturers in line with published standards
- B4. Arrange collation of up-to-date Metadata and associated applications (e.g. an interactive EPG that will use and present schedule data) for transport and delivery
- B5. Adopt mandatory/recommended Metadata elements and attributes to be documented using a common classification scheme for interoperability in agreement with manufacturers
- B6. Deliver complementary programme associated elements such as additional audio tracks and data services
- B7. Discuss with other broadcasters (and manufacturers) the format of a possible common viewer/parental control rating/signalling scheme
- B8. Support the transport mechanisms being developed by DVB (via DVB-GBS)
- B9. Consider the alternative provision of EPG information by delivering TV-Anytime description and signalling via broadband Internet, using a standard XML format.

##### Discussed with no conclusions:

- *Multi-lingual descriptions: maybe not allowed by TV-Anytime or would necessitate discussion on the encoding and handling of classification schemes with manufacturers. Otherwise, the handling of textual instance may be difficult in a purely unidirectional broadcast environment while this may find a solution where the configuration allows the discovery and access of ancillary Metadata services e.g. over IP as specified by TV-Anytime (SP006).*

Manufacturers

- M1. Provide sufficient footprint including local storage to operate in the configurations mentioned above with a reasonable level of quality of service to be defined in collaboration with broadcasters
- M2. Comply with DVB GBS specifications
- M3. Define Metadata lifecycle rules including indications on the management of shared cache memory and the management of Metadata updates
- M4. Adoption of mandatory/recommended Metadata elements and attributes to be documented using a common classification scheme for interoperability in agreement with broadcasters
- M5. Agree with other broadcasters and manufacturers on a common parental rating scheme
- M6. Advanced DVD-like features for high-end devices: access to multi-component programmes (alternative sound track, ancillary data services e.g. multi-language subtitling, audio description):
  - *Non-linear chapter navigation would require segmented Content*
  - *recording of associated interactive applications will also need to be supported*
- M7. Multi-tuner design:
  - *this could allow recording of a programme while watching another and is a desirable feature for users, but not necessarily essential*
  - *a multi-tuner design also allows the concentration of Metadata services such as a EPG data in a particular multiplex - this could be useful for more advanced features*
- M8. Consider possible viewer/parental control mechanisms in collaboration with service providers/regulators.

### Appendix: Possible Future Profiles

#### 'LEVEL 2': ENHANCED PROFILE (INDICATIVE)

##### 2.1 Context of enhancements

- Digital television Services (Terrestrial, Cable, Satellite, ADSL) with asymmetric return path (modem)
- Content: advanced audio-video features including better resolution, surround sound, enhanced interactive applications, multi-language subtitling, signing.

##### 2.2 Level 2: What features would be required? (in no particular order)

1. Recording of all programme related/associated (including audio and/or data streams)
2. Access to ancillary Metadata services over IP as e.g. pre-signalled in the broadcast stream (pushed IP address), e.g. access to additional EPG data or programme related additional information
3. Audience metering collecting anonymous user Metadata over the return path
4. Discovery and access to ancillary Metadata services over IP (e.g. alternative EPG services, playlists)
5. Exchange of user profiles and preferences for targeting services and e-commerce
6. Enhanced cache memory and storage capacity to allow pre-downloading of targeted Content (e.g. advertising)

##### 2.3 What would be additional desirable features? (implementation features)

- A1 Multi-tuner devices to record one programme while watching another
- A2 Enhanced footprint and storage capacity
- A3 Personalisation
  - A3.1 Automatic (intelligent agents) or user driven (profiles) local filtering of incoming Metadata (e.g. EPG, ECG...) using interactive assistance
  - A3.2 Multi-user profiling and preferences
  - A3.3 Notification to the user of scheduled or live broadcast Content of interest according to the user preferences
  - A3.4 User bookmarks, including personal indexing of stored Content
  - A3.5 Programming/Editing of virtual channels combining broadcast and/or pre-recorded Content (management of playlists)
  - A3.6 User control of access to private data
  - A3.7 User can have portable profile (for transfer from PDR to personal computer or for use when e.g. visiting family or friends or staying in a hotel)

##### 2.4 Who should do what and when?

- IP service providers to develop the infrastructure and, if required, negotiate with broadcasters for pushing the information
- Service providers to develop user data-based services. Service providers and manufacturers to develop implementation and interoperability guidelines to develop resource sharing rules (Content and Metadata life-cycle for access, download, caching and deletion)

**‘LEVEL 3’: ADVANCED PROFILE (INDICATIVE)****3.1 Context of enhancements**

- *Content: Segmented Content*

**3.2 What is needed for broadcasters? (in no particular order)**

1. Access to and recording of specific programme segments
  - 1.1 Using user preferences
  - 1.2 Using pre-designed programme features (e.g. access to programme highlights)
  - 1.3 Updating of programmes segments (e.g. recording latest specific news item from daily news reports)
2. Non-linear navigation through recorded Content
3. Access to and recording of segmented Content Metadata (synchronised and not synchronised)
4. Advanced targeting services using segment insertion (e.g. insert targeted advertising within a programme at an insertion point pre-established by the service provider).

**3.3 What would be additional desirable features (implementation features)?**

- A1 Further advanced footprint and storage capacity
- A2 Instant replay of live action / last segment (instead of last minute)
- A3 Advanced user assistant and interactive capabilities to use segmented Content
- A4 DVD-like trick modes (e.g. chapter access, language choice)
- A5 Connectivity to other consumer devices for accessing more Content and also record and archive locally downloaded Content.

**3.4 Who should do what and when?**

- Content creators must be informed/educated on the new possibilities offered for richer Content and services
- Broadcaster must invest in the necessary infrastructure to develop and deliver these new Content and (possibly cross-platform) services in the most affordable manner
- Manufacturers must implement the corresponding part of the TV-Anytime standard.

**‘LEVEL 4’: POSSIBLE FEATURES FOR FUTURE PROFILES**

The following features are mentioned in TV-Anytime and/or DVB PVR but have been considered out of scope by B/ITVA:

- Content: e.g. HDTV, scalable/context adaptable Content, broadcast and on-line Content, enhanced/advanced interactive applications and services, other new Content types
- Network distributed storage capacity and remote storage management
- Home networks
- Verification of delivery of Content
- Verification of updating of Content
- Bi-directional broadband access
- Enable retro-record (i.e., capture entire programme or ad starting up to x minutes back into the live stream), or gives option to capture at later date when it is available
- There are flexible usage rules (e.g., limited viewing windows) on the PDR system.

## 6.5 Getting started – implementation issues

It should be noted that this appendix, written by Allen Mornington-West, describes the challenges from a UK perspective. The digital terrestrial television stakeholders in the UK have the added challenge of dealing with the legacy issues of a transmission infrastructure that went into operation in 1998.

### 6.5.1 Introduction

In understanding who may need to do what we need to identify the series of stakeholders whose existing business and whose new commercial opportunities may arise from the adoption by the viewing public of new Content technology.

We will identify the very core stakeholders and suggest the key implicit trading relationships which can maintain a positive commercial revenue flow. We will need to understand the role and the consequences of adapting to technology change. PVRs are already on the market. Manufacturers are expecting positive expressions of interest from the broadcasters before they will adopt a common, open-standard PVR solution for free to air broadcast services.

At this stage a clear identification of a valid positive business model is out of reach. The "gut feel" is that TV-Anytime services are likely to become a "must have" feature of service provision in the time span of three to five years. If a common standard approach is not adopted in this time then it is likely that the provision of increasingly powerful technology will make some of the opportunities for service providers to retain contact with their viewers more difficult.

### 6.5.2 The role of technology change

The rate at which technology changes can be implemented in a market is not the same rate at which they can be imagined or even demonstrated for the benefit of investors and upper management. One feature of current consumer oriented technologies is that the forward thinking is usually well in advance of the ability to deliver at a price which the average consumer is willing to pay. The supporting infrastructure required for new forms of Content delivery and consumption is considerable. The extent of this is usually best appreciated when in discussion the phrase "it just needs some Metadata to support it and it will work" is uttered. Just because a technology is available it should not be taken as read that it can be universally deployed for all classes of user.

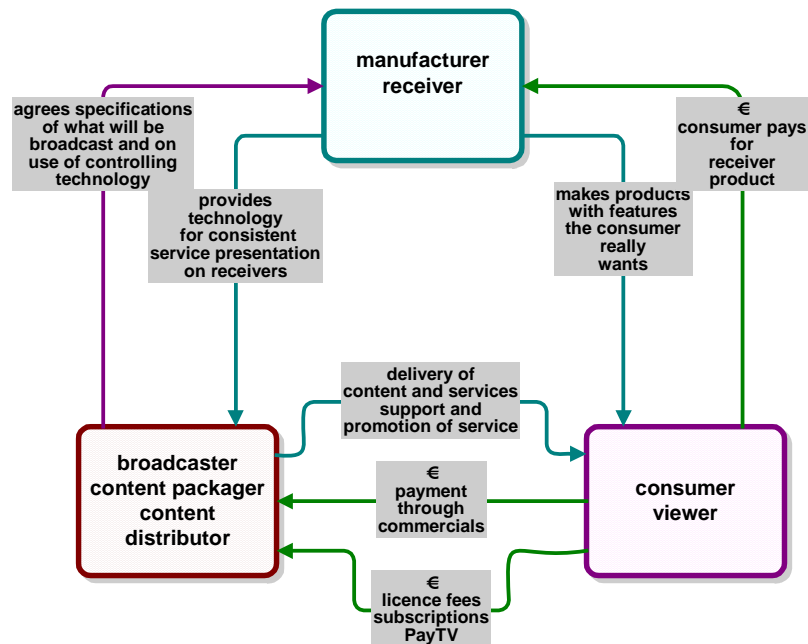
Within the overall concept of a media delivery service whose usability is intended to be much enhanced by the provision of a Metadata and Content related signalling service - in this case TV-Anytime is the obvious standardised example - it is essential to analyse and review the full end to end path which will characterise the creation, manipulation and consumption of the information comprising the service. It follows that the infrastructure that supports and provides this service has to face considerable change in the way in which it may have traditionally managed its internal information and Content flows. Change management is actually the fundamental threat facing all businesses.

### 6.5.3 About the key actors

The service provider community (those who provide the channels and operate the platform), the receiver manufacturers together with the consumer form the centre of a most important three-way handshake. Revenue does not flow - willingly, at least - around this loop unless each player does something to justify his or her return on investment. However, in this model, the consumer is the source of revenue.

If the quality and form of the Content provided by a broadcaster does not meet the viewer's anticipations then the viewer may seek alternatives such as other service providers, delivery systems or other formats such as DVD or broadband. Similarly, the manufacturer needs products that try to meet the real desires of the purchaser.





A distortion of this model occurs when the service provider subsidises the receiver. The viewers' payments need to cover the service provider's costs for the receiver, including the interest on this major capital investment. The service provider is usually responsible for the performance of the receivers and, for receivers with moving parts such as a hard disk, this may be a significant responsibility. The manufacturer loses the freedom to add in such extra features that may provide market leverage and, in a vertical market, the viewer loses one of the important elements of choice.

#### 6.5.4 Additional terms required for this appendix

Most of the coverage of this section is based on a presumption of the overall viability of implementing a TV-Anytime service approach of a service of providing signalling and Metadata to media devices. We now need to elaborate on the meaning of some terms, at least, for the purpose of this section. By PVR we mean a device which records television or audio Content received from a digital transmission and maintained in digital format in the recording. The device may use the information from accompanying digital services including DVB SI in order to provide basic identification of the programme such as service provider, date and time, title and perhaps short description.

It follows that a TV-Anytime service is something that a PVR could use if it had adequate processing resources. However, the provision of a TV-Anytime service does not mean that a PVR must be used – such a service could provide an excellent basis for an IDTV product. A TV-Anytime service is much more than an EPG data service. Trivial use of TV-Anytime Metadata would result in a conventional EPG though it would not be making best use of the available features of the TV-Anytime specification.

#### 6.5.5 What a solution based on TV-Anytime can provide

At the time of writing, TV-Anytime specifications are reasonably complete for phase 1 features and for the matching DVB GBS specification. The phase 1 specifications are characterised by being focused on providing one-way information flows that are intended to assist the viewer in navigating and to capture programmes that the service provider would like to promote. It is easy to see how these simple tools can be used creatively and to great commercial advantage.

TV-Anytime phase 2 specifications are still undergoing discussion prior to being proposed as an ETSI standard and then being adopted by DVB GBS as the basis for further work. This phase supposes

that a receiver has an “always on” connection to a service provider. Much of the functionality will be best implemented with a software application and this requires that the receiving unit provides a matching API. Features include telescoping adverts, automated replacement of adverts according to household personalisation, return of viewer habits and so on.

It might be useful to summarise just what characterises phase 1 of TV-Anytime and its DVB GBS specifications:

- Focus on broadcast provision of information with the use of the return channel or an external communications path not mandated.
- No interface for a specific applications environment. The meaning of the TV-Anytime signalling is entirely interpreted by the receiver's middle ware in accord with the agreed TV-Anytime semiotic.
- Programme information Metadata schema which is extensible and which is very comprehensive. It provides a comprehensive genre dictionary, methods for enabling the receiver to retrieve deeper information from a return channel, identification of Content elements within an overall programme and so on.
- Programme signalling which allows for:
  - Accurate signalling to GoP level of programme and Content element start- and finish times. These are robust and stay with the programme after remuxing or recoding on a hard disk.
  - Identification of a trailer or programme promotion.
  - Identification of a programme or Content as a member of a group.
  - Identification of Content as a member of a series.
  - Segmentation of a programme into segments which for example, on replay, can be played in a different order.

The list is innocently powerful and it provides for some complex and highly effective methods of identifying programme segments and commercials. These will provide tools that will work for the service provider and advertiser and, at the same time, be a valued element of the overall quality of service which the viewer may experience. It helps to remember that TV-Anytime is really a service and that the PVR is the device. Many people confuse, for example, existing PVR products such as TiVo and Sky+, which operate in conjunction with proprietary services, with TV-Anytime service concepts.

### 6.5.6 ‘Big Bang’ or ‘slow burn’?

A review of the TV-Anytime and DVB GBS specifications shows that full use of phase 1 tools is not simply a matter of providing Metadata for insertion in a DSM-CC carousel. Such a feature could be provided to existing transmissions with relatively little pain. Carousel insertion is a well-practised art and there exist common methods for object and module insertion that would avoid the need for manual intervention in re-authoring. Many of the features of TV-Anytime are matched by signalling which is intended to be part of the DVB service information (SI) and these require fresh approaches to the process of information creation, presentation and play out control system management.

These approaches require development by vendors of play out control systems and multiplexing apparatus in order that the essential features of TV-Anytime can be accurately implemented. When the dataflow paths are followed further up-stream it becomes apparent that other system elements require adaptation in order to better handle TV-Anytime signalling. It is clear that proper use of TV-Anytime - even in phase 1 - is not simply a matter of bolting on an EPG data source.

In a full, end-to-end implementation of a TV-Anytime service there is a large number of players who would gain some benefit in adapting their current processes (or developing fresh ones) to make

full use of the flexibility which TV-Anytime offers. In the previous diagram, the interconnections between the various business processes or entities suggest a basic information or Content flow.

It is clear that to engineer changes across all of these stakeholders would be unworkable. Even engineering changes across the core of this map – the receiver manufacturer, the service provider and the viewer interest – represents a significant act of faith and investment. Nevertheless, it should be clear, too, that change does not have to be done all at once. It is not necessary to provide deep TV-Anytime Metadata to describe each programme and it is not necessary to provide a mark up for each programme. At the same time there is, in any real network, a significant amount of series programming and of repeat showings, and there is no reason why the Metadata should not simply be re-used.

A basic understanding of which TV-Anytime signalling will be used first is needed. Early services may provide some Metadata with which receivers can work. A possible next step is to implement precise signalling of actual Content start times. This enables an essential viewer desire for a stable television or radio service – that of correctly captured programmes – and it forms an important reason why a viewer would buy a TV-Anytime receiver. It also helps to wean service providers away from ‘sunset’ analogue technologies such as Teletext and PDC.

These early developments could be followed by providing promotional trailers and group bookings of services. Initially these may appear to be entirely focused on the ability to make life easier for the viewer. However, the creative use of these features in relation to channel promotions, commercial breaks and sponsored programming will provide payback for the service provider. This can be realised as soon as the back-office processing that connects the promotion production, air time traffic sales, programme sponsoring and other commercially driven targets is implemented.

From a service provider's point of view there is a point in the ingest process where it would be ideal to be able to accept the Content and the Metadata as an integrated bundle. There are defined interfaces which support TV-Anytime defined Metadata and signalling constructs. These interfaces work as well for acquired Content such as films as they do for one time use Content such as (live) news, current affairs and general entertainment. The completely new business market of post-publishing mark-up also opens.

The implementation of these interfaces will have its own business driver. One which is beginning to guide the commercial behaviour of service providers and Content rights owners is that of considering business processes as if they were part of an integrated array of end-to-end process steps. Thus Content arriving at ingest should need no correction, the Metadata will need to be correct and the encoding and standards transfer will be appropriate – or the vendor will simply not be paid. It follows, for example, that the promotion editing production path will need to include the manipulation of the necessary rights and timing Metadata as an intrinsic part of its process.

Fortunately, TV-Anytime information can span all of these necessary business process changes if its needs are taken into consideration as the core processes are updated to modern management practices.

### 6.5.7 Is it now or never?

The short answer is both, but several factors need to be taken into consideration. Service providers do not have the option of doing nothing about the impending presence, in three to four years<sup>1</sup>, of powerful PVRs in viewers' homes – at least, not if they intend to retain a significant share of the viewer's ‘eyeball time’.

Within the same time span a number of other changes will occur. A sample list of changes is contained in the following table:

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<sup>1</sup> Effectively, at time of writing, up to the end of 2008.

Task Area	Timeline
Renegotiate Content contracts to include Metadata as a deliverable	At least two years +. Most contracts are written for a two to three year span and the contract details are usually handed down from earlier generations of contracts in order that the negotiation is not protracted. These changes could be driven by the need of the service provider to manage their own internal operational processes more efficiently. TV-Anytime sits on the back of these changes and on the back of the Metadata transfer. The increasing use of MXF as a wrapper could help in this process though much of the data usually associated with the MXF operation is heavily oriented towards use in the production domain of the Content producer and it may have limited applicability for the viewer facing service provider.
Renegotiate multiplex operator contracts and implement engineering changes	Two years at least. Multiplex operators have significant investment in the encoding and multiplexing command and control and the impact of change on the contracts that they hold with service providers are complex. Regulatory requirements place tough demands on overall up time - typically 99.995% - and operators can not afford to be responsible for unplanned down time as a consequence of the change of encoder and multiplexer control at the service provider end. In addition, they may also be responsible for the correct insertion of the service information and they may be concerned that changes in the service composition could lead to significant numbers of heritage receivers being dark. In the UK by 2008 it is estimated that the population of actively used heritage receivers could be at least 8M.  These contracts typically span 12 years. While the existing contracts may provide for technology update, the operators will be concerned to ensure that they are replacing an existing infrastructure with one which has much greater flexibility so that it is more resilient to future change. The business case for a technology change is likely to be made on the grounds of improved compression, more efficient use of null bytes and on the need to replace apparatus now that the silicon is no longer available for maintenance of the earlier apparatus. The needs of TV-Anytime sit on the back end of these changes.
Renegotiate network distribution contracts	Two years. For the most part this is a matter, particularly in a nation wide network, of ensuring that the consequence of data processing and of add-drop multiplexing of services has been properly planned, modelled, trialled and rolled out. As with multiplex operators - and transmission service providers - there are overall service up time requirements that are contractually binding. As multiplex operations mature, so the need to adapt the network arises and requirements for TV-Anytime are arguably almost invisible.
Transmission service provider contracts	Three years. There is much change which may be covered by the need to move frequencies and powers around in order to implement analog switch off. Some transmission operators may be responsible for the insertion of the correct SI at the transmitter site and they will need to be assured through comprehensive planning and testing that the proposed changes will maintain the net up time of the overall network.
R-engineering of multiplexers and multiplex controllers	Two years. For the plain carriage of Metadata within a DSM-CC carousel, no change is needed. This is not quite the case where there is a need to accommodate the precise timing feature which TV-Anytime can provide. This tight timing reflects a widespread need, but one for which little real commercial pressure has been felt. It is reckoned that its implementation for TV-Anytime would force other services to catch up very quickly or lose faith with viewers.
Upgrade of play out control systems	Two years. The changes required are quite subtle and they need to be integrated with matching changes in the upstream presentation, scheduling and channel management systems. Experience suggests that these changes, while relatively simple to describe and not expensive to implement, require time for reliable implementation. It also requires that matching interface specifications are available for the system components either side of the play out control system.
Upgrade channel management, scheduling and presentation control systems	3 years. These systems will be subject to updating as they match the need to handle the Metadata needed for efficient process control approaches in service provider operations. The time lag reflects several of those resulting from issues outlined above. Whilst this work is underway the TV-Anytime functionality can be added.

Task Area	Timeline
Receiver designs for the consumer market	<p>Two years. The development cycle for a new consumer product is not short and neither is it cheap. Manufacturers must gauge the potential maturity of a technology for the open market, together with the desire of the buying public to buy products which use it. In the absence of a TV-Anytime service manufacturers will produce a range of products which will attack the media management issue in innovative ways. These are not likely to be uniform and they are not likely to be attuned to any service provider needs. TV-Anytime offers a means of standardising this interface whilst, at the same time, allowing receiver manufacturers to produce a core product technology which would survive use across the EU.</p> <p>Added to this is the realisation that Moore's law suggests that by 2007 a €400 DTT PVR may have two front ends, 1Tbyte of hard disk, a 1GHz processor, 256Mbyte RAM, Ethernet broadband and the ability to act as a node in a home network. There would be sufficient processing power in such a product to enable some image matching and searching operations to be undertaken. This could provide for an automated Content based search engine which would enable the viewer to find desired Content on the basis of "an image like this one". It could also power automated skipping of segments in which the viewer has no interest.</p> <p>It is likely that the horizon time line of 2008 will witness an increasing use of broadband as a source of viewing Content. This reflects the growing penetration of genuine broadband services by telcos and cable operators.</p> <p>Manufacturers need to find new market areas in which fresh product features can be launched in which they can provide differentiated products. These are urgently needed in order to counteract the loss of the CRT, analogue tuner and VHS markets. In the UK alone the analogue replacement market is estimated to be £3500M annually whilst the cost of providing a simple DTT "zap" box to the remaining non-digital households in 2008 would amount to a one time value of just £500M.</p>
Re-negotiate the audience monitoring contracts and the payback processes	<p>Three years. Classic audience monitoring has been based on the use of PAL and teletext and this has been workable because the bulk of viewing has been of an analog signal. Even off tape delivery and digital satellite services provided this facility and the low percentage of delayed viewing meant that any inaccuracy was minimal. In the era of entirely digital services this may no longer be adequately accurate. Other methods such as matching audio fingerprints may be useful and could work when Content is used away from the initial point of acquisition.</p> <p>The renegotiation has little in fact to do with TV-Anytime as the changes in viewer behaviour powered by PVRs will take place in any case. That said the noise created by this element of the debate is likely to become vociferous.</p> <p>On one hand advertisers wish to target and pay for the exposure of their adverts to only the people who will be buying. On the other hand, they pay the advertising agencies and the service providers at a rate based on the reach - the number of people who will have been exposed to the advert. It is not feasible to have both and yet the call to meter all consumption and to require the instant return of viewing figures seems to be a presumption of any new media technology. It may be hard to reconcile some of these drivers with those of personal privacy, the retention of trust in a service provider and in the general anonymity of viewing as a prime though unspoken desire of viewers.</p>

### 6.5.8 Heritage or the future

One challenge for TV-Anytime is whether to focus on enabling the TV-Anytime functionality in future product or to provide some level of functionality for heritage receiver products. We simply define a heritage as one that lacks the resources to manage a TV-Anytime Metadata schema and related DVB signalling. The bulk of the 24M receivers in use across the EU market area are what might be loosely described as 4Mbyte class receivers. By 2008 the typical heritage receiver will be one which will not have been designed with any degree TV-Anytime performance in mind. Attempting to define the use of TV-Anytime such that heritage receivers could use the data looks to be a seriously foolish way of ensuring a deep heritage problem in the years to come.

From a TV-Anytime focus we identify that the level of performance required should be visionary and should encompass the provision of resources which should enable phase 2 specifications to be

adopted should the commercial models justify this. Thus those receivers which can manage phase 1 functionality will slowly become the future heritage. For sound financial reasons manufacturers will be keen to promote new receivers to embody new functionality rather than undertake the upgrade of an existing hardware.

Heritage receivers - as seen at the horizon date line of 2008 - will thus deliver excellent performance but it will be based on the use of a simple DVB service information stream. This could be profiled to use less capacity than currently is the case and to promote the up take of more powerful receivers. In so doing the existing base of 4Mbyte class receivers would continue to provide a useful auxiliary service in many households for a number of further years.

### 6.5.9 Who needs to do what and by when

The above has, we hope, provided an outline of the scope of change which may ultimately be needed as service providers grapple with the provision of attractive broadcast services to viewers. Increasingly services and Content which is not easily discovered on a network will be overlooked by viewers who, themselves, will be wallowing in a sea choice of source of Content.

We hope that we have identified many of the players in an end to end chain of Content and data provision. Perhaps this is from the advertiser, the Content creator, the service provider, the viewer and back via the audience measurement service. Somewhere in this mix there will be the regulators and the cultural guardians as well as the commercial operations which provide professional services.

We have left out any deep discussion of the defensive or protective use of Content rights management, of copyright protection technologies, of controlled access or of patent licensing. There are some areas where the approximation of EU Directives<sup>1</sup> in local legislation gives rise to serious questions as to the viability of enabling any form of personal media Metadata storage and there are areas where the protection of personal privacy is clearly under serious attack. The offensive use of patents is also a likely activity as some rights holders seek to use them to defend their current business position. Other defensive measures might include appeals to legislature or media regulatory action at local or EU level. Many of these areas remain to be investigated and challenged in the courts. If the cases go public then case law may be established but this may be costly and private settlement is more likely. Either way there is likely to be a delay in pursuing such approaches through the courts.

Finally the viewer will be increasingly able to consider acquiring Content from sources other than the direct broadcast source - a source which characterises some 95% of all viewing and listening at the current time.

Each of the entities set out in the diagram above may be represented by a company or a division of a corporation. In each entity there will be someone whose role it is to identify the future opportunities and risks and to implement strategies which direct any resulting policy. The table above has identified for a few of the stakeholders some of the key factors which will condition the timeline of their response in respect to ongoing system development and the incorporation of those changes which would aid the implementation of a TV-Anytime service.

In many respects the strategic position to be adopted depends on whether an entity takes on the option of TV-Anytime creatively or whether it views the whole consumer development of PVR as a threat to commercial continuity which must be resisted with the use of any available tools. For those entities which take this reactionary approach there is an armoury of defensive tools which could be engaged but it warrants analysis to see that the use of protective approaches is not going to result in a long term negative impact on the commercial viability.

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<sup>1</sup> One example is EU Directive 96/9/EC for which, at this time, the ECJ has been requested to provide formal opinions on two specific cases.

However, if we take the positive view of engaging with the opportunities of the PVR engine and the possibility of providing a TV-Anytime service for it then the following table sets out in short form the policy, planning and implementation time line issues which should be considered. In most cases the combination of intellectual inertia and the breadth of change required sets the time line. In the author's view, it is by happy circumstance that these time lines are not that different from the timeline offered by the impending threat of widespread adoption of PVR technology by viewers.

main stakeholder	Some considerations for policy, strategy, planning, implementation and operations
Content rights owner and distributors	Rights owners will benefit from ensuring that the Content which they provide is despatched with Metadata in accord with the acquisition contract. The TV-Anytime standards set the interface for exchange information. Distributors would be able to demand that the Metadata provided is used. Appropriate adjustment of future contracts should be envisaged. The time line as at least two years.
Product or brand advertiser and product or brand sponsor	Advertisers need to understand what a Metadata world such as that offered by TV-Anytime might offer. Importantly, by insisting on a uniform standard the amount of work which an advertiser would need to undertake for each broadcast outlet will be greatly reduced.
Programme inventor creator and programme production and programme scripter	Creators need to start to capture Metadata from the outset of a programme concept. Actually this is mostly going to be useful in the production process where it will be used to automate the media tracking and it will ease later rights payments. Much of this information is wholly production oriented and though carried within an MXF wrapper it may be dropped as the completed programme crosses the commercial transaction boundary. The big challenge is one of culture shift and it may take well-worded contracts to promote behaviour.
Advertiser and advert production and advert creative and advertising sales agency	Advertisers are at the start of this branch of the feeding chain and their strategy visionaries should be in touch with developments in the way in which the general population might take up new service styles such as TV-Anytime. Advert creatives need to understand what TV-Anytime can offer. Initially this will be phase 1 functionality but it is important that they keep a sense of reality about the possibilities especially in the light of the relative weak response to the concept of interactive advertising.
Contributing service provider aggregator	<p>The service provider is one of the key links on the basic revenue chain. Amongst the roles that they carry out is programme promotion planning and production. This is part of a general workflow process that includes the channel management system, schedule planner and the operational aspects of programme Content and advert ingest, programme Content conformance and the operation of the traffic management system. Improvements and streamlining of this work flow process is one of the changes which will take place over the next five or so years.</p> <p>For service providers there is the considerable challenge of managing the change whilst keeping the whole operation on air. One growing challenge - on that will exist irrespective of the growth of PVR or of TV-Anytime - is the need to manage the in house Metadata library.</p> <p>Service providers also have the challenge of working out what parts of a Metadata schema are of any interest or use to the general viewer. It follows, roughly, that the service provider needs to work out whether to support a PVR service (and TV-Anytime is an example of such a service) through the use of an out of band service. In this case it is likely to be a broadband IP connection.</p>
Presentation schedule system	Vendors of these systems need to see how TV-Anytime signalling - particularly the need to ensure the time accurate insertion of signalling is managed. The general business of strategic working alliances with other broadcast apparatus and service companies is common place.
Work flow process management	There is a range of activities within this grouping. Many modern channel management systems provide for mapping many elements of a service provider's work flow so that progress can be managed with computer assistance. This includes the process of ingest management - at which point all media and Metadata ought to be 100% present and correct - through to Content archive retrieval and play out system data and Content loading.
Media server manufacturers and media and Metadata server mgt systems	There is a small part which media server systems need to play in conventional broadcast. Increasingly there will be a need to ensure that any Metadata which is associated with an audio or television Content is managed as a whole. Presently play out control systems manage this by co-ordinating retrieval and preparation of Content from a number of sources. There exists an opportunity to help this process to be tighter.

main stakeholder	Some considerations for policy, strategy, planning, implementation and operations
Encoder, multiplex and multiplex controllers	There are some new features which are required for accurate signalling of played out Content and there are possibly no manufacturers who have a product capable of managing this easily.
DVB SI processor	This is a specialised product area and there are companies already working on being TV-Anytime compliant.
Carousel generator and inserter	There are companies who are already working on providing efficient and low latency interfaces for Metadata carousels for TV-Anytime.
TVA data compressor	There are companies who are already working on providing the standardised data compression systems for TV-Anytime.
Cross carriage SI generator	It depends on the architecture of the network and the view of the receiver population for which TV-Anytime services are ideally targeted as to the architecture of SI cross carriage. Future TV-Anytime capable receivers are likely to have at least two front ends one of which is able to scan and to thus implement cross carriage at the receiver. If this is the agreed strategy between the service provider, multiplex operators and the regulators then this can remove the need to provide this service for TV-Anytime.
Printed press and cross media promo support process	The arrangements for providing the printed press are different in most in EU territories. Many use the published schedules in order to drive third party data enhancement services and this is a business area that can be expected to grow. Metadata once captured becomes a resellable item. Planning database development so that it encompasses universal standards such as TV-Anytime should be considered as part of the on going business development strategy. Billboards remain a popular method of advertising on one medium in order to pull an audience for television or radio. The increasing use of WWW references suggests that sufficient numbers of viewers access these further sources of information. TV-Anytime also provides for a similar root for further programme information and this could also be used.
Programme acquisition - and contracts and Content re-acquisition and disintermediator programme commissioning	Service providers should consider the adoption of Metadata provision as a part of the contract completion. In an ideal world this will be possible and requested Metadata will arrive along with the media at the ingest. The same will be true of Content which is re-acquired and of Content which is commissioned. Clearly it will be a more efficient process if the same Metadata schema is used.
Outsource Metadata processing and post mark up Metadata contract services	It is likely that the role of third party data service provider will become increasingly important. For many service providers the costs of continuing to do everything in house is already seen as not efficient. Third party providers are also well placed to develop a post mark up business for TV-Anytime services in which, for example, live programs are provided with segmentation information which can be reviewed later. It is likely that this could be a well funded subscription business and one which could work well across many delivery systems.
IPTV gateway service provider operator and URL ISP service provider	
Media farm operators	The future viewer is increasingly likely to access Content - television and radio - from network systems such as media farms. This could take place in many ways and it supports the viewer's own PVR as possibly one element in a home network. VoD services are a natural product though the competition with DVD and HD services may weaken the financial power of this proposal.
Audience measuring and (advert) response CRM process	The future approach to audience measurement will need considerable adjustment. Within the UK it seems that the radio industry has accepted change though whether the television industry will adapt so readily is yet to be seen. Many advertisers and thus their agencies and the advert sales will be affected. It is too easy to suggest that all future receivers shall be connected back to a central metering point - as a minimum it offends most principles of privacy - on the other hand advertisers wish to pay for audience reach and, in a world where the PVR enables significant time shifting - the value of a time shifted reach has to be debated. Some advertisers are said to be concerned that a viewer may be able to see an advert which may be out of date. However this and other forms of viewer behaviour are little different to that with a VHS machine.



main stakeholder	Some considerations for policy, strategy, planning, implementation and operations
Transmission service operator and monitoring and measurement services and distribution operator and cross carriage system operator	In many territories there will be a number of corporate entities involved in these activities. For many of them continuous adjustment to their operations is already common. For operations which pass through services and rebroadcast them it is sufficient to be sure that the Metadata carousels and the DVB signalling are remarried in the remuxing process. Cross carriage offers some interesting challenges and the approach may be to try to keep this as simple as possible and to allow the receivers of the future to do more of the work of gathering service information.
Retail outlet operator	Retail outlet operators have a fair sized task in training their sales staffs. The task of training is one which should be shared with the manufacturers as much as with the service providers.
Receiver manufacturer	<p>Manufacturers have a true challenge in an open market where products have functionality which is enhanced by the information broadcast to their receivers. On the one hand the receiver needs to be intuitive to use on the other it needs to be able to provide the viewer with access to the kind of information which they find useful.</p> <p>A challenge for receiver manufacturers is to work together to convince service providers that they should be co-ordinated about their approach to managing a PVR oriented service such as TV-Anytime.</p>
Help services manufacturer help line and service / mux provider duty officer	As products become more complex it is increasingly likely that failure is probably not due to the Content which the service provider broadcasts. In a well controlled vertical market the performance of a receiver is rigorously tested against sample services. This is not so easy in a horizontal market. Manufacturers who share the concern may benefit from promoting the use of a common standard and service providers can help this by agreeing a common understanding of the semantics. One possible route would be to promote the marketing of receivers which had satisfied a suitable suite of tests in order that, for example, they might claim to be TVA compliant.
The viewer	<p>At last, the person who will be paying one way or another for all of this making it really easy for the viewer. Here the target is clear:</p> <ul style="list-style-type: none"> <li>• No subscription.</li> <li>• No mandatory telco connection (EG for monitoring).</li> <li>• No special access cards required.</li> <li>• Complete viewing privacy.</li> <li>• Minimal interference from non-programme Content if that is what is desired.</li> <li>• Freedom to use the PVR in their home network with products from other manufacturers.</li> </ul> <p>From a functional point of view the viewer's desires are likely to include:</p> <ul style="list-style-type: none"> <li>• Accurate recording (or reminding) of a programme when it actually takes place (not when it is billed or when DVB SI catches up or whatever).</li> <li>• Simple to use access to the range of programmes which are scheduled to be available for a 10 day span.</li> <li>• Easy identification of groups, series of programs so that nothing is missed.</li> <li>• Capture of a programme or series from its trailer.</li> <li>• Easy search, finding and management of Content on the hard disk. Consider that a 1Tbyte disk may store the equivalent of 600 VHS tapes and that if this were from a commercial service it may contain 10 000 adverts. Thus when the viewer commands "skip" that is exactly what is wanted.</li> <li>• Simple controls which do what they say they will do with no interference from service providers.</li> </ul>

## 6.6 An alphabetical list of abbreviations and terms used in this report

Abbreviation	Term	Definition
	advertising pod	A group or block of television adverts
API	Application Programming Interface	The layer between the operating system and the applications in a set-top box or integrated digital television. Common digital television APIs in Europe include OpenTV, MHP, MHEG, Liberate and Media Highway
	archive viewing	The viewing of a television programme more than one week after the transmission date; a kind of time-shifted or asynchronous viewing in its broadest sense
ARPU	Average Revenue Per User	A measure of the earnings of a Pay TV or PVR service operator
	churn	The proportion of subscribers who do not renew their subscription; usually "annual churn"
ECG	Electronic Content Guide	A screen-based listing of the programmes the user has recorded and those that have been booked
EPG	Electronic Programming Guide	A screen-based listing of channels and programmes that the viewer can see; typically an EPG looks ahead for a period of up to 8 days
iDTV	Integrated Digital Television [set or receiver]	To receive digital television one either needs an iDTV or a set-top box and a conventional television
	in-band	The delivery of a PVR Metadata service via the same transmission network as the television channel(s)
	Network PVR	A television service that allows the viewer to see what he wants and when he wants; programmes are stored centrally; viewers can book the programme after it has been broadcast unlike conventional PVRs that require the user to plan and record the programme before it is broadcast.
	Now and Following	A mandatory part of the DVB-Service Information standard that contains basic information about the programme currently being broadcast and the programme that follows it
NVOD	Near Video On Demand	A service that transmits a given programme at regular interval, say every two hours; the converse of VOD
	offset viewing	The viewing of a television programme with a short delay compared with the broadcast version; viewing commences before the broadcast is over; a kind of time-shifted or asynchronous viewing in its broadest sense
	out-of-band	The delivery of a PVR Metadata service via a transmission network other than the one used to deliver the television channel(s)
PDR	Personal Digital Recorder	The TV-Anytime Forum uses this term to denote devices that make digital recordings of digital broadcasts
PVR	Personal Video Recorder	A device that allows its user to watch television when and how he wants; this usually implies an EPG from which to select programmes, signalling Metadata to facilitate automatic, accurate and reliable recordings, an ECG to retrieve recordings and a number of functions to facilitate recording and play-back; the TV-Anytime Forum uses the term to denote devices that make digital recordings of analogue broadcasts.
	PVR service	The delivery of an EPG and signalling Metadata so that the viewer can find, record and view what he wants and when he wants. This may be in-band or out-of-band
	segmentation	A TV-Anytime function that allows the viewer to navigate among the segments of a given television programme
	SMATV	Satellite Master Antenna Television; an arrangement whereby a number of households receive one or more satellite channels centrally and redistribute them by cable as an analogue or digital signal; a kind of small-scale cable TV system
STB	Set Top Box	A device that demodulates a digital signals, extracts the various data streams and arranges for these to be viewed as a television programme on a television set

Abbreviation	Term	Definition
	Teletext	An information system that supplies simple alphanumeric data via the vertical blanking interval of an analogue television signal; the viewer can display this on his television set either superimposed on top of the television picture or as an alternative to the television picture; the user accesses the information that is displayed as pages or sub-pages using three digital codes on the television remote control device; first introduced in the 1980's and still widely used in the Nordic countries and Singapore.
	time-shifted viewing	The viewing of a television - in part or whole - with a delay in relation to the broadcast; also termed asynchronous viewing
VOD	Video On Demand	A video service that allows the viewer to see what he wants and when he wants; programmes are stored centrally; a network PVR is a sub-category of video on demand that handles broadcast television only.
	zapping	Changing channels in a multi-channel environment; this normally requires a remote control device; zapping is commonly effected using the arrow or up-down keys
	zipping	Compressing the duration of a television programme by using the fast-forward or jump 30 seconds function of a time-shifting device

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