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**COMMISSION STAFF WORKING PAPER**

**on the interoperability of digital interactive television services**

## EXECUTIVE SUMMARY

The purpose of this working paper is to seek public comments on the issue of interoperability of interactive digital television services, and in particular on whether it would be appropriate to make implementation of certain standards compulsory at EU level.

Digital television brings many benefits, including greater programme choice from more channels, greater impact and involvement from higher quality and new screen formats such as wide-screen and high definition, and greater flexibility, thanks to mobile and in-car reception possibilities.

Interactive digital TV adds another layer of functionality beyond the transmission and reception of video. Using software components drawn from the information technology (IT) sector, interactive television consists of applications sent in the broadcast transmission alongside the video. These vary from familiar items like teletext or video games to much more sophisticated applications that require the receiver to have a return channel for two-way communication, such as e-commerce and internet services.

The working paper explores issues surrounding interoperability and what interoperability can achieve in the evolving technical and market environment of digital television, recognising that this is part of a wider convergence with IT and telecommunications. The concept of interoperability needs to be assessed in a broader context than in the days of analogue television, when interoperability meant a single technology, universal receiver able to receive all national terrestrial services, the “one box solution”. Such simple interoperability is much harder to sustain across the single market, in today’s more dynamic world of network diversity and higher level functionality.

Interoperability at a technical level no longer guarantees access to viewers as it once did in the analogue environment; third party access conditions play an increasingly important role. Moreover the exercise of user choice takes different forms in different digital television business models, for example in pay TV and free-to-air TV, and the degree to which technical interoperability can contribute to user choice depends on the business model used.

Member States are all adopting digital television at different speeds; and Member States have considerable autonomy in broadcasting policy in line with the principle of subsidiarity. The outcome of this review process will need to ensure that any approach can be made operational within the diverse broadcasting markets of the EU.

This review of interoperability of digital interactive television services - required by Article 18(3) of Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (Framework Directive)<sup>1</sup> - is being undertaken in two stages. This working paper is the first stage of that process; its purpose is to launch an open consultation on the interoperability of interactive television services and related issues. The Commission plans a Communication by June 2004 in order to report on the consultation and set out its position on this issue. In order to stimulate the consultation, this working paper includes questions for market players, Member States and citizens. The consultation is an opportunity for in-depth reflection on the issues surrounding the role of interoperability in today’s developing digital television markets.

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<sup>1</sup> OJ L 108, 24.4.02, p.33.

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## **1. INTRODUCTION**

Digital television uses digital compression of video and advanced radio carrier modulation techniques to achieve substantial benefits for market players and consumers. These include much more efficient use of transmission spectrum and lower emitted power, hence lower cost for those providing services. For the consumer, digital television brings many benefits, depending on what type of digital service broadcasters decide to offer. Benefits include greater programme choice from more channels, greater impact and involvement from higher quality and new screen formats such as wide-screen and high definition, and greater flexibility, thanks to mobile and in-car reception possibilities.

Interactive digital TV adds another layer of functionality beyond the transmission and reception of video. Using software components drawn from the information technology (IT) sector, interactive television consists of applications sent in the broadcast transmission alongside the video. These vary from familiar items like teletext or video games to much more sophisticated applications that require the receiver to have a return channel for two-way communication, such as e-commerce and internet-based services.

The issue of interoperability of interactive digital television is the subject of this working paper.

### **1.1. Legal background**

Article 18 of Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (Framework Directive) concerns the interoperability of interactive television services in the EU. It addresses the concern that lack of interoperability in interactive television could adversely affect the free flow of information, media pluralism and cultural diversity by limiting freedom of choice for users.

Article 18.1 requires Member States to encourage providers of digital interactive television services and equipment providers to use an open application program interface (API). An API is a stack of software components which manages interaction between applications sent by the broadcaster and the receiving equipment's operating system. Article 18.2 requires Member States to encourage proprietors of APIs to make available all such information as is necessary to enable providers of digital interactive television to provide all services supported by their APIs in fully functional form.

Article 18.3 requires the Commission to examine the effects of Article 18 one year after its adoption, i.e by July 24<sup>th</sup> 2004.

### **1.2. Approach to the review**

The Commission is undertaking the review of interoperability of digital interactive television services required by Article 18(3) in two stages. This working paper is the first stage of that process; its purpose is to launch an open consultation on the interoperability of interactive television services and related issues. The Commission plans to adopt a Communication by July 2004 in order to report on the consultation and to set out its position on this issue.

In order to stimulate the consultation, the Commission offers the analysis contained in this working paper, together with questions for market players, Member States and citizens. The

consultation is an opportunity for in-depth reflection on the issues surrounding the role of interoperability in today's complex digital television markets.

Recital 31 of the Framework Directive indicates the range of issue involved. The recital states that interoperability of digital interactive television services should be encouraged at the level of the consumer in order to ensure the free flow of information, media pluralism and cultural diversity; that it is desirable for consumers to have the capability of receiving, regardless of the transmission mode, all digital interactive television services, having regard to technological neutrality, future technological progress, the need to promote take-up of digital television, and the state of competition in the markets for digital television services.

The recital also states that digital interactive platform operators should strive to implement an open application program interface (API) conforming to standards and specifications adopted by European standards bodies and that migration to new open APIs should be encouraged and organised. It also includes a rationale to support the use of open APIs, as they facilitate interoperability, i.e the portability of interactive content between delivery mechanisms and full functionality of this content on enhanced digital television equipment.

Given the range of these concerns, the present working paper takes a broad approach to analysing interoperability issues, including expectations of what interoperability should achieve, what can be realistically achieved in today's markets, and the related issues mentioned in the recital.

In order to address these issues, the analysis contained in this working paper is structured in three parts:

#### *Chapter 2 - Where are we coming from?*

This sets out the approach to interoperability that was established for analogue broadcasting, and which continues to condition expectations today.

#### *Chapter 3- How have circumstances changed?*

This section sets out the new elements introduced by digitisation and convergence and how these affect interoperability.

#### *Chapter 4 - Which way forward?*

This section contains specific questions upon which the Commission seeks to consult, based on the preceding analysis.

## **2. WHERE ARE WE COMING FROM?**

The policy paradigm for the interoperability of television services was established at national level for analogue television. National authorities mandated the use of a single television transmission standard in order to achieve a range of different policy objectives, including:

- To ensure access by all broadcasters to all viewers, and by implication to guarantee equal treatment of all broadcasters as content providers in support of media pluralism.

- To meet an industrial policy objective, by ensuring that manufacturers could invest with confidence in receiver manufacturing so that economies of scale would be achieved rapidly, thereby enabling mass-market roll-out of cheap receivers.
  - To meet a consumer welfare objective, by ensuring that consumers could receive the few services available on a single, universal receiver.
- As terrestrial television was the sole TV network, frequently controlled by the only broadcaster, the combination of a single transmission standard interoperable with a single receiver also contributed to another policy objective, complete coverage of the population.

A key feature of analogue terrestrial TV is that all services are available on a single, universal receiver, a ‘one box solution’. This is the paradigm which hereafter is referred to as ‘Simple interoperability’. As pointed out in the introduction, recital 31 of the Framework Directive states that it is desirable for consumers to have the capability of receiving, regardless of the transmission mode, all interactive services, i.e ‘simple interoperability’. Although this paradigm guaranteed interoperability in support of the above benefits at *national* level, there were interoperability issues at international level.<sup>2</sup> European countries introduced colour television transmission systems during the 1960s and 1970s, using the PAL or SECAM standards. These systems were incompatible; so simple interoperability did not exist at European level.

Whereas both PAL and SECAM systems represented a fundamental and worthwhile innovation compared with the earlier US system, the co-existence of two systems in Europe reflected competition between the industries of two different countries, channelled through their governments’ national champion strategies of that era.<sup>3</sup> In the absence of a single global television standard, industry developed procedures and other techniques to allow equipment to interoperate at the studio level. Consumers wanting to receive terrestrial services from more than one country initially needed more costly multi-standard television sets, unless they had access to cable television networks.<sup>4</sup> More recently, it has become possible for manufacturers to integrate receivers for all three analogue transmission systems into a single silicon chip, thereby creating a universal receiver. Such integration of different systems is a proxy for interoperability rather than true interoperability, as it effectively replaces and substitutes for simple interoperability achieved through a single standard.

Analogue colour television transmission standards have been very stable. A well-conserved colour television set bought in 1967 could still be receiving analogue services forty years later. These standards will have lasted for nearly fifty years in many Member States by the time analogue television is closed down.

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<sup>2</sup> The United States was using NTSC a first generation system dating from the 1950s, which was not interoperable with later European systems. As reception of terrestrial television signals across the Atlantic Ocean was impractical, simple interoperability between transmission systems and receivers on the different continents did not matter. However, absence of interoperability at studio level meant that programmes could not initially be electronically converted between the different colour television systems. Programmes for export were therefore made on film. Over the years, the industry developed standards in support of interoperable studio equipment - so that broadcasters could use the same equipment for producing programmes whatever the standard - together with electronic standards converters in order to facilitate content portability between them.

<sup>3</sup> Walter Bruch developed the PAL system for Telefunken in Germany. Henri de France developed SECAM in France.

<sup>4</sup> Operators installed real-time PAL/SECAM converters in their network head-ends.

In summary, the analogue paradigm initially offered a limited range of services over one type of network. Consumers could choose from a range of standardised receivers with simple functionality. There was a high level of interoperability at national level, but at international level, there was an interoperability deficit both at the level of programme exchange – portability of content – in TV studios, and in terms of simple interoperability between the transmission systems and receivers of the different systems. The emergence of different standards was caused both by innovation - European standards offered significant benefits compared with the first US standard - and forces of competition between the two different European standards channelled through the industrial policies of the era.

Interoperability developed ex-post in response to a market requirement. It started in TV studios – where more costly solutions could be justified – and moved only later to consumer equipment.

Another interesting feature from today’s perspective is the intertwining of different policy objectives in the analogue era, ranging from industrial policy, through communications regulation to content regulation. In modern regulatory systems, these elements are increasingly kept separate, given that different types of regulation have different objectives, and there is greater reliance on market forces to deliver consumer benefits.

### **3. HOW HAVE CIRCUMSTANCES CHANGED? – INTEROPERABILITY, INTERACTIVITY AND REGULATION**

#### **3.1. The scope of interoperability**

##### *3.1.1. Overview*

In general there is much greater complexity in today’s systems compared with analogue. Network diversity means that there are many more digital television networks and the three main types - satellite, cable and terrestrial – compete on more equal terms than in analogue, given that in digital television they all started at more or less the same time. This leads to a multi-platform environment, as described in other documents.<sup>5</sup>

Digital television is much more dynamic than analogue television, meaning that its take-up of new technologies is far higher than analogue television. Individual digital technologies will have a shorter life because they will be replaced by newer and more efficient digital technologies, challenging established approaches to interoperability. There are new functions, or ‘associated facilities’, such as conditional access (CAS); also applications program interfaces based on software technologies from the IT sector, driven by technological convergence.

Assumptions behind the industrial policy-rationale for simple interoperability - notably issues relating to economies of scale - have been completely transformed since the analogue era, as described in section 3.1.6 below. In addition, other networks and platforms outside television increasingly have the capability to deliver video services, as a consequence of convergence.

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<sup>5</sup> Communication on Barriers to widespread access to new services and applications of the information society through open platforms in digital television and third generation mobile communications COM (2003) 410 of 9.7.2003; also Communication on the transition from analogue to digital broadcasting (from digital ‘switchover’ to analogue ‘switch-off’) COM (2003) 541 final of 17.9.2003.

For instance, ADSL may become an important platform for the delivery of television services, as well as broadband internet access. Video games terminals can be used as digital television set-top boxes. The audiovisual capability of computers is developing under the impetus of DVD and internet. These platforms and networks have different approaches to achieving interoperability, compared with broadcasting.

New regulatory notions have developed alongside interoperability, notably access. There are also new business models with different parameters from the analogue free-to-air model.

This section examines how each of these developments affects interoperability, and the benefits it traditionally delivered in the analogue paradigm.

### *3.1.2. Network diversity and complexity*

Network diversity means that simple interoperability – defined as the possibility to receive all services on a single universal receiver - has not been economically feasible during the opening stages of the digital television market. Satellite, cable and terrestrial receivers use different tuners owing to the different physical properties of the transmission path. A cable receiver cannot receive satellite transmissions. Industry has developed more complex notions of interoperability to cover the multi-platform environment. DVB transmission systems are interoperable in the sense that their architecture enables broadcasters to strip out the tuning/demodulator element of, for instance a satellite transmission, and replace it with the format appropriate for a cable network, independently of the picture and audio information.<sup>6</sup> This facilitates multi-platform distribution. Broadcasters transmit their digital services over different transmission networks simultaneously - a process known as simulcasting - in order to cover all the populations of different receivers.

Multi-platform digital distribution goes against the traditional media policy assumption that all services should be available on a single receiver. Integrating the different digital receivers (i.e tuners) into a single product is technically possible but still costs too much and could reduce consumer choice by making receivers more expensive. In time, as for analogue PAL/SECAM TV sets, single box solutions combining receivers for all three transmission systems will become more economically feasible.<sup>7</sup> Such integration therefore provides a proxy for simple interoperability for the consumer that supports network diversity and innovation.

### *3.1.3. Technology dynamics*

The dynamic nature of digital technology means constant innovation. New technologies are entering the market much more rapidly than before. Unlike with analogue television, new

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<sup>6</sup> In USA, pictures and audio have to be decoded back to baseband in order to accomplish the same task. Another example of such complex interoperability is DVB-H (handheld), a forthcoming terrestrial transmission system for pocket devices such as personal digital assistants. This may be interoperable at multiplex level with DVB-T, the main terrestrial transmission system, but interoperability does not necessarily mean that DVB-H services can be viewed on a DVB-T receiver.

<sup>7</sup> Common use of the internet protocol across all broadcast networks would also solve this issue. The Commission is monitoring the progress of the US Federal Communications Commission's 'plug and play' rules. Based on an industry Memorandum of Understanding, these promote the integration of cable tuners and other related functionality into television sets. A set top box is still required for advanced bidirectional services such as video on demand or interactive data enhanced television services. See press release of 10.9.03, together with statements of Chairman Powell, Commissioner Abernathy and a consumer fact sheet, available at: [www.fcc.gov](http://www.fcc.gov)

digital transmission systems are entering the market less than ten years after the start of digital television services. These do not offer simple interoperability with earlier systems i.e new receivers do not necessarily receive services transmitted using first generation digital broadcasting systems. Some of these systems have options for backwards compatible modes, but these carry penalties in terms of efficiency.<sup>8</sup> Simple interoperability can only be guaranteed at the expense of innovation. More complex approaches to interoperability have therefore been developed in order to circumvent this problem, notably by considering interoperability possibilities at other levels in the technical chain of operations.

Having a single standardised technology for a particular technical function is not necessarily desirable for certain tasks. In the case of conditional access systems, it was decided that the security risks outweighed the benefits of a single CA system developed through an open standardisation process.<sup>9</sup> Instead, market players kept their individual, proprietary CA algorithms and developed a technical interoperability regime at another level, through a common scrambling algorithm to be included in all pay TV decoders, in conjunction with two interoperability techniques which were themselves standardised.<sup>10</sup> This approach was enshrined in Community law.<sup>11</sup> This example shows that interoperability can be achieved without standardising all parts of a system, rather by choosing certain levels and applying appropriate interoperability techniques that can themselves be standardised.

#### 3.1.4. *Interoperability and access*

Simple interoperability enabled analogue free-to-air broadcasters to have access to all receivers, the whole audience. Broadcasters often controlled terrestrial television networks. Interoperability was synonymous with access to viewers. However, this is no longer the case. Parties other than broadcasters control communications networks, and often it is necessary for the broadcaster to negotiate access agreements for use of these facilities. Standardisation of technical aspects facilitates – but does not guarantee - access and interoperability. Access is primarily a commercial issue; until access agreements are concluded, use of the facility is not possible, even if all the facilities in the network are standardised and interoperable. The new regulatory framework for eCommunications contains provisions on access regulation designed to ensure that network operators do not abuse their market power, in particular with regard to the use of proprietary technologies for conditional access systems.

Conditional access is an interesting example as it shows the distinction between interoperability and access. Conditional access systems have the technical capability to be interoperable – for the pay television services of several operators to be received on a single receiver – but the EU regulatory framework does not force operators to implement this interoperability under normal circumstances.<sup>12</sup> They must decide to enter into a commercial

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<sup>8</sup> For instance the DVB-S2 second generation satellite transmission system.

<sup>9</sup> A single conditional access systems would make all pay TV operators reliant on each other to ensure the integrity and security of the single CA system against hackers. If one operator was hacked, all operators would have to replace their subscription cards.

<sup>10</sup> The common scrambling algorithm is held and administered by ETSI, but it is not an open standard for security reasons. The two interoperability techniques are simulcrypt and multicrypt. See Annex 1, section 1.

<sup>11</sup> TV standards Directive 95/47, OJ L 281, 23.11.1995, p.51, now replaced by the Framework Directive 2002/21 cited in footnote 1.

<sup>12</sup> Article 5 of the Access Directive 2002/19/EC requires National Regulatory Authorities (NRAs) to encourage and where appropriate ensure *inter alia* adequate interoperability of services. However, this requirement is subject to the objectives set out in Article 8 of the Framework Directive. Moreover,

agreement to offer each other reciprocal access to customers and interoperability procedures are implemented following that agreement. Broadcasters wanting to offer pay services over a particular platform need to negotiate access.<sup>13</sup> This model is different from the traditional assumption in free-to-air television that all services should be available to everyone on a universal receiver in order to guarantee freedom of choice.

### 3.1.5. *New business models*

Choice takes different forms according to the business model. Pay TV is an elective service, and where there are competing platforms, customers choose between different providers, each offering some exclusive content, as well as some common content. The choice is content-driven. Pay TV operators usually provide a decoder for their customers, containing both standardised technologies and proprietary technologies, including conditional access. This represents a so-called vertical market model. Security and billing requirements mean that there is much greater complexity than in the free-to-air model, entailing a continuing relationship between customer and supplier.

In the free-to-air model, the consumer was traditionally offered a small number of services and a wide range of television receivers for retail purchase. Providers of digital free-to-air services and consumer electronic manufacturers are extending this horizontal market model to free-to-air digital services, offering a substantial increase in the number of services. Unlike in pay TV, there is no continuing customer relationship once customers have purchased products, apart from product guarantees. Security is less of an issue in free-to-air than in pay TV.<sup>14</sup>

Within industry, there is debate about the value of vertical market models and whether these restrict consumer choice, notably by locking customers in to a particular platform. The decline in the cost and prices of set-top decoders is reducing switching costs for consumers. The cost of the subscription now accounts for a much higher proportion of consumer expenditure. A recent study undertaken for the Commission offers a methodology for assessing switching costs within the context of market definition.<sup>15</sup> Continuing vigilance on the part of competition authorities and national regulatory authorities (NRAs) is necessary to uphold consumer welfare. Consumer choice in pay TV is based on services, rather than on equipment. In economic terms such equipment – whether intended for free-to-air or pay

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exercising their responsibilities in this way needs to be defensible in terms of promoting efficiency, sustainable competition and giving maximum benefit to end-users.

<sup>13</sup> Article 5.1(b) of the Access Directive empowers NRAs to impose obligations on operators to provide access on fair, reasonable and non-discriminatory terms to facilities listed in Annex 1, part II of the Directive, namely APIs and EPGs, to the extent that it is necessary to ensure accessibility for end-users to digital radio and television broadcasting services specified by Member States. This provision could be used to ensure that services enjoying must carry transmission rights are able to secure access to these associated facilities. Art 6.1 of this Directive further requires Member States to ensure that conditions set out in Annex 1 part I of the Directive apply, namely that CAS operators offer such services to all broadcasters on a fair, reasonable and non-discriminatory basis compatible with Community competition law.

<sup>14</sup> However, even for digital free-to-air, some form of secure certification process for interactive applications is necessary in order to ensure that applications will not cause receivers to fail, in the style of a computer operating system “crash”.

<sup>15</sup> “*Market Definition in the Media Sector – Economic Issues*”, a report by Europe Economics for the European Commission – DG Competition, November 2002, paragraphs 3.4.55 – 80. Available under “EU competition policy in the media sector” at the following URL:  
<http://europa.eu.int/comm/competition/publications/publications/>

services - is anyway a secondary good, dependent on the service, the primary good, having limited or no value without it.

In the free-to-air model, there is choice of both services and equipment through a horizontal market. The free-to-air model has a stronger tradition of prior co-ordination through standards bodies, driven both by the need to achieve economies of scale without equipment subsidy, and public interest considerations. There are also fewer elements to co-ordinate because it is a simpler model. Industry has reflected on the possibility to extend the horizontal market model to pay TV. The OPIMA industry group postulated the idea that consumers should be able to buy terminal equipment “and begin to consume and pay for services, without having prior knowledge which services would be consumed, in a simple way”.<sup>16</sup> As noted elsewhere,<sup>17</sup> this is one potential model; but it would require more intensive advance co-ordination of many more technologies and functions through standardisation bodies than the simpler, free-to-air model.

The key issue is how far such co-ordination processes might themselves limit choice of market offerings, notably by slowing down the pace of innovation. Standardisation bodies must also comply with competition law.<sup>18</sup> As with many issues there is a balance to be struck, between areas where it is more efficient for companies to innovate in the market, and areas which could be co-ordinated and standardised. In any case, regulatory initiatives on standards should not exclude a particular business model. In the event that a particular business model generates market power, appropriate ex-ante remedies are available under the EU regulatory framework for eCommunications, together with the relevant articles of the Access Directive discussed under 3.1.4. These complement remedies under EU and national competition law.

### 3.1.6. *Economies of scale*

In the analogue model, industrial policy provided a justification for achieving interoperability using a single standard. This enabled manufacturers in a particular country concerned to achieve economies of scale more rapidly, and to produce a wide range of cheap receivers.

As discussed in the next section, communications regulation does not include this type of industrial policy objective, which now tends to be left to market forces. The liberalisation of trade means that manufacturers can leverage economies of scale across global markets. Successful standards can achieve critical mass at product level very quickly. This benefits European citizens, by reducing the price of products more rapidly.<sup>19</sup>

The transition from individual components to silicon means that economies of scale can no longer be attained at Member State level. Much larger markets are needed in order to justify heavy investments in silicon chips. Manufacturing anyway no longer has a national structure because of trade liberalisation. The justification that interoperability via a single standard creates economies of scale no longer applies at national level.

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<sup>16</sup> See the charter of the Open Platform Initiative for Multimedia Access (OPIMA), [http://opima.telecomitalia.com/opima\\_charter.htm](http://opima.telecomitalia.com/opima_charter.htm)

<sup>17</sup> See section 1.3 of, COM (2003) 410 final.

<sup>18</sup> Guidelines on the applicability of Article 81 of the Treaty to horizontal co-operation agreements, 2001/C 3/02, OJ C3/2 6.1.2001. See section 6, paragraphs 159-178, [http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/c\\_003/c\\_00320010106en00020030.pdf](http://europa.eu.int/eur-lex/pri/en/oj/dat/2001/c_003/c_00320010106en00020030.pdf). Some recent cases notably Rambus have focused on the terms under which IPR is made available.

<sup>19</sup> For instance, the European DVB-S satellite transmission system was adopted faster outside Europe, thereby stimulating subsequent European market roll-out.

At EU level, there is some rationale for trying to achieve economies of scale through the single market to help roll-out, especially for technologies used in free-to-air television, where consumer subsidy mechanisms are difficult to implement.<sup>20</sup> There are however practical limitations, notably if broadcasters want to implement a new technology ahead of the uplift provided by world markets. The widely differing economic characteristics of different Member State markets, together with the strong tradition of subsidiarity that applies to audiovisual policy, mean that implementation of new broadcasting systems is fragmented in time across Member States.<sup>21</sup>

This has a number of consequences. Smaller and/or less economically-advantaged Member States depend on larger Member States to adopt a standard and achieve economies of scale. Broadcasters implementing digital television in a particular Member State later in the roll-out curve will have a wider choice of technologies than those who pioneered the first implementations seven years ago. The combined effect of subsidiarity and innovation is that achieving simple interoperability via a single standard – however desirable - is very hard to achieve within the EU, without improved clustering (in time) of digital roll-out in Member States. In the first half of 2004, the Commission will be assessing the switchover plans of Member States, based on reports submitted by the end of 2003 under the eEurope action plan, and may in the light of these reports identify further actions to be proposed.

The current debate on interoperability of interactive television services contains some of these elements, notably how to achieve a sustainable commercial launch for the Multimedia Home Platform (MHP) standard across the EU (see section 3.2.3).

### *3.1.7. Effects of convergence*

Convergence means that video services can increasingly be delivered over other networks and not just broadcasting networks. Different traditions of interoperability apply in other sectors affected by convergence. These need to be taken into account, because it would be inappropriate to contemplate regulatory intervention in support of interoperability in broadcasting if such measures could easily be bypassed by players on other networks. Asymmetric approaches are subject to regulatory arbitrage and therefore carry a high risk of failure.<sup>22</sup>

The IT sector has a legacy of non-interoperable, proprietary operating systems, although increasing use is now being made of Linux open source software. However, content portability – file exchange - is possible between different applications and between the same application running on different operating systems. All personal computers can access web content when equipped with a browser able to read web content in HTML format.<sup>23</sup>

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<sup>20</sup> Pay TV, mobile telephony and some broadband operators offer equipment subsidies that can be recovered over time from subscription fees. Such schemes – which must respect competition law - can be beneficial for overcoming consumer uncertainty and the chill factor imposed by initially high equipment costs in pure horizontal retail equipment markets where subsidies are not used.

<sup>21</sup> Digital Audio Broadcasting offers a case study on the consequences for the equipment market. See working documents ONP-DBEG 02-12Rev1 and ONP-DBEG 02-13Rev2 at [http://europa.eu.int/information\\_society/topics/telecoms/regulatory/digital\\_broadcasting/index\\_en.htm](http://europa.eu.int/information_society/topics/telecoms/regulatory/digital_broadcasting/index_en.htm)

<sup>22</sup> Imposition of MAC standard for DBS satellite may have contributed to the incentives for the market to migrate to telecom satellites, outside the scope of Council Directive 86/529/EEC, OJ L 311 p.28, 6.11.86. See annex 1, section 2.

<sup>23</sup> In addition, emulator programmes are available to enable e.g Windows to run on the Apple Macintosh.

The telecoms sector perhaps lies in between the IT sector and broadcasting. The traditional public switched telephone networks (PSTNs) tended to be built to national specifications, with interoperability between national networks taking place via international gateways using interfaces and signalling systems agreed in the International Telecommunications Union (ITU). Certain customer interfaces are also standardised, such as the communications interface between handsets and base-stations in GSM. For 3G services, interoperability may be achieved through gateways rather than a handset with a single standardised API.<sup>24</sup> Interoperability is exploited at different levels, rather than relying solely on simple interoperability between handsets and the network.

Consumer electronics players are positive towards interoperability and standardisation, notably in broadcast receivers. For digital television, set-top boxes add a degree of flexibility that was absent when all technical elements were combined into the integrated television receiver. It is possible to upgrade the television receiver without replacing the display, generally the most expensive system component. In other parts of their business, not related to communications or broadcasting, technology competition is common and standardisation much less common, as there is no public policy dimension linked to interoperability.<sup>25</sup> The distinction between standardised, interoperable communications terminals and unstandardised, non-communicating terminals like DVD players, or competing games machine formats, is likely to blur as these other products are increasingly enhanced by communications capability.<sup>26</sup>

Where a single standard for any technical function does emerge in a timely manner and enjoys widespread market support, it provides the most efficient way of achieving interoperability. In general it is easier to agree standards at lower levels, e.g transmission standards like DVB or the internet protocol, than at higher levels in the open systems model. This is because everyone needs transport, but players value flexibility for higher level functions because it is at these levels that they are able to differentiate their service offerings.

### 3.1.8. *Summary*

This section has shown that the assumptions that underpin simple interoperability in analogue broadcasting are challenged by the complexities of digital broadcasting and convergence. Simple interoperability between a receiver and a network using a single standard does not guarantee a broadcaster's access to network facilities; therefore it does not ensure competitive service provision. The new regulatory framework safeguards media pluralism by ensuring that broadcasters have rights of access. Technology dynamics, and the long timeframe over which digital broadcasting is being rolled out in Member States mean that implementation of a unique standard across the EU will be very difficult to achieve, even at the level of transmission of TV services.

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<sup>24</sup> As stated in Open Platforms, the Commission is following interoperability in the 3G arena in parallel to DTV. As in pay TV, subsidies are likely to compensate for lower levels of standardisation, in order to provide an incentive for consumers to acquire handsets or to switch between operators.

<sup>25</sup> The classic example is the Betamax/VHS format battle of the 1980s. More recently the single, common specification for DVD players promoted interoperability between discs and players, but there is no official standard adopted by an officially recognised standards body. An industry consortium developed the DVD specification. However, for rewriteable DVD, IT and CE companies were unable to agree on a single specification so there are three non-interoperable formats, increasingly integrated into a single product.

<sup>26</sup> World-wide web access using a Sony Play Station 2 terminal is now possible. One European cable network is using Microsoft X-box games terminals as set-top boxes. Internet enabled DVD players are in preparation.

Serving multiple populations of receivers using co-existing standards means that proxies for interoperability must increasingly be used, by integrating different receiver technologies into the same product or simulcasting to different receiver populations. New business models like pay TV and the approaches of other sectors bring notions of interoperability that are quite different from the historic broadcast paradigm of a single technology used on a single network with a single technology universal receiver, in order to guarantee equal treatment and freedom of choice for all. The notion that interoperability can be achieved at different levels is important. Interoperability techniques applied upstream in network head-ends and at content origination level may become as important as the network/receiver level that has been the focus of traditional policy interventions in broadcasting.

The challenge for policy makers is to identify which benefits interoperability can achieve in this new and more complex environment, and how far other approaches can deliver the benefits which interoperability used to deliver in the less complex environment of analogue and free-to-air television. The new framework addresses the needs of a complex convergence of networks and seeks to regulate only where necessary. Assessing necessity means that legacy approaches to interoperability require rigorous scrutiny in order to test how far they remain valid. As indicated in the preceding section, where industry can agree and introduce a single standard in a timely and consensual manner, this should be welcomed by public authorities.

### **3.2. State of play in interactive TV**

Previous sections have addressed the analogue interoperability paradigm and the challenges and changes brought by digital television and the convergence of technologies. The following section describes the evolution of interactive television. Most of the examples in the earlier sections covered the one-way transmission of television services and the relevant receivers, usually implemented in hardware. Interactive television is more complex than transmission because its software technologies address the interaction between users and content. Interactive TV is therefore positioned at a higher level in the architectural model. In simple terms, applications or data are prepared and transmitted alongside the television programmes. They are processed by a stack of software components resident in the receiver called an Application Program Interface (API). The API is also referred to as “middleware” because it lies between the operating system that controls the receiver and the application.

#### *3.2.1. Technology aspects*

Interactive television services require the presence of an API (as described above) located in the receiver, above the operating system. Applications and associated content are normally transmitted by the broadcaster using a carousel procedure<sup>27</sup> i.e a continuous loop, derived from analogue teletext. There are two distinct technical approaches that underlie all competing API systems. In the first, the API takes the form of an ‘execution engine’. Execution engines require content applications to be developed by programmers using a computer language. The approach is roughly equivalent to APIs in the personal computer world, including Windows and comparable APIs in Mac OS and Linux. In the second approach, the API takes the form of a ‘presentation engine’. Presentation engines are roughly equivalent to browsers in the PC world. Content is authored using simple software tools for display in the presentation engine; programming skills are not needed so this form of

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<sup>27</sup> Certain large or strategic applications like the Electronic Programme Guide may be resident in the receiver however so the consumer does not have to download them every time they are needed.

interactive television has cost advantages. This declarative approach requires less computational power in the receiver than the so-called procedural approach of execution engines, but offers more limited functionality. These two approaches can be separate, but it is also possible to deploy a presentation engine as an application, running on an execution engine.<sup>28</sup> For the purposes of this document, the generic term API covers both approaches.

Both these technical approaches offer applications such as digital teletext, Electronic Programme Guides and video games. The applications can be segmented into different classes or profiles. The simplest are ‘enhanced broadcasting’ applications, where the consumer interacts with the application that has been downloaded into the receiver, such as digital teletext. More complex applications require a return channel for two-way interactivity - for instance voting in a reality TV show – typically via a modem built into the receiver. Internet access is also possible with return channel technology using the TV screen as the display device.<sup>29</sup>

It is not essential to include an API in the receiver if the objective is only to offer conventional digital television services. So called “zapper boxes” contain no API and are purely intended for accessing multi-channel digital TV. Such receivers process aggregate channel service information into a grid in order to offer a very basic navigator containing a programme listing for each service, instead of a sophisticated EPG running on an API. An important axis in the commercial debate on interactive television is how far the inclusion of any API will increase the need for memory and processing power and thereby raise the cost of receivers, and whether consumer appreciation of interactive television justifies the resulting price increase.

### 3.2.2. *Market development*

When digital television services started in Europe, there were no European standards for APIs. Interactive television featured competing proprietary technologies rather than standards. Unlike in transmission, where broadcasters and manufacturers have a tradition of co-operating on new systems, APIs represented an entirely new area where competitors sought to capture market share and become the leader, using different proprietary systems. Convergence added a new dimension to competition as major IT players drew on their software skills to offer API stacks for interactive television, threatening incumbent consumer electronic players.

Pay TV operators dominated the first stage of digital television roll-out in Europe and showed a much greater tendency to compete with each other using these different, non-interoperable API technologies than free-to-air broadcasters for whom competition is based on services, rather than technologies.<sup>30</sup> Operators accelerated the roll-out of digital television by

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<sup>28</sup> The advantage is that third parties do not have to submit such content for the time-consuming interoperability testing across different manufacturers’ decoders required by some APIs, nor offer financial guarantees that an application will not crash some set-top boxes. Such tests and guarantees are often required by pay TV platform operators in order to secure interoperability.

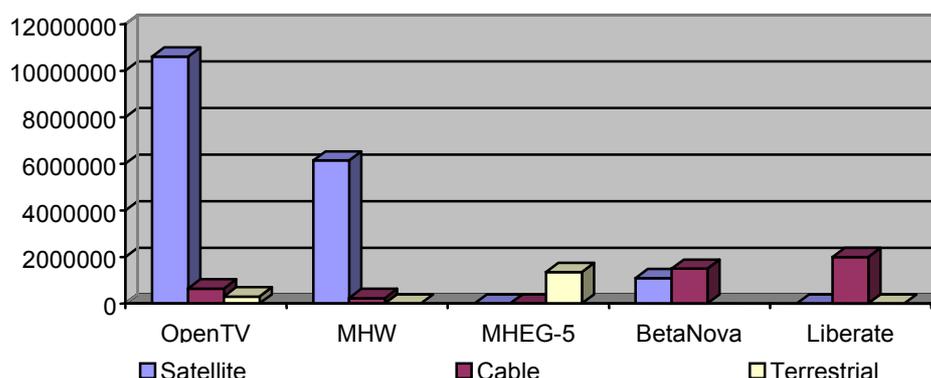
<sup>29</sup> There is a widespread industry view that Internet on the TV screen offers a poor user experience, owing to the different characteristics of today’s television displays and computer monitors, and more limited hardware resources. Note that business models to support the return channel function in horizontal markets have not yet emerged. Vertical market operators do provide a return channel. However, Short Message Service (SMS) on mobile phones often provides an interaction channel for voting, even on analogue TV.

<sup>30</sup> Limited consumer awareness and usage of interactive television services means that technology competition does not yet drive consumer choice at retail level. In a more mature marketplace, consumers might express choice by opting for pay TV platforms with more or less complex, interactive

subsidising decoders and made substantial investments in certain markets. Industry estimates suggest that there are over 30m decoders in European homes able to receive interactive television. Figure 1 below shows how these are distributed between the different API platforms.

Figure 1: *estimated market shares of 'legacy' API platforms across digital interactive television markets in the EU.*<sup>31</sup>

Note: "MHW" signifies Media Highway



Sources: ConTeSt consultancy, individual industry sources; reproduced from section 2.3 of the report *Standardisation in Interactive Television*, CENELEC, April 2003.

More recently, interactive television has aroused interest among free-to-air broadcasters and among public authorities. In Member States where analogue multi-channel television has already achieved high penetration, some players consider that interactivity is the key differentiating service that will drive the roll-out of digital television, instead of digital multi-channel. Some public authorities also consider that effective roll-out of interactive television could fulfil a general interest objective, by providing an alternative, more consumer-friendly platform for the delivery of Information Society services to consumers. Previous developments in the sector point towards caution; technological capability does not always translate into actual customer demand.

Recent analysis undertaken by CENELEC<sup>32</sup> indicates that interactive television has not lived up to the high commercial expectations that built up during the dot.com boom. In Member States where interactive television is widely available, consumer demand has not so far taken up the more sophisticated two-way interactive television services, which are capable of

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services, which would affect pricing. More complex interactive service packages will require a return channel and probably the more costly execution engine API implementation, rather than the lighter and cheaper presentation engine implementation. The significance of these two implementations of API technologies is discussed in section 3.2.1 below

<sup>31</sup> The Commission is aware of several other minor API platforms that are not displayed in this graphic. Tables 2.2 and 2.3 in the main report of Study on interoperability, service diversity and business models in digital broadcasting markets, Oxera, February 2003, provide further details of usage, available at:

[http://europa.eu.int/information\\_society/topics/ecom/shortcuts/digital\\_broadcasting/studies/index\\_en.htm](http://europa.eu.int/information_society/topics/ecom/shortcuts/digital_broadcasting/studies/index_en.htm)

<sup>32</sup> See *Standardisation in Interactive Television*, CENELEC, April 2003, available at [www.cenelec.org](http://www.cenelec.org)

delivering Information Society services to the television screen. The public has preferred simpler enhanced broadcasting interactivity linked to television programmes.

This is understandable, given that the market is immature and consumers are not used to interacting through their television screens. More time is needed, notably in order to refine and improve service propositions. It appears that API suppliers and commercial providers of interactive television services have retrenched and are preparing more long term strategies for developing the interactive television market. It seems unlikely that a single system could capture the market through competition alone. The battle to control the customer has given way to a more fundamental need to convince customers of the value of interactive television. The creation of compelling content services will of course play an important role in convincing them. Altered commercial circumstances have meanwhile helped to shift the axis of the debate on interoperability, by making players more willing to work together, independently of regulatory pressure. In particular, ensuring content portability between different API platforms has become more attractive, given the obvious financial advantages compared with creating applications and content for different API platforms independently.

### *3.2.3. Standardisation and interoperability of APIs*

At the start of the market, there was no interoperability between any of the API platforms available, at any level. Applications and content had to be authored independently for each system and there was no simple interoperability at receiver level; as with computers, applications developed for one platform would not run on a receiver containing the software stack of another API.

Policymakers have wondered why market players were unable to agree on a standard in time for the start of the market, given that they had agreed on a single transmission standard for each of the main delivery mechanisms. The analysis in the preceding section provides some indications. The functionality was entirely new and controlled by players from outside the broadcasting sector, with competitive instincts formed in the IT sector. When the digital television market started in Europe in 1996, the specification body that developed the European digital television transmission standards had hardly any members with software and IT experience.

As interest in interactive television built up, demand for an interoperable, second generation interactive television system developed, notably among consumer electronics companies and free-to-air broadcasters. These players sought to create a system able to support a horizontal market for interoperable equipment at retail level. DVB initiated work on MHP in 1996. The first attempt to specify MHP was a low-cost presentation engine to be based on MHEG5. This was abandoned in favour of a more ambitious specification, an execution engine to be based on Java virtual machine technology. Java has important advantages as it is independent of the different operating systems used in receivers and has a high level of security for transactional applications. By this time, specialist interactive television API companies had joined DVB, together with major IT players. Only then did DVB assemble the expertise necessary to develop the MHP standard. The complexity of the technical and commercial issues addressed by MHP meant that a first version of the first two profiles became an ETSI Technical Specification in July 2000 and work continued both on the third profile and debugging the first two profiles.<sup>33</sup>

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<sup>33</sup> ETSI TS 102 812. The MHP specification exercise needed to achieve legal certainty regarding the licensing of certain Java technologies, and satisfy the technology provider Sun Microsystems Inc. that

When the Framework Directive 2002/21/EC was agreed in December 2001, there was a debate on the merits of imposing a single standard – namely MHP- as the only way to achieve interoperability in digital TV. Use of a single standard could replicate the simple interoperability described in earlier sections of this document, it was argued. Other market players pointed to the extensive investments they had made in proprietary API systems and decoders and argued that interoperability did not require migration to a single system; content portability could be achieved through reauthoring of applications. This led to an inconclusive debate on the costs of reauthoring.<sup>34</sup>

In response to a number of Parliamentary Questions and a resolution,<sup>35</sup> the Commission has indicated its support for voluntary migration to MHP as the most obvious way of achieving interoperability in digital TV, but has recognised that the industry was free to develop alternative approaches to interoperability. The Commission also initiated a dialogue with Member States in the Communications Committee on interoperability and access to APIs under the EU regulatory framework. The Commission will follow up on both these issues as it verifies Member States' transpositions of the EU regulatory framework.

For market players, the requirement imposed by Art 18.3 on the Commission to review interoperability and user choice by July 2004 has provided a powerful and direct stimulus to reflect on interoperability issues. In order to prepare for this review, the Commission tasked CENELEC to prepare the study already referred to above, in section 3.2.2, on standardisation in digital interactive television, specifically to support the implementation of Art 18 of the Framework Directive. Undertaken with extensive inputs from industry players, the study provides a snapshot of opinion on the state of the market and it makes a number of recommendations for supplementary standardisation in order to complement the MHP standard.

The core analysis is that the opportunity for achieving interoperability through the MHP standard varies depending on the market. The short-term potential for successful introduction of MHP lies in the markets where digital television is less developed. In markets where there are extensive deployments of earlier proprietary systems, other approaches would be more appropriate. This would not rule out migration to MHP in the longer term, after amortisation of earlier investments. Once the standard was established, lower costs compared with proprietary systems would anyway favour MHP. The study made four recommendations for further standardisation: (1) specifications and guidelines for authoring processes; (2) the specification of one or more presentation engines able to work independently of an execution engine or running as an application on top; (3) guidelines for the use of DVB service information; and (4) a reference model for cable receivers.<sup>36</sup>

These recommendations are intended to complement the MHP standard with additional elements in order to cover the complete range of interoperability circumstances in different markets. The authoring specification and guidelines (1) would improve content portability

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interoperability with the broader Java community would be maintained. DVB also devised an innovative, legally enforceable conformance testing regime to ensure interoperability between different manufacturers' MHP products, in order to eliminate the need to test applications on different receivers.

<sup>34</sup> However, there is a measure of consensus that even where the same API is used, applications will need to be modified to take into account the characteristics of different transmission mechanisms, notably capacity, latency and the availability of a return path

<sup>35</sup> European Parliament resolution on an EU action plan for the successful introduction of digital television in Europe, texts adopted at the sitting of 23rd September 2002, B5-0488/2002.

<sup>36</sup> cited in section 3.2.2 above.

between all APIs, including MHP. This is the most easily achieved form of interoperability in developed markets with extensive deployment of earlier systems. It would also help ensure that content developed for other platforms would also be available in MHP format, subject to modification for linguistic and cultural differences between markets. The presentation engine recommendation (2) would provide a low-cost, entry level step which some market players consider necessary, owing to the higher costs of MHP in the short term. Recommendations (3) and (4) support interoperability by promoting a more harmonised implementation of the existing standards.

The report did not cover another technique for achieving interoperability, namely the development of software plug-ins that would enable MHP receivers to process applications authored for earlier APIs.<sup>37</sup> This is a potentially useful technique, but controllers of proprietary APIs have to develop the plug-ins themselves at their own discretion. The study did however note that work had been undertaken to develop a software bridge in order to enhance interoperability and migration strategies between the MHEG 5 presentation engine and MHP; moreover MHEG 5 has been submitted to ETSI for standardisation.<sup>38</sup>

Given the favourable reception accorded to the report, the Commission launched a standardisation mandate in order to encourage further, complementary standardisation in the area.<sup>39</sup> This has generated a standardisation work plan addressing the items in the CENELEC report, which merits the consideration of parties planning to respond to this consultation.<sup>40</sup> The objective of developing a standardised portable content format (PCF) marks a considerable step beyond specifications and guidelines for authoring. The PCF will enable content providers to author their content once and run it on multiple API platforms through edge-of-network transcoders. PCF will cover 80% of interactive television applications. It will *inter alia* make more content available to run on MHP, as content written in PCF to run on other API platforms will also run on MHP.<sup>41</sup> The progress and prospective outcomes of this work could be taken into account in the Commission's final assessment, as appropriate.

Thinking on interoperability within the DVB group also evolved during this period. Voluntary migration towards MHP was previously seen as the sole route to interoperability. However, changes in the market described above – notably the need for cheaper receivers after the collapse of the dot.com boom – together with regulatory concerns raised by this review led to in-depth reflections on how best to achieve interoperability across EU markets in differing stages of development. DVB rejected requests from several members to develop a cheaper, scaled-down version of MHP for a combination of practical and commercial reasons. In the time necessary to develop a new specification, the majority opinion was that MHP would

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<sup>37</sup> The plug-in technique can be made to work in the other direction, i.e by developing an MHP plug-in for earlier APIs. However, the limited hardware resources of early receivers may affect practical use of plug-ins.

<sup>38</sup> Draft ETSI ES 202 184; MHEG 5 is already an International Standardisation Organisation standard, ISO/IEC 13522-5.

<sup>39</sup> M331, undertaken by CENELEC and ETSI Special Task Force 255, reporting to the Commission through the Joint Technical Committee (Broadcast) of CENELEC, EBU and ETSI.

<sup>40</sup> Standardisation Work Programme in support of digital interactive television and the effective implementation of article 18 of Directive 2002/21/EC, ETSI TR 102 282, V1.1.1 (2004-02, available at [www.etsi.org](http://www.etsi.org))

<sup>41</sup> Current exceptions include the largest and most complex applications, notably Electronic Programme Guides and video games which are “written to the metal” of individual API platforms in order to optimise speed.

become cheap enough to meet the low-cost target. In the mean time, those seeking an entry-level API could choose one of the existing APIs.<sup>42</sup>

DVB also reaffirmed that it would support voluntary migration to MHP, but added a requirement to support co-existence between MHP and other selected APIs. Interoperability at content level is important in this context, as recognised in the CENELEC report. DVB therefore committed to produce the PCF specification, due to be submitted for standardisation in the first quarter of 2005. Work on such a format would also take into account the opportunity to make web content more easily available on interactive television through the XML language, in line with the approach expressed in the Commission's Communication on 'Open Platforms'.<sup>43</sup> Some players place higher value on content portability from the web – i.e. horizontal interoperability at content level – rather than simple interoperability at receiver/network level.<sup>44</sup> For instance a presentation engine based on the WML language – easily convertible to and from other mark-up languages - has recently been submitted for standardisation to ETSI.<sup>45</sup>

At world level, standardisation work within the ITU also has similar objectives, to ensure portability of content between different regions, and to identify common elements in order to maximise interoperability at other levels in so far as market realities permit. MHP has emerged as the core common element in a future ITU standard for execution engines, building on initiatives taken at industry level.<sup>46</sup> ITU has also initiated standardisation work on presentation engines. In addition to the inputs from Europe, there have been significant contributions to the ITU draft Recommendations from the USA and Japan. ITU Recommendations carry significant weight at a global level, and especially for those countries still contemplating new services and standardisation choices.

From discussions in the Communications Committee,<sup>47</sup> the Commission is aware that Member States' positions reflect their market development. Member States with more developed digital television markets, where there has been high investments in set top boxes containing first generation APIs, are not ready to implement a single standard. Smaller Member States – and others with less developed markets - favour the introduction of MHP as a single standard to achieve interoperability and are able to demonstrate high degrees of industrial consensus behind this position. As argued earlier, timing plays an important role in the single market characterised by different rates of digital broadcasting switchover.

#### 3.2.4. *Summary on state of play in interactive TV*

This section has shown that the market for interactive television services is still immature, with low demand. There is still uncertainty about which technical approach to use, with some players preferring the greater possibilities of the execution engine, and others preferring the cheaper, independent presentation engine at least in the short to medium term, with the additional possibility that some presentation engines offer for improved interoperability with

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<sup>42</sup> Notably Liberate, MHEG 5, Open TV and Media Highway.

<sup>43</sup> COM(2003) 410, cited in section 3.1.1 above.

<sup>44</sup> In that context, it is also worth noting that broadcasters are increasingly using IT technical platforms for programme making and news editing instead of specialised broadcast technical platforms. For instance, servers are increasingly being used instead of video recorders.

<sup>45</sup> ETSI work item DTS/JTC-016, sponsored by SES Astra, Bouygues, Microsoft, Sky Interactive.

<sup>46</sup> Notably the Globally Executable MHP initiative (GEM) undertaken by DVB, which achieved consensus on key elements with the US OCAP initiative and ARIB in Japan.

<sup>47</sup> The Communications Committee established by Article 22 of the Framework Directive 2002/22/EC, cited in Executive Summary above.

internet content. This distinction underpins the whole market. Mandating a single standard implies making a choice between these two technical approaches. The possibility of a standard being mandated has provided a strong incentive for industry players to reflect on how to improve interoperability at different levels within the value chain, notably in order to make best use of financial resources available for content origination. They have identified work items intended to improve interoperability across the range of Member States' markets, in different stages of development, taking into account both market priorities and the subsidiarity principle that applies in audiovisual policy.

### **3.3. Public policy objectives**

Having established that the role of interoperability has changed, and that the market for interactive television services is still immature, this section seeks to place interoperability into the broader context of the EU regulatory framework for electronic communications networks and services, which covers the market for communications infrastructure (including infrastructure used to carry broadcast transmissions). All such infrastructure in the EU is open to competitive supply.

The top-level policy objectives of the new regulatory framework are set out in Art 8(2) to 8(4) of the Framework Directive<sup>48</sup> as a series of objectives for National Regulatory Authorities. These are grouped under competition, the single market and the interests of the citizen. For the purposes of this document, the following are relevant:

To promote competition, by *inter alia*:

- ensuring that users, including disabled users derive maximum benefit in terms of choice, price and quality.
- ensuring that there is no distortion or restriction of competition in the electronic communications sector;
- encouraging efficient investment in infrastructure and promoting innovation

To develop the internal market, by *inter alia*:

- removing remaining obstacles to the provision of electronic communications networks, associated facilities and services and electronic communications services at European level;
- encouraging the establishment and development of trans-European networks and the interoperability of pan-European services, and end-to-end connectivity
- ensuring that in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications and services

To promote the interests of citizens by *inter alia*:

- ensuring a high level of protection for consumers in their dealings with suppliers;
- promoting the provision of clear information;

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<sup>48</sup> Cited in Executive Summary above.

- ensuring that the integrity and security of public communications networks are maintained.

Article 8 (1) provides guidance on how these objectives should be achieved. Measures should be proportionate to the objectives and Member States are required to ensure that NRAs carry out regulatory tasks while taking utmost account of the desirability of making regulations technologically-neutral.<sup>49</sup> National regulatory authorities may contribute within their competence to ensuring the implementation of policies aimed at the promotion of cultural and linguistic diversity, as well as media pluralism.

The tools for ensuring that these policy objectives can be met are set out in the Framework Directive itself and in the supporting Directives. These include the procedures for assessing whether competition is effective in a given market and imposing remedies on undertakings with market power where it is not. If, for example, the use of proprietary and non-interoperable technologies were to result in a lack of effective competition, regulators can impose suitable remedies to redress the situation, such as mandatory access to the facilities of operators with significant market power. The general standardisation regime set out in Article 17 *inter alia* provides the Commission with reserve powers to enforce standards to the extent strictly necessary to ensure interoperability of services and thereby to improve freedom of choice for users, as described above. Member States are required to encourage standards under the same provisos.

The primary vector for delivering freedom of choice is however competition. The EU regulatory framework favours market-led standardisation. Recital 30 notes the international success of European digital television transmission standards. These were developed from the mid-1990s onwards. There was no regulatory protection for particular standards, rather competitive pressure. If European players did not develop suitable standards, Directive 95/47/EC would have permitted other international standards to have been used following passage through a European standardisation process. This forced European industry to produce a timely and effective package of regional standards that met global market needs. The current package builds on that approach. There is therefore no industrial policy dimension to the standards provisions in the EU regulatory framework. Rather the market must deliver. The difficulty arises when there is no standard or when it is late, because the area is new, and preceded by first generation proprietary systems. The issue is then how to achieve an appropriate level of interoperability between co-existing systems *ex post*, or whether to migrate to a single system.

The challenge for the EU regulatory framework is how to reconcile some conflicts which may arise between its high level policy objectives in such situations, and to interpret the legislator's intentions regarding the usage of particular tools in order to address these problems. It is also important to pay attention to perverse effects and signals that regulatory action sends to market players.

For instance, a proprietary technology may be very innovative when introduced into the market, offering substantial benefits to end-users, in the absence of a standard. Mandating migration to a standard after market players had been permitted to use proprietary standards for several years could be hostile to future infrastructure investment. It would send a signal that investors should in future wait until a standard had been agreed for any new service

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<sup>49</sup> See recital 18.

before making investments and offering services to the public. Such a delay could also damage welfare by reducing choice.

On the other hand, if providers of proprietary systems withheld information that would facilitate market entry for a subsequent standardised system – for instance how to port content over from one system to another - this would impact welfare adversely, given that the standardised system would be innovative in its turn and deliver additional benefits beyond the first generation proprietary systems. From a single market perspective, if interoperability through a single standard could be achieved, it would offer greater prospect of pan-European service provision.<sup>50</sup> Standardised systems may lag behind the leading-edge in innovative markets, but if the technology is relatively stable, the benefits outweigh the disadvantages. Commission policy is that, in general, standardisation should be an industry led process; it is for market players to agree and introduce standards in a timely and consensual manner, in order to meet their own business needs.

As described above, however, implementation of a single standard for interoperability is hard to achieve in the EU, given the large differences in circumstances between Member States, which will affect the timing of services and therefore the technology used. Attempts to impose a unique TV transmission standard at European level in the past were unsuccessful.<sup>51</sup> Subsequently, in the case of digital transmission systems, EU law required ‘use a transmission system which has been standardised by a recognized European standardisation body’ without specifying any particular standard, in keeping with the policy of technological neutrality. Agreement by market players on the DVB transmission standards, which were adopted by ETSI, has been very positive for the single market and for interoperability at the transmission level.

Attempts by Member States to ensure interoperability within their own territory by imposing particular standards can lead to barriers within the internal market, hence the requirement to notify technical rules under the transparency mechanism of Directives 98/34/EC and 98/48/EC.<sup>52</sup>

The high-level policy rationale that motivates interoperability concerns at EU level is the Single Market. Article 8(3)(b) of the Framework Directive cited above, requires NRAs to contribute to the development of the internal market *inter alia* by encouraging the establishment and development of trans-European networks and the interoperability of pan-European services, and end-to-end connectivity. This should be considered in parallel with the requirement imposed in Article 17.2 on Member States to encourage the use of standards to the extent strictly necessary to ensure interoperability of services and to improve freedom of choice for users. The same necessity test and proviso for mandating standards qualifies the Commission’s reserve powers to make implementation of certain standards compulsory in Articles 17.3 and 4. The aims and provisions of Article 18 – as set out in section 1 - are closely associated with this approach.

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<sup>50</sup> Use of multiple standards would also be positive, albeit requiring integration of several systems at terminal level, in order to ensure that the equipment could be used throughout the Union. Proprietary systems require market players to negotiate licences without the guarantee of fair, reasonable and non-discriminatory terms imposed by standardisation. This may raise a potential barrier.

<sup>51</sup> See Annex 1, section 2.

<sup>52</sup> Directive 98/34/EC as modified by Directive 98/48/EC on ‘*the provision of information in the field of technical standards and regulations*’ OJ L 204, 21.7.1998, p. 37 and OJ L 217, 5.8.1998, p. 37.

The need to contribute to the development of trans-European networks and end-to-end connectivity are objectives taken from switched telecommunications networks and have limited application in broadcast services markets currently. Terrestrial services do not have the character of pan-European services, although terrestrial distribution could in theory contribute to a pan-European service strategy.<sup>53</sup> Cable networks are in general regional or national. Consolidation of cable network ownership has created several transnational backbone networks, but services still differ from market to market.

Satellite distribution is the obvious way of achieving pan-European services, but the cost of purchasing programme rights for all Member States is a barrier even for free-to-air services. Satellite pay television services are not marketed across borders, both for copyright and contractual reasons. Given the complex issues surrounding pan-European or even transfrontier pay TV services, simple interoperability may be a secondary concern, although achieving content portability between API platforms is still a relevant interoperability objective.

As argued in the Switchover Communication, the range and quality of content services drive consumer demand and the roll-out of digital television, rather than the characteristics of individual technologies. The provision of attractive content is up to market players. Policy interventions need to be justified and should address well-defined general interest objectives and market failures.

In summary, public policy objectives in the new regulatory framework are very high level and need to be balanced against each other in this case. In particular, the Commission must make an assessment of how far normal market process through competition supports user choice and how interoperability contributes to user choice in different business models. Factors to be taken into account alongside user choice include innovation and the need to provide certainty for investment. The Commission will also need to consider how far Single Market objectives contained in the Framework Directive can be applied and the subsidiarity dimension.

## **4. WHICH WAY FORWARD?**

### **4.1. General considerations**

The preceding analysis is intended to provide a comprehensive, but concise description of the forces at play, and to provide an update on interoperability developments since the Framework Directive was agreed. In particular, it seeks to show that interoperability has become more complex in dynamic markets characterised by network diversity and a wider range of business models, where access plays an important role in guaranteeing fair competition and indirectly in achieving media policy objectives such as cultural diversity. The interoperability issues that were once only a problem at international level will increasingly occur within individual countries. The pace of innovation and the different speed of roll-out across Member State markets mean that co-existence between multiple standards and technologies for different functions across the value chain is likely. Over time, the lower costs associated with standardised systems may provide some incentive for migration away from proprietary systems. Convergence means that horizontal interoperability – for example between internet and TV networks – will also grow in importance.

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<sup>53</sup> Member States give priority to national television services when allocating spectrum to terrestrial services; but they must act in accordance with the Authorisation Directive 2002/19/EC in respect of electronic communications networks and services. Recital 12 and Article 6 of this Directive are relevant in that context.

Proprietary technologies are part of the competition cycle in dynamic markets. They do not necessarily eliminate the possibility for achieving interoperability at one or more of the different levels described earlier. The “one box solution” is attainable, by integrating different system elements together, rather than having a single technology. Integration may not be economically feasible during the early stages of the market, but becomes possible as economies of scale reduce equipment costs. Integration of proprietary technologies depends on commercial negotiations between those controlling the IPR and equipment makers. The EU regulatory framework imposes obligations on providers of CAS in relation to the licensing terms for CAS technology and therefore provides support for integration.<sup>54</sup>

## 4.2. Policy options

In considering the way forward, trade-offs will need to be made between different policy objectives when assessing the impact of different measures to support interoperability. For instance, insistence that all facilities in the value chain are interoperable from initial market introduction could reduce incentives for innovation and the role of competition. The impacts of such an approach would differ according to the business model.

Policy options can be segmented into two main families. The first family entails some form of mandatory standardisation. Under this option, the most technologically neutral approach would be to require use of standards recognised by a European standards body for delivering interactive television services. This would provide an incentive for standardisation and would not block market entry by a future generation of technologies as long as they were standardised. It would also enable market actors to choose between the two technical approaches to interactive TV, execution engines or presentation engines, assuming both were standardised.

Such an obligation would be equivalent to the requirement for standardisation of transmission systems imposed by the earlier TV Standards Directive 95/47<sup>55</sup>. However, the large installed base of receivers equipped with earlier unstandardised APIs in Europe would imply a high cost in terms of receiver replacement, or reduced functionality if this solution were to be imposed *ex post*. One solution would be to limit the use of mandatory standards to free-to-air terrestrial television, specifically excluding cable and satellite television, where most pay TV investment in earlier APIs is concentrated. As governments control the underlying spectrum for terrestrial television, they normally insist on use of standardised technologies for terrestrial anyway.<sup>56</sup> A recent study undertaken for the Commission<sup>57</sup> indicates that this would be perhaps the least costly route to preserving the cohesion of the horizontal equipment market served by free-to-air broadcasting and the interoperability paradigm that underpins it. The study also provides some analysis of the trade-offs between variants of this policy option.

The second family involves supporting interoperability at all levels without mandating a particular API technology. The standards work being undertaken under Commission mandate

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<sup>54</sup> Pursuant to Article 6.1 of the Access Directive 2002/19/EC, and requirements stated in Annex 1, Part I (c) operators of conditional access services are not to subject the granting of licences to conditions prohibiting, deterring or discouraging the inclusion in the same product of means specific to another access system

<sup>55</sup> Cited in section 3.1.3 above

<sup>56</sup> Such measures must be in any case notified to the Commission pursuant to Directive 98/34/EC as modified by Directive 98/48/EC on ‘*the provision of information in the field of technical standards and regulations*’ OJ L 204, 21.7.1998, p. 37 and OJ L 217, 5.8.1998, p. 37.

<sup>57</sup> Study on interoperability, service diversity and business models in digital broadcasting markets, Oxera, February 2003.

M331 has led to a work plan of items for future standardisation including presentation engines, a portable content format to support single authoring for multiple APIs etc. This process is likely to run through 2004 into 2005. Such standards could be added to the list of standards published in the Official Journal, as they became available. The essence of this approach is the encouragement – rather than imposition- of standards in order to achieve interoperability at different levels. The Commission could consider a recommendation on the desirability of using open standards agreed by a European standardisation body for free-to-air television.

An additional element in this second approach would be to develop further ideas for promoting interoperability on a rolling basis. A technology cycle frequently begins with competing proprietary systems, then there is a standardised system, and this itself may be challenged by a new generation of proprietary technologies or possibly another standard. The challenge is to strike a balance between interoperability and innovation.

Annex 1 provides two examples of how the Union addressed comparable television interoperability issues in the past.

### 4.3. Legal analysis

The legal base for any Commission intervention on standards lies in Article 17 of the Framework Directive.

In accordance with Article 17(1), the Commission has published in the Official Journal of the EU a list of standards and/or specifications to serve as a basis for encouraging the harmonised provision of electronic communications networks, electronic communications services and associated facilities and services<sup>58</sup>. The list includes the MHP standards – see extract below.

\*\*\*\*\*  
APPLICATION PROGRAM INTERFACES (APIs)

Article 18(1)(a) of the Framework Directive requires Member States to encourage, in accordance with the provisions of Article 17(2), providers of digital interactive television services for distribution to the public in the Community on digital interactive television platforms, regardless of the transmission mode, to use an open API.

#### Multimedia home platform

Technical interfaces and/or service features	Reference	Notes
Multimedia home platform (MHP) specification 1.0	—ETSI TS 102 812	
Multimedia home platform (MHP) specification 1.1	—ETSI TS 101 812	

Comments: Work on the multimedia home platform (MHP) technical specification continues in the digital video broadcast group (DVB). DVB has grouped the MHP functionality into three classes of profiles, i.e. enhanced broadcasting, interactive broadcasting (both covered by MHP version 1.0) and Internet access (covered by version MHP 1.1). ETSI has already adopted version MHP 1.0.2 and MHP 1.1.

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<sup>58</sup> OJ C 331, 31.12.2003, p.32.

Under Article 17(3), ‘if the standards and/or specifications referred to... [in the List] have not been adequately implemented so that interoperability of services in one or more Member States cannot be ensured, the implementation of such standards and/or specifications can be made compulsory, to the extent strictly necessary to ensure such interoperability and to improve freedom of choice for users’. Clearly it is necessary to allow a reasonable period of time for implementation of a voluntary standard before deciding that implementation of the standard is not adequate.

If, as a result of the present consultation, the Commission considers that the implementation of certain standards should be made compulsory then, under Article 17(4), it will publish a notice of its intention in the *Official Journal of the EU* and will invite public comment by all parties concerned. It will also consult the Communications Committee under the regulatory procedure (which requires a weighted majority of Member States to support the measure).

*(Note that the procedure in Article 17 of the Framework Directive only allows for implementation of a standard to be made compulsory if it has already been published in the OJ. In the area of interactive digital TV, only the MHP standards have been published to date, and therefore these are currently the only candidates for compulsory implementation.)*

#### **4.4. Issues for consultation**

By means of this working paper, the Commission is inviting comments upon its analysis as set out in sections 1-3 of this working paper, and is consulting specifically upon the following issues:

1. The extent to which interoperability of interactive digital TV services has been achieved in the EU.

In addressing this issue, respondents are invited to comment on the following:

a) the different levels of interoperability, and access and interworking issues, described in Sections 1 and 2, i.e:

- Simple interoperability: device to network interoperability, typically ensuring access in free-to-air broadcasting;
- Content interoperability: portability of content between different API platforms;
- Head-end interoperability: normally real-time operations to facilitate multi-platform availability of services e.g replacing modulation format;
- Interworking agreements: commercial agreements between platform operators to make services available to each others’ customers.

b) the role of market forces:

- to what extent can market forces ensure that interoperability is provided to meet user needs?
- will the market on its own produce “one box” receiver solutions, e.g containing several proprietary APIs and conditional access systems?

- will the deliverables resulting from the CENELEC report and the follow-up mandate (in particular, authoring guidelines and possibly a common content format) facilitate adequate interoperability across the different markets of the EU?

c) the role of public authorities:

- what forms should public authorities' support for interoperability take during different phases of the technology lifecycle typically (1) proprietary systems (2) introduction of standardised system(s), possibly after some delay (3) introduction of replacement next generation technology...etc, taking into account policy objectives described above?
- how far will access rules suffice to meet the objectives of content regulation, as expressed in Art 18 (free flow of information, media pluralism and cultural diversity)?

d) the result of including the MHP standard in the voluntary list of standards published in the OJ in December 2002:

- is MHP being implemented by market players? If so, by which market players?
- at what point after publication would it be appropriate to decide whether or not the standards have been adequately implemented?

2. the benefits that could be achieved if implementation of the MHP standards published in the OJ were to be made compulsory.

In addressing this issue, respondents are invited to comment on the following:

- how would compulsory implementation of MHP standards improve interoperability and freedom of choice for users?
- who would benefit? who would not benefit? when would the benefits be felt? which undertakings would be required to implement the standard?
- who would bear the costs? would the benefits exceed the costs?
- if implementation were to be made compulsory, from what date would it apply? would there be a phasing-out period for legacy systems?
- how would the imposition of the MHP standards affect switchover and related policy objectives?

3. Should the Commission add further API-related standards and public specifications to the list of standards required by Article 17 of the Framework directive as they become available?

Possible candidate standards include:

- MHEG 5, currently undergoing a standardisation process in ETSI;
- Other possible outputs from the standardisation mandate M331, mentioned in section 3.2.3 above.

#### **4.5. Address and deadline for comments**

Comments on this working paper should be sent by e-mail to [info-b1@cec.eu.int](mailto:info-b1@cec.eu.int) by 30<sup>th</sup> April 2004 at the latest, with “Interactive television” in the subject line. Please give the name of a contact in the event of queries concerning your contribution.

Comments will be published on the Europa website unless confidentiality is expressly requested at the following URL:

[http://europa.eu.int/information\\_society/topics/ecommerce/index\\_en.htm](http://europa.eu.int/information_society/topics/ecommerce/index_en.htm)

## ANNEX 1

### 1 CONDITIONAL ACCESS

Achieving political agreement on interoperability of conditional access systems and an access remedy for the conditional access gateway were important elements in the co-decision process on the TV Standards Directive 95/47.<sup>59</sup>

Article 4 (c) required all conditional access providers to offer use of their systems to all broadcasters on “fair, reasonable and non-discriminatory terms”.

For interoperability between different pay TV platforms, industry provided a technical solution based on a common scrambling algorithm, to be included in all pay TV decoders. This enables TV subscription services from several operators to be received on a single decoder, when implemented through one of two interoperability techniques, simulcrypt and multicrypt, also known as the common interface. Simulcrypt requires a commercial interworking agreement between operators and is not under the control of the user. Multicrypt assumes that operators will implement their conditional access systems on a detachable module, to be slotted into receivers. This provides a horizontal market solution; decoders can be sold without the need to license and embed a conditional access system in the decoder. Consumers are able to swap modules as they change from one CA system and pay platform to another; integrating several CA systems on to one module would also be possible.

Pay TV and cable operators strongly supported simulcrypt and the concept of embedding conditional access in decoders for reasons of cost and security. They also argued that imposing the common interface would create a “free rider problem” and prevent them from subsidising decoders in order to help roll-out: multicrypt did not provide for the need to close decoders in order to collect remuneration from other broadcasters wanting to offer pay TV services. In other words, multicrypt lacked a “simlock” feature like GSM enabling subsidy recovery. Free-to-air broadcasters and the consumer electronics companies supported the imposition of multicrypt, arguing *inter alia* that operators’ control of the conditional access gateway would lead to foreclosure of pay TV markets.

The outcome was that Directive 95/47 required use of the common scrambling algorithm in all pay TV decoders, but did not impose either simulcrypt or multicrypt, leaving the choice by implication to market players and their business models, a position carried over to the new communications framework.<sup>60</sup> This reflected political preferences for a “market-led approach”. Moreover, a sequence of competition cases investigated *inter alia* the market foreclosure risks associated with conditional access.<sup>61</sup>

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<sup>59</sup> Directive 95/47/EC cited in executive summary above, article 4(c). See also The Development of the Market for Digital Television in the European Union, report in the context of Directive 95/47/EC, COM 1999 540 final, Communication from the Commission.

<sup>60</sup> See Article 24 of Directive 2002/22/EC on universal service and users’ rights relating to electronic communications networks and services (Universal Service Directive), OJ L 108, 24.4.2002, p.47

<sup>61</sup> The Commission ruled MSG Media Service to be unacceptable under the Merger Regulation in 1994 – see Commission Decision 94/922/EC; and the two related merger cases Bertelsmann/Kirch/Premiere – case IV M.993, OJ L 53, 27.2.1999 - and Deutsche Telekom/Beta Techniek - case M1027 - were deemed unacceptable in 1997. The intervening MMBG venture collapsed in 1995 owing to disagreements among the market parties. The Nordic Satellite Distribution venture was similar to MSG

Currently, simulcrypt is still operators' preferred interoperability technique, although they rarely conclude interworking agreements, as it would diminish the exclusivity of premium content. However, the thematic channels have used the Article 4(c) access provision to secure a presence on competing platforms, where these have used the same delivery mechanism, thereby avoiding the demodulator issue.<sup>62</sup> As argued in sections 3.1.2 and 3.1.4 above, simulcast and access remedies lessen the need for simple interoperability.

A small, but expanding market opportunity for multicrypt modules exists. A recent exercise to develop a similar system based on cheaper smart cards was rejected owing to security and business model concerns expressed by CA providers. DVB plans to review the security of multicrypt modules have been postponed. The Commission is monitoring US initiatives to introduce a multicrypt system with upgraded security into American cable decoders.<sup>63</sup> However, other provisions exist in the new framework that would address this issue, notably the requirements imposed by Article 6 of the current Access Directive.<sup>64</sup>

## 2 MAC/ analogue HDTV

From the mid-1980s until 1992, the Commission supported the imposition of the MAC/packets family of analogue television transmission systems. These were intended to prevent an extension of the PAL/SECAM interoperability issue to the new satellite television market. The Commission responded to a request by public broadcasters and imposed use of MAC standards for transmissions from high power direct broadcast satellites.<sup>65</sup> However, other market players preferred to use the PAL/SECAM systems in order to have cheaper and more timely receivers. Moreover, contrary to the expectations of public authorities, the satellite TV market achieved sustainable growth using lower power telecommunications satellites, which were not included in the scope of Council Directive 86/529/EEC. The requirement to use MAC on broadcast satellites may have provided a further incentive to use telecom satellites.

The Commission developed further justification for its support of the MAC standards as a result of analogue HDTV. During this period, there was extensive political concern about Japanese industrial policy linked to major research projects such as MITI's 5<sup>th</sup> Generation Computing Plan. The intensive technology research and international standards promotion campaign undertaken by the Japanese public broadcaster NHK in support of its Hi-vision standard was seen as an attempt to target the next generation of consumer electronics products. Moreover, its selected technical parameters meant there was no interoperability with

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in scope, targeting analogue pay TV initially, and proved unacceptable under the Merger Regulation for similar reasons to MSG. More recent ventures have been acceptable under competition law, albeit subject to remedies, including: Case IV/36539 British Interactive Broadcasting/Open – see Commission decision 1999/781/EC; Case No. COMP/JV37 BskyB/Kirch pay TV – see OJ C 7, 11.1.2000; BskyB/Telepiu

<sup>62</sup> See Development of Digital Television in the European Union, reference report 1998, September 1999, by IDATE, <http://europa.eu.int/ISPO/infosoc/telecompolicy/en/ideov98.pdf>.

<sup>63</sup> This FCC initiative has been subsumed into the Open Cable Initiative, footnoted under section 3.1.2 of this working paper.

<sup>64</sup> Directive 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities (Access Directive) OJ L 108, 24.4.2002. Article 6.1 states that when granting licences to manufacturers, CAS IPR must be licensed on fair, reasonable and non-discriminatory terms to equipment makers. This is intended *inter alia* to facilitate the integration of several CA systems in one receiver.

<sup>65</sup> As defined by the WARC 77 spectrum plan.

existing European television infrastructures.<sup>66</sup> European industry collaborated in the Eureka 95 research project to create European HDTV standards. This project developed a further MAC standard (HD-MAC) to cover HDTV transmission.

By 1991, it had become increasingly clear that most markets would not migrate from PAL/SECAM and take up the first generation MAC systems; without this, there was no prospect for introducing HDTV services using HD-MAC. Although major European consumer electronic manufacturers were still committed to MAC, broadcasters were increasingly pre-occupied with a new generation of digital television technologies flowing from both by the Community's Fifth Framework Programme and activity in the United States, where a prototype digital HDTV transmission system was in development. Digital television technologies offered a much wider range of service possibilities including cheaper multi-channel standard definition services, alongside the more costly HDTV option. European market players preferred digital multi-channel.

Following consultation, the Commission abandoned attempts to impose migration to MAC in support of the twin objectives of interoperability across the Single Market and the roll-out of HDTV. Policy was reoriented towards providing an appropriate regulatory framework for digital television.<sup>67</sup> Choices of standards and service were to be left to the market, rather than regulation. Separation between regulation and industrial policy has characterised subsequent policy development in this area.<sup>68</sup> Subsequently, a new generation of professional digital standards converters appeared on the market, able to convert programming between standards, ensuring portability of content with almost no loss of quality. This undermined the interoperability rationale previously used to justify a separate European HD standard.

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<sup>66</sup> 1125 scanning lines/60Hz frequency versus 625lines/50Hz.

<sup>67</sup> The TV Standards Directive 95/47, cited above in footnote 11.

<sup>68</sup> The industrial policy objectives behind the MAC HDTV strategy were scaled back to focus on the introduction of the wide-screen (16:9) format into the market. This was promoted with Community funding through an Action Plan; see Council Decision 93/424/EC of 22 July 1993 on an action plan for the introduction of advanced television services in Europe, OJ L 196, 5.8.1993, p.48. This action plan is further discussed in a recent Commission staff Working Paper, 'The contribution of wide-screen and high definition to the global roll-out of digital television', SEC 2004/46.

## GLOSSARY

### 3G

#### **Third Generation**

Generic name for third generation mobile telecommunications networks

### ADSL

#### **Asynchronous Digital Subscriber Line**

Technology that allows broadband data access over standard copper phone lines.

#### **Algorithm**

A set of steps that a computer follows to complete a task

#### **Analogue Television**

Precursor to digital television; uses variations in signal strength to transmit images

### API

#### **Application Program Interface**

API means the software interfaces between the applications made available by broadcasters or service providers and the resources in the enhanced digital television equipment for digital television and radio services. The API, also known as middleware, is the underlying technical facility for features such as the Electronic Programme Guide, hard disk, Personal Video Recorders (PVRs) and any interactive television service, whether enhanced broadcasting or return-channel enabled. APIs can be grouped into two types, those which are more intensively computational, based on an execution engine, and those which are declarative, based on presentation engines.

#### **Associated Facilities**

Those facilities associated with an electronic communications network and/or

an electronic communications service which enable and/or support the provision of services via that network and/or service. It includes conditional access systems and electronic programme guides.

#### **BetaNova**

A legacy set of middleware APIs developed by Kirch's Beta Research division for use in video networks.

### CENELEC

#### **European Committee for Electrotechnical Standardization**

Organization composed of electrotechnical committees from European countries focused on developing and harmonizing standards across Europe.

<http://www.cenelec.org/>

### CA(S)

#### **Conditional Access (System)**

Conditional access means any technical measure and/or arrangement whereby access to the protected service - such as Pay-TV - is made conditional upon prior individual authorization.

#### **Convergence**

Convergence is the result of digital technologies whereby information (voice, text, audio and video) can be converted into digital form and transmitted through different networks and accessed from different end-user terminals. The result is a convergence of services of ICT, media and telecommunications industries. Examples include the convergence of broadcasting and telecommunication and the convergence of television and personal computers.

## **Declarative Programming**

An approach to computer programming that describes a problem and has the computer resolve a solution. This contrasts with more traditional procedural programming in which the computer is given specific instructions to execute in a specific order.

## **Decoder**

A decoder is a device that converts coded data into an understandable format. For example, digital television signals are often transmitted to viewers in MPEG-2 format. A digital set-top box is used to convert the MPEG-2 formatted data into a video signal that a television can directly display. See also 'set top box'

## **Decrypt(ion)**

Decryption is used to convert an encrypted data into an understandable format. For example, a set-top box using a CAS would decrypt a broadcast signal so the content could be viewed.

## **Demodulator**

Device that retrieves data from an electronic signal

## **Digital Television**

Digital television broadcasting technology allows for significant improvement in terms of transmission capacity (number of channels and services), picture quality and information management. The technology benefits from digital compression techniques that can for example increase the number of channels available to viewers in a given block of radio spectrum.

## **DVB**

### **Digital Video Broadcasting Project**

An industry consortium that develops standards for digital television broadcasting

<http://www.dvb.org>

## **DVB-H**

### **Digital Video Broadcasting - Handheld**

A new terrestrial standard designed to allow personal and mobile devices to receive digital television broadcasting and data services.

## **DVB-S**

### **DVB-S1**

### **DVB-S2**

### **Digital Video Broadcasting - Satellite 1/2**

Standards for the broadcast of digital television over satellite networks

## **DVB-T**

Standard for the broadcast of digital television over terrestrial networks

## **DVD**

### **Digital Versatile Disk**

### **Digital Video Disk**

An audio, video, and data storage system based on optical disks

## **E-Commerce**

E-commerce means any business or service normally provided for remuneration at a distance by electronic means and at individual request of a recipient of services. These activities can consist for example of selling goods on-line, offering on-line information (such as homepages of newspaper) or commercial communications, providing tools allowing for search, access and retrieval of data or

services which are transmitted point to point, such as video-on-demand.

## **EPG**

### **Electronic Programme Guides**

EPG is an on-screen display of channels and programme data, which helps viewers navigate through the many channels available in digital television. EPGs are especially useful on cable and satellite services that offer a large number of channels.

## **Encoder**

Equipment that makes data not plainly understandable until passed through a decoder. For example, a broadcaster might encode video signals in MPEG-2 format before transmission to viewers.

## **Encrypt(ion)**

Encryption is the process of converting plainly understandable data to a format not understandable without complementary decryption. CAS uses encryption to ensure only qualified consumers can view content. Unauthorised viewers are not able to decrypt the signal and view the content.

## **ETSI**

### **European Telecommunications Standard Institute**

Organization that produces telecommunications standards for use in Europe

<http://www.etsi.org>

## **Execution Engine**

An execution engine is API that controls the step by step execution of an application, not including the presentation of content. For example, an execution engine might handle a channel change for set-top box when a viewer presses the appropriate button on a remote control.

## **Free to Air Broadcasting**

Means broadcasting on a channel, either public or commercial, of unencrypted programmes which are accessible to the public without paying in addition to the modes of funding of broadcasting (such as license fee and/or the basic tier subscription fee to a cable network). 'Free to air' television covers transmission by cable, satellite and terrestrial technologies but excludes services to which access is limited by Conditional Access system such as Pay-TV Services.

## **GEM**

### **Globally Executable MHP**

A specification that allows the core elements of MHP to be used alongside other, non-DVB platforms developed in other bodies e.g. OCAP

## **GSM**

### **Global System for Mobile Communications**

A popular standard for mobile communication networks

## **HD-MAC**

### **High Definition Multiplexed Analogue Components**

Extension of MAC standard for analogue high definition broadcast signals

## **HDTV**

### **High Definition Television**

The generally agreed upon definition of HDTV is approximately twice both the vertical and horizontal picture resolution of today's TV, which essentially makes the picture four times as sharp. HDTV is potentially a valuable enhancement, notably for big screen displays used in Home Cinema systems. Digital HDTV

services are now available in a number of countries.

### **Hi-vision**

Japanese studio standard for analogue high definition television signals

### **HTML**

### **HyperText Markup Language**

Data format used to define World Wide Web pages.

### **Interactive Television**

This term covers both enhanced broadcasting – local interaction with an application that is temporarily resident in the receiver and “true interactivity” where there is a return channel. Interactivity in a service implies a close control by the user of the service by means of ongoing system of two-way communication between the user and the service provider. ‘True interactivity’ refers to a request by an individual transmitted through a ‘return channel’ to which the service provider replies by supplying individually requested data and services separately from the main video programme.

### **ITU**

### **International Telecommunications Union**

United Nations System organization that used by government and industry to coordinate global telecommunications networks and services

<http://www.itu.int>

### **Interworking**

Agreements between operators to make services available to each others’ customers

### **IPR**

### **Intellectual Property Rights**

The rights derived from the exclusive or non-exclusive ownership of content for an unlimited or limited period of time

### **JVM**

### **Java Virtual Machine**

Software that interprets and executes Java language programs

### **Liberate**

A set of middleware APIs developed by Liberate for use in video networks. Liberate is a company focused on products for cable network operators.

<http://www.liberate.com>

### **Linux**

An open source, UNIX based operating system

### **MAC**

### **Multiplexed Analogue Components**

Transmission standard for use on satellite networks that was rejected by broadcasters

### **MediaHighway**

A set of middleware APIs developed by Canal Plus Technologies for use in video networks. MediaHighway was recently acquired by NDS.

<http://mediahighway.nds.com>

### **MHEG5**

A presentation engine standard from the Multimedia and Hypermedia information coding Experts Group used, inter alia, by teletext

[http://www.dtg.org.uk/reference/mheg/\\_mheg\\_index.html](http://www.dtg.org.uk/reference/mheg/_mheg_index.html)

## **MITI**

### **Ministry of International Trade and Industry**

Former name of Japanese government body responsible for trade and industrial policy, currently known as METI or Ministry of Economy, Trade, and Industry

<http://www.meti.go.jp/english>

## **Modulation**

Techniques to encode content information on a carrier signal

## **Multicrypt**

Technique where different Conditional Access systems share a common interface so content can be encrypted for different Conditional Access regimes

## **MHP**

### **Multimedia Home Platform**

An Application Program Interface used by providers of digital interactive television services to distribute content on digital interactive television platforms. The specification of MHP has been developed by the Digital Video Broadcasting Project (DVB)

<http://www.mhp.org>

## **Multi-platform**

Scenario where more than one technical type of network exist for the transmission and reception of content or services

## **NRAs**

### **National Regulatory Authorities**

Bodies of government responsible for telecommunication regulation at the member state level

## **NHK**

## **Japan Broadcasting Corporation**

Japanese public broadcaster

[www.nhk.or.jp/index-e.html](http://www.nhk.or.jp/index-e.html)

## **OCAP**

### **OpenCable Application Platform**

The US cable version of MHP, developed by OpenCable

<http://www.opencable.com/ocap.html>

## **OpenTV**

A set of middleware APIs developed by OpenTV for use in video networks. OpenTV is a company focused on interactive TV products for network operators and content developers.

<http://www.opentv.com>

## **OPIMA**

### **Open Platform Initiative for Multimedia Access**

A specification allowing consumers to consume and pay for services developed by the International Electrotechnical Commission

<http://www.chiariglione.org/leonardo/standards/opima/>

## **OS**

### **Operating System**

Software responsible for providing the underlying functionality necessary for applications to run on a computer

## **PAL**

### **Phase Alternate Line**

Standard for television broadcast signals used in Europe and other parts of the world, originally developed by Germany

## **Pay TV**

Users obtain access to additional or premium content against payment of a specific fee e.g. regular subscription or 'pay per use'. Pay-TV channels broadcast encrypt signals using conditional access systems (see above) so that access (via a decoder) is limited to only those people who subscribed to the Pay-TV Channel. In Community law pay-television services are covered by the Television without Frontiers directive.

## **Presentation Engine**

Programming code that controls the way content is displayed to a viewer. For example, a set-top box might use a presentation engine to interpret MHEG5 data in order to display teletext content on a screen.

## **Procedural Programming**

An approach to computer programming languages in which the computer is given specific instructions to execute in a specific order, mimicking the internal hardware circuitry of a computer

## **PSTN**

### **Public switched telephone network**

This provides the long-established fixed telephone service; it can be upgraded to deliver broadband or television services using ADSL technologies (see above).

## **SECAM**

### **Séquentiel Couleur avec Mémoire**

Standard for television broadcast signals used in Europe and other parts of the world, originally developed by France

## **Set-top Box**

General term for an add-on television receiver that is physically external to television box. See also 'decoder'.

## **Simulcast**

Simulcast means inter alia the broadcasting of analogue and digital signals simultaneously (hence the term simulcast). This can be one step in the way from analogue to digital Television (switch-over). Simulcast is also used to describe the simultaneous transmission of the content on different networks such as terrestrial, cable, or satellite.

## **Simulcrypt**

Technique that permits allows different Conditional Access systems to be used simultaneously in order to achieve interoperability

## **Teletext**

Generic term for textual information transmitted by television signals

## **WML**

Wireless Markup Language

XML-based format for digital content delivery and interaction used originally in mobile telephone handsets, but more recently adapted for use in interactive television as WTVML.

## **XML**

### **Extensible Markup Language**

General purpose way of representing metadata in content

## **Zapper Box**

Digital TV receiver not equipped with interactive capabilities, intended for multi-channel reception only.