

**Unclassified**

**DSTI/ICCP/CISP(2006)5/FINAL**



Organisation de Coopération et de Développement Economiques  
Organisation for Economic Co-operation and Development

**19-Dec-2007**

**English - Or. English**

**DIRECTORATE FOR SCIENCE, TECHNOLOGY AND INDUSTRY  
COMMITTEE FOR INFORMATION, COMPUTER AND COMMUNICATIONS POLICY**

**DSTI/ICCP/CISP(2006)5/FINAL  
Unclassified**

**Working Party on Communication Infrastructures and Services Policy**

**IPTV: MARKET DEVELOPMENTS AND REGULATORY TREATMENT**

**JT03238173**

Document complet disponible sur OLIS dans son format d'origine  
Complete document available on OLIS in its original format

**English - Or. English**

## **FOREWORD**

The Working Party on Communication and Information Services Policy discussed this paper at its 37th and 38th meetings and agreed to recommend the declassification of the paper to the ICCP Committee.

The ICCP Committee agreed to declassify this paper at its meeting in October 2007. The paper was drafted by Mr. Jaebum Lee.

## TABLE OF CONTENTS

|   |    |
|---|----|
| FOREWORD .....                                      | 2  |
| TABLE OF CONTENTS .....                             | 3  |
| MAIN POINTS .....                                   | 4  |
| I. INTRODUCTION .....                               | 6  |
| Definition of IPTV and scope .....                  | 6  |
| How IPTV Works.....                                 | 7  |
| II. MARKET TRENDS .....                             | 10 |
| IPTV markets: competitive outlook .....             | 10 |
| IPTV markets: At an early stage .....               | 11 |
| Upgrading DSL networks to support IPTV.....         | 11 |
| Differentiation of services by IPTV operators ..... | 12 |
| On-demand content is increasing .....               | 13 |
| Access to Premium Content .....                     | 13 |
| III. REGULATORY TRENDS .....                        | 14 |
| Reviewing regulations.....                          | 14 |
| Importance of regulatory framework for IPTV .....   | 15 |
| Access to Local Loops .....                         | 15 |
| IV. COUNTRY INFORMATION .....                       | 17 |
| AUSTRALIA .....                                     | 19 |
| AUSTRIA .....                                       | 20 |
| BELGIUM.....  | 21 |
| CANADA.....   | 21 |
| CZECH REPUBLIC .....                                | 23 |
| FRANCE .....  | 23 |
| GERMANY.....  | 25 |
| HUNGARY.....  | 26 |
| ITALY .....   | 27 |
| JAPAN .....   | 27 |
| KOREA .....   | 28 |
| NETHERLANDS .....                                   | 28 |
| PORTUGAL .....                                      | 29 |
| SPAIN .....   | 30 |
| SWEDEN .....  | 30 |
| SWITZERLAND .....                                   | 31 |
| UNITED KINGDOM.....                                 | 31 |
| UNITED STATES .....                                 | 33 |
| NOTES .....   | 36 |

## MAIN POINTS

This paper examines current market trends and regulations for IPTV and also provides information on developments in the provision of IPTV service in a number of OECD countries. IPTV is difficult to define. For the purposes of this paper, in order to capture some of the most interesting market developments in OECD member countries, IPTV is defined as video and ancillary services such as audio/text/data delivered over the Internet Protocol and offered as a channels of linear and/or non-linear programming of broadcast quality designed to be viewed on a television.

Current market trends in the IPTV area include:

- *Fixed-line telecommunications operators - competitive outlook:* Market data indicate that telecommunications operators<sup>1</sup> are likely to become competitive in the market for video programming distribution as one of the services offered with their IPTV services. These predictions take into account the multiple services that IPTV providers offer, also called “multiple-play.” Despite successful entry into the market, however, it is unlikely that these new entrants will attain revenues in IPTV markets commensurate with the revenues of their more entrenched competitors, at least at the outset.
- *IPTV markets - At an early stage.* Fixed-line telecommunication operators need to upgrade their DSL networks to provide competitive IPTV service offerings. This is one of the reasons why IPTV markets are at an early stage except in a few countries such as France, Italy, and Spain where IPTV services are starting to become a mass market service.
- *Upgrading networks to support IPTV:* Fixed-line telecommunications operators are upgrading their existing DSL networks or replacing them with fibre optic cable to support IPTV and other multimedia services. However, the timing and exact technology to be adopted vary depending on a number of complex factors including the level of competition in the market, the state of the existing network, population density, and the structure of the housing market.
- *Differentiation of services by IPTV operators:* Though the competitive process results in various competitors offering very similar products or bundles of products, IPTV operators may be more innovative than their traditional counterparts, and may try harder to differentiate their service offerings.
- *On-demand content is increasing:* Consumers are increasingly attracted to time/place-shifted viewing and the video-on-demand (VoD) market is already showing strong growth. In addition to consumer demand, other factors driving the VoD market include the growing availability of VoD video content with more favorable access conditions, the emergence of High Definition DVD recorders, a growing market for mobile video/TV, and the increasing use of personal video recorders (PVRs).
- *Access to Premium Content:* IPTV operators need to purchase premium content demanded by viewers. However, premium content owners are concerned that their content will be freely available through peer-to-peer distribution over the Internet. The success of the legal online music download market, however, may be changing the perceptions of premium content owners. As a result, IPTV operators are increasingly obtaining premium content because they are applying digital rights management (DRM) technologies to the content, to assure premium content owners that the content they provide will be adequately protected.

Current regulatory treatments of IPTV services include:

- *Reviewing regulations:* The development of IP based networks for transmitting video content, as well as the development of different types of video content and availability of a wide range of different distribution models used to distribute video content requires a review of existing regulatory frameworks in order not to stifle innovation and the diffusion of new services. A number of OECD countries have begun to take steps in this direction.
- *Importance of regulatory framework for IPTV:* The development of IPTV services has benefited from a regulatory framework in most countries which has facilitated access to broadband networks by new entrants through local loop unbundling (LLU), as well as by light touch regulation which has prevailed with respect to abstaining from imposing any onerous requirements for the provision of IPTV. There has been increasing policy recognition of technological convergence and this has facilitated the development of IPTV.
- *Access to local loops:* Local loop unbundling allows ISPs to replicate local loops of incumbent operators on a cost basis while allowing service differentiation from the service offerings by the incumbents, and thus can stimulate new entry into the IPTV market. While in most OECD countries cable TV operators are not subject to unbundling, some countries have decided to apply LLU to cable networks also.

## I. INTRODUCTION

The purpose of this paper is to look at current trends of the market and the regulatory treatment for IPTV in OECD countries.

### Definition of IPTV and scope

IPTV is “television” delivered over Internet Protocol. Traditional “television” service normally refers to linear programming (one-way scheduled audiovisual programming) of broadcast quality offered as a channel/channels designed to be viewed on a TV set. However, as technology develops, the definition of “television” may change in at least one of the areas cited below with implications as well for the definition of IPTV.

Linear Programming – Electronic programming guides (EPG) and digital video recorders (DVR) allow viewers to easily record scheduled television programming for watching at times of their choices. Interactive functionality also enables viewers to escape from scheduled programming toward Video on Demand (VoD). Viewers may start to regard, in the future, DVR-recorded video and non-linear programming as “television programmes.”

Broadcast quality - Quality of video can also be a factor in determining if a programme is meant to be viewed on a PC or on a TV, but as bandwidth and processing power increase, the distinction between “broadcast quality<sup>2</sup>” and non-broadcast quality is likely to disappear.

Offered as a Channel/Channels – Choosing an arbitrary threshold between a series of programming in a channel/channels and a “video clip” may provide a further distinction between TV programmes and “non-TV programmes”. However, as Internet video providers such as “MSN Video<sup>3</sup>,” “CBS News Video<sup>4</sup>” provide “playlist” functions, stringing video clips together, viewers would simply tune in to a channel of custom-defined content.

View on a Television Set – As technology converges, the line separating television sets and computer monitors is blurring. As computers become more multimedia focused, viewers can view television programming on a computer monitor, while advanced set-top boxes such as Apple’s Apple TV permit viewing on a TV through the use of a PC.

In light of these considerations, a range of IPTV definitions is possible. This paper does not seek to define IPTV in a regulatory context.<sup>5</sup> This means that even though an IP-based TV service is categorised as an IPTV offering in this paper, the IP-based service is not necessarily subject to the same regulations applied to the other types of IPTV offerings. Also this does not imply that traditional broadcasting regulations need to be applied to the defined IPTV services, rather it could imply that the broadcasting regulations may be deregulated due to the increased competitive level in the relevant market(s).

That said, for the purpose of this paper, in order to capture some of the most interesting market developments in OECD member countries, IPTV is defined to be video and ancillary services such as audio/text/data delivered over the Internet Protocol and offered as a channel/channels of linear and/or non-linear programming of broadcast quality designed to be viewed on a television.<sup>6</sup> With this operational IPTV definition, the paper covers linear, broadcast style services, and also pure VoD offerings.<sup>7</sup> For the

purpose of this paper, IPTV does not have to be operated over a private/managed networks<sup>8</sup>. Private networks are necessary to deliver consistent quality. This can occur even if the service passes in whole or in part over the public Internet. However, it does not include services designed to be primarily viewed over personal computers, or services which provide a library of short clips. The definition of IPTV thus incorporates such services as Akimbo, which provides access to cable channels wholly over the Internet and then through a set-top-box allowing them to be displayed on a television”.

With respect to the regulatory definition of IPTV services, most countries are applying regulations to the television broadcast service component of IPTV services. Most of the EU and OECD countries introduced horizontal regulatory frameworks which apply minimum broadcast regulations to broadcasting audiovisual services and allow new services such as IPTV to be provided without being subject to *ex ante* regulations before the services prove to be substitute services in the relevant communications markets. In the EU, the policy framework for television broadcast regulation is the Television Without Frontiers Directive of 1997 (TWF) and subsequent revisions, which includes minimum harmonisation regulations including country of origin requirements.<sup>9</sup> In Japan, a new streamlined law on “Broadcasting Using Telecommunications Services” was enacted in 2001 to regulate television broadcast using telecommunications services. According to the law, only registration is needed for telecommunication operators to provide IP-based television broadcasts. In Canada, the independent regulator CRTC exempted broadcasting services and mobile television service over the public Internet from licensing or other requirements of the Broadcasting Act of 1999 and 2006 although the CRTC did not exempt television broadcasts over managed IP-based networks. In the United States, the FCC is letting IP-enabled services including IPTV develop in the market while it is examining issues relating to services and applications making use of Internet Protocol. These light touch approaches by most OECD countries may be based on a common perception that innovative services such as IPTV can significantly enhance consumer benefit and the level of competition. Thus, IPTV provides excellent opportunities to review and deregulate traditional broadcasting regulations in order to avoid a situation where heavy-handed regulations block market entry of innovative services.

### How IPTV Works<sup>10</sup>

An IPTV network is divided into three major segments: the head-end user (or hub office), the network, and the customer premises. The head-end is where the content is aggregated and prepared for transmission on the network. The network can be copper, copper upgraded to support broadband or fibre and while traditionally configured for voice and data it is now capable of carrying video. The customer premise represents the delivery point of the video and audio transmission. It is noted that the architecture of other networks, including cable TV networks, is not very different from that of an IPTV network. The head-end and the network is typically the same, however, the last connection, which is delivery to the home, differs.<sup>11</sup>

Most video content is aggregated at the IPTV operator’s head-end, where video feeds are received, aggregated, and encoded to be delivered to the network. Much of the content is transmitted to the head-end via fibre or by satellite. Video on Demand (VoD) content is pre-encoded. Video encoders encode video streams into packets (encoding) and encapsulate the encoded video packets into IP packets<sup>12</sup> (encapsulation; the IP packet is by default an MPEG-2 Transport Stream<sup>13</sup>). A single IP packet contains seven MPEG-2 encoded packets (see Figure 1). Video streams are encoded using different codec, a compression algorithm, such as MPEG-2, MPEG-4 (H.264, Windows Media VC-1). For local programming, video encoders are located in regional head-ends.

**Figure 1. IP Encapsulation (MPEG-2 Transport Stream) of seven MPEG-2 encoded packets**

Source: Kenelm D. Deen, Contribution and distribution over IP networks.

MPEG-2 has been the encoding method for digital cable and digital satellite systems for about 15 years. The cost of MPEG-2 encoders, which can be installed in a set-top box or a PC, is thus low due to economies of scale. However, the compression efficiency of MPEG-2 is not sufficient for twisted copper pair loops, whereas cable systems can send all the video channels using the MPEG2 codec since the bandwidth of hybrid fibre coaxial (HFC) cable can be near 4.5Gbps. Moving to H.264 typically provides a 40% saving in bandwidth over MPEG-2 encoded content, enabling IPTV operators to offer High Definition (HD) services to the home.<sup>14</sup>

If an IPTV operator does not have sufficient bandwidth and cannot prioritise the video traffic along the IP network end-to-end with quality of service (QoS) tools, it is technically possible that the video traffic may be delayed or fragmented.

Following encapsulation, the IP packets (normally, MPEG-2 TS) are streamed onto the network. The process of encapsulation and streaming happens in real-time. The video streams are received by the local switch office, which sends the streams to individual customers. The local switch office is normally where local content from TV stations, video servers and advertising are added and mixed. Video servers are computer based devices connected to large storage systems. Video servers are mostly used for Video on Demand (VoD). Video servers are also used for Network Personal Video Recorders (network PVR) which allow subscribers to record video streams (including both live and VoD content) remotely on a storage device located at the operator site. The local switch office is also a place where the IPTV middleware is housed. The middleware is a distributed operating system that runs both on servers located at the IPTV operator's location and on the set-top box, and handles user authentication, TV channel change requests, billing, VoD requests, etc.

All scheduled video channels in an operator's offer can be broadcast simultaneously from the head-end to local switch offices because the core network is normally a fibre optic cable, but the access network of the local DSL loop from the local office to the customer's set-top box does not have sufficient capacity to stream all the live channels at once. Current ADSL broadband networks can typically support download speeds of up to 8Mbps and upload up to 256 kbps within a 1.5 km distance from the central office (or wherever the DSLAM is located). More advanced access technology, ADSL2+, for example, can provide downstream speed of up to 24Mbps. If a video programme is encoded with a MPEG-2 codec, an ADSL loop can accommodate at maximum 2 standard definition (SD) channels (8 Mbps/4Mbps = 2 channels), while an ADSL2+ network can allow up to 6 SD channels (24/4=6) or 1 HD channels and 2 SD channels (15 Mbps x 1 + 4 Mbps x 2 = 23 Mbps) on the condition that the local loop is used only for video delivery.

**Table 1. Bandwidth demand for encoding technology**

| Encoding                 | MPEG-2     | MPEG-4 part 10 (H.264) | VC-1        |
|--------------------------|------------|------------------------|-------------|
| Average SD               | 4 Mbits/s  | 1.5 Mbits/s            | 1.5 Mbits/s |
| Average HD               | 15 Mbits/s | 8 Mbits/s              | 8 Mbits/s   |
| Digital Right Management | No         | No                     | Yes         |

Source: Kenelm D. Deen, Contribution and distribution over IP networks

Given the limitation of the bandwidth of twisted copper wire, telecommunication IPTV operators are providing hundreds of video channels to customers by sending only selected video channels at a time from local offices to set-top boxes, instead of broadcasting all the video channels simultaneously. To do this, operators are using switched digital video technology which switches a video stream to individual set-top box only when the video stream is requested by a viewer. Each subsequent viewer on the node who requests the same channel shares the stream; the operator thereby conserves bandwidth. In a traditional broadcast network (terrestrial TV, CATV, satellite) using broadcast video technology, all the content constantly flows downstream to each customer and the customer switches (tunes) to a different channel using a set-top box. A switched IP network works differently. Content remains in the network, and only the content the customer selects is sent to the customer's home. That frees up bandwidth and the customer's choice is not limited by the bandwidth of the network to the home. The conservation of bandwidth and the capability of sending only selected content to customers who request it enable IPTV operators to provide customers with a large number of video channels and reallocate unused bandwidth to other services.

One of the many protocols which enable channel change in the IPTV services is IP Group Membership Protocol (IGMP). When IPTV users change the channel on their set-top box, the box does not tune to a channel as would happen with a cable system. The IPTV set-top box is simply an IP receiver. The set-top box switches channels by using the IGMP version 2 to join a new multicast group. When the local switch office receives this request, it checks to make sure that the user is authorised to view the requested channel then directs the routers in the local office to add that particular user to the channel's distribution list. In this way, only signals that are currently being watched are actually being sent from the local office to the DSLAM and onto the user.

VoD services can be streamed or downloaded to subscribers. VoD servers pull pre-compressed video streams and transmit them as IP packets when requested by customers. Local offices generally deploy local VoD servers to generate a unicast stream from the local VoD servers to a particular home. This stream is typically controlled by the Real Time Streaming Protocol (RTSP), which enables users to play, pause, and stop the programme they are watching.

IPTV operators need to provide multiple video streams (coming from a live TV multicast stream, VoD/Network PVR unicast stream, Picture in Picture video stream) and voice and broadband Internet access services to compete with cable TV operators. To do this, they need to upgrade their existing ADSL-enabled copper lines by using more advanced transmission technologies, such as ADSL2+, VDSL<sup>15</sup>, VDSL2,<sup>16</sup> while using the same copper lines, or/and by replacing part or the whole of the copper lines with optical fibre. A second requirement is to adopt a video codec with increased compression capability. For example, AT&T's IPTV service, U-Verse TV, uses MPEG-4 (H.264) encoding rather than MPEG-2 encoding.

## II. MARKET TRENDS

### **IPTV markets: competitive outlook**

Fixed-line telecommunication operators have been faced with declining revenues because of voice competition, the substitution of fixed for mobile services, and the rapid deployment of VoIP services. These developments have resulted in a lowering of average revenue per user. The relatively rapid decline in the number of subscriber lines faced by some incumbent operators has also been of concern to them since the cost involved in regaining customers can be high. These developments have led telecommunication operators to focus on strategy on multiple play offers which are viewed as providing a more effective way in reducing customer churn by locking-in customers. The provision of video services is viewed as a basic element of multiple play services.

In addition, competitive pressure from traditional television broadcasters has given fixed-line telecommunication providers significant incentive to upgrade their own networks and enter the video market. Many cable companies are also migrating to IP-based digital networks. In Europe at the end of 2005, 64 million households (one-third of all European TV households) subscribed to TV services via cable and 7.1 million households in Europe obtained digital TV via cable, 9 million Internet customers and 7.5 million telephony customers have chosen cable.<sup>17</sup> In the US at the end of 2005, cable subscribers numbered 65.4 million of whom 28.5 million were digital cable customers and 25.4 million household subscribers were using cable modem-based broadband Internet access service and 5.6 million were digital phone (VoIP) customers.<sup>18</sup> Satellite broadcasters such as DirectTV and Sky have also deployed personal video recorders (PVRs) which allow real-time transmission to be transformed to a near version of VoD by allowing real-time content to be recorded, stopped, and rewound. In October 2005, the UK-based BSkyB bought a fixed-line operator, Easynet, in order to offer its customers interactive and targeted services including Video-on-Demand (VoD) services.

On top of the competitive pressures from existing pay-TV service providers, more and more free-to-air digital terrestrial TV channels will be available. A market research firm, Datamonitor, estimates that by 2010, 95% of households in Europe will have made the switchover to digital TV. One of the possible influences that these free-to-air services have on the evolution of the IPTV market can be seen in BT's "BT Vision," a VoD service combined with dozens of digital terrestrial channels (Freeview) transmitted over-the-air to a DTT tuner-installed set-top-box. The set-top-box which can receive over-the-air DTT signals can save the corresponding bandwidth in an IPTV fixed-line network thus, allow IPTV services providers to deliver digital terrestrial channels without additional network investment.

Given the level of competition in the video market, IPTV may not provide the revenues many fixed-line telecommunications operators hope to attain by providing this service. Some analysts have suggested that the offer of IPTV could eventually result in operating losses.<sup>19</sup> Market data shows, however, that despite strong competition and the fact that telecommunications operators may not attain the revenues necessary to remain competitive in the long-term in a multiple-play market, in the near-term, telecommunications operators are likely to become competitive new entrants in the market for video programming distribution with their IPTV services. The rate of IPTV uptake will vary and, according to some market research firms, the number of IPTV subscribers would reach 29.5 million worldwide in 2010.<sup>20</sup> iSuppli predicted in August 2006 that global IPTV subscribers would grow to slightly more than 63 million in 2010 (compound annual growth rate of 92.1%)<sup>21</sup>, while the Multimedia Research Group

forecast in October 2006 that global IPTV subscribers would grow from 4.3 million in 2005 to 36.8 million in 2009<sup>22</sup> and to 50.5 million in 2010.<sup>23</sup> In Western Europe, Gartner (April 2006) forecast that the IPTV subscriber market would reach 3.3 million subscribers in 2006 and 16.7 million in 2010.<sup>24</sup>

### **IPTV markets: At an early stage**

The need for new revenue streams and competitive pressures are leading fixed-line telecommunication operators to add video services to their service offerings over DSL lines. However, in order to provide competitive IPTV service offerings, they first need to upgrade their DSL networks or build new networks to support the distribution of multichannel video services. This may be one of the reasons why IPTV markets are at an early stage except in a few European countries such as France, Italy and Spain where IPTV services have entered into the mass market. As an example, DT's T-Home in Germany started commercial launch in October 2006, AT&T's U-Verse TV started commercial launch in June 2006, Verizon's FiOS began launch in August 2005, and KPN's Mine TV in May 2006. Upgrading requires investment in new equipment for IPTV services, such as video head-ends, video servers and the development of set-top boxes. In addition, a robust integrated system needs to be put in place to integrate new and existing facilities into a large size subscriber base. Because of the investment requirements, the deployment of IPTV services by alternative and relatively small sized telecommunication operators has often taken place on a regional basis. The larger sized telecommunication operators, and in particular incumbents, already had a national reach for DSL, but nevertheless needed to invest in network upgrades in order to provide IPTV on a national basis. This national reach often provides telecommunication incumbents with an advantage over cable operators in some countries where cable companies are often smaller and more fragmented companies.

### **Upgrading DSL networks to support IPTV**

Fixed-line operators are upgrading their existing DSL networks or replacing them with fibre cable to support IPTV services. However, the timing and exact technology to be adopted varies depending on a number of complex factors including the level of competition in the market, the state of the existing network, population density, and the structure of the housing market.

France, which is among the leaders in the OECD providing IPTV service, also provides one good example where competition is leading to the upgrading of networks. Free, a new entrant ISP, was one of the first companies to launch an IPTV service in the French market using two types of leased loops from France Telecom such as "full unbundling" and "line sharing." As an example, in order to offer multiple-play services, Free invested in equipment including DSLAMs (Digital Subscriber Line Access Multiplexers) and video cards. Even though French regulations allow "bit stream access" (or "wholesale access") to the incumbent's network, Free did not use it since the company has no management control over the physical line and is not allowed to add other equipment. Free upgraded France Telecom's line to ADSL2+ to enable a number of value-added advanced service capabilities. Furthermore, Free, in September 2006, announced plans to spend EUR 1 billion over six years on a nationwide FTTH rollout in order to differentiate its services further from other competing multiple-play operators. In addition, it has also indicated its willingness to unbundle its fibre network for other operators. At the time of writing, the other two major IPTV operators in France, France Telecom and Neuf Cegetel, announced their plans to deploy FTTH networks.

In the United States, where cable modem use is more prevalent than DSL lines,<sup>25</sup> competition is leading to network upgrades. Nationwide fixed-line telecommunication operators such as AT&T and Verizon are actively deploying optical fibre networks to compete with cable TV operators' multiple play services. AT&T is deploying a Fibre-to-the-Node (FTTN)/VDSL2 network to offer multi-channel IPTV HDTV services and other advanced functions. AT&T's 'U-verse service,' a triple play<sup>26</sup> package (digital

voice, video and broadband access), is combined with AT&T's analogue and wireless telephone services to provide quadruple-play potential. Verizon's Fiber-to-the-Home (FTTH) 'FiOS' service, a triple play package (video + broadband access + digital voice) is also combined with Verizon's wireless telephone network (and where digital voice is not available, its analogue telephone network) to provide quadruple play possibilities. Verizon, however, provides only VoD as IPTV; its linear programming is transmitted over fiber via quadrature amplitude modulation (QAM). These services compete with cable companies' triple play offerings. AT&T's FTTN/VDSL2 deployment means that the company will deploy fibre deeper into their networks and install cabinet-based nodes beyond the exchanges in order to bring copper loop lengths within 1km between the cabinet and customer premises. At that distance VDSL2 can deliver 50Mbps downstream, but its performance falls off more rapidly with distance. When the copper loop length exceeds 1.5 km, VDSL2 does no better than ADSL2+. This has made 1km the maximum loop length target for many VDSL2 deployments.

The technological state of existing networks, population density and structure of the housing market (dense apartment complexes, suburban housing) can affect the timing and technology for network upgrading. In Korea, VDSL1 began to be deployed in 2001 bypassing ADSL2 and ADSL2+ technologies. This was facilitated by the fact that in Korea housing is predominantly based on high-rise apartments which reduces the cost of laying down fibre. VDSL1 is capable of delivering 52Mbps downstream, 12Mbps upstream at a distance of about 300 meters.<sup>27</sup> In Europe, some telecommunication companies such as Swisscom and Deutsche Telekom plan to migrate directly to VDSL2+, with a few exceptions such as Belgacom which uses VDSL1 since they want to have the most advanced standard for DSL networks from the current ADSL network, which in many cases may be short of bandwidth for competitive IPTV offerings.

Upgrading the local access network is expensive. The cost of deploying fibre-to-the-home is 15 times more expensive than deploying copper wire to the central switch, while fibre deployment to cabinet-based node (FTTN) beyond the central switch is 3 times more expensive than copper wire.<sup>28</sup> Given the high cost of upgrading the local access network, there has been an interest in the development of municipal broadband Internet access networks which would provide open access to ISPs.<sup>29</sup>

### **Differentiation of services by IPTV operators**

Many new IPTV operators try harder to differentiate their service offerings from traditional pay-TV service providers, especially in the highly competitive multiple-play services markets. The competitive process itself often leads IPTV services providers to match competitors' service offerings, as in the case of the French IPTV market. In France, the most advanced and largest IPTV market in the OECD, the three major IPTV operators, Free, France Telecom, and Neuf Cegetel, have competitively introduced various value-added IPTV services to try and differentiate their services. The service differentiation by IPTV operators seems successful when compared with relative straight forward triple-play service offerings by Noos, a cable TV operator in France. The competitive pressures have led the IPTV operators to match each others' offerings with the result that they have very similar service offerings. Those services include HD broadcast channels (except FT), Personal Video Recorders (PVR),<sup>30</sup> digital terrestrial TV (DTT) tuners,<sup>31</sup> WiFi/GSM dual-mode handsets for voice,<sup>32</sup> media centre capability, etc. Free provides a "TV to PC" service, which allows TV programmes to be streamed to any PC connected to the Internet. France Telecom improved the portability of content by making available video series to users of IPTV, PDAs, PCs, and mobile phones.

AT&T Broadband TV Service in the US provides another example of service differentiation by an IPTV services provider. AT&T has announced that its U-verse OnTheGo service enables subscribers to view approximately 30 channels of live TV on any Windows-based PC using any broadband Internet

connection. Channels include Bloomberg, History Channel, A&E, The Biography Channel, Comedy Time, Oxygen and Fox.<sup>33</sup>

### **On-demand content is increasing**

Most IPTV operators in the OECD provide VoD services which consumers demand because of the convenience of time-shifted and place-shifted viewing, free viewers from traditional broadcast schedules and home watching. Data from market analysis shows that the VoD market is already showing strong growth of over 40% in 2005 compared to 2004, and significant growth is expected to continue in 2007. Market research also predicts that several developing trends will mature by 2008 to drive VoD growth. These trends include strong global IPTV development, the growing availability of VoD movie content with more favourable access conditions and the emergence of High Definition DVD Recorders (HD-DVD or Blu-ray) that will facilitate ‘download and burn’ of purchased VoD films, and a growing market for mobile video and mobile TV where a substantial amount is downloaded via broadband and synchronised to mobile phones.<sup>34</sup> The increasing use of PVRs also complements the rise of on-demand content. Market research company, In-Stat, estimated in June 2006<sup>35</sup> that worldwide unit shipments of PVRs reached 19 million in 2005, up from 11.9 million units in 2004 (60% increase) and would reach 42 million by 2010. It is also estimated that in the United States 18% of households will have a PVR by the end of 2006 while fewer than 2% of households in Europe will have a PVR at the end of 2006.<sup>36</sup>

### **Access to Premium Content**

IPTV operators need to purchase access to the premium content demanded by viewers. However, premium content owners are generally very careful about their content being made available to a range of devices without appropriate content protection measures that help distinguish between authorised and unauthorised uses of the content. For example, content owners may use such protections to enable or disable place-shifted<sup>37</sup> viewing, depending on the commercial terms of the service and would also seek to prohibit making the content freely available on the Internet through pirate peer-to-peer sites.

However, premium video content owners are making their content available to the entire array of on-line video service providers, based on the belief that content protection measures, including digital rights management (DRM), encryption and watermarking technologies available to the content can adequately protect the premium content from unauthorised use. The iTunes Store, for example, started to offer over 200 television shows for download from Discovery Channel, Comedy Central, MTV, and FOX. Additionally, a catalogue of 75 feature-length movies from Disney-owned studios was introduced.

### III. REGULATORY TRENDS

#### Reviewing regulations

The development of IP based networks and the use of these networks for transmitting content, as well as the development of different types of content and availability of different terminals to watch content requires a review of existing regulatory frameworks in order not to stifle innovation and the diffusion of new services. In the United States the regulator, FCC, has been reviewing the appropriate regulatory treatment for IP-enabled services including IPTV while IPTV service providers including AT&T (“U-verse TV”) are currently providing their services.

In the European Union, the European Commission proposed a new draft TV Directive in December 2005 with the intention of facilitating and promoting European media markets by applying a set of minimum obligations to on-demand audiovisual services which were not regulated under the current TV directive, “TV without Frontiers (TVWF).”

The current TVWF Directive (last reviewed 1997) affects only “broadcasters” who have editorial responsibility for the composition of schedules of television programmes and transmit them. It does not cover non-linear programming. The TVWF requires that when a TV broadcaster is established and therefore under the jurisdiction of a Member state, it only needs to comply with the rules of that Member state and all the other Member states are required to ensure free reception of its TV broadcasts (“Country of Origin Principle”).<sup>38</sup> It is also intended to promote the distribution and production of European audiovisual programmes, for example, by ensuring that a majority proportion of transmission time is dedicated to EU works.

The European Commission published proposals for a new Audiovisual Media Services Directive (AVMS) on 13 December 2005. Audiovisual media service is defined as a service where the principal purpose is the delivery of moving images with or without sound in order to inform, entertain or educate the general public by electronic communications networks. Audiovisual media can be of two types: linear and non-linear. Linear programme will include the real-time programmes transmitted as scheduled (*i.e.* TV broadcasting). Linear services are defined as audiovisual media services where a media services provider decides on the moment in time when a specific programme is transmitted and establishes the programme schedule.<sup>39</sup> Video-on-demand is considered a non-linear use of video. Non-linear services are defined as “any audiovisual media service where the user decides upon the moment in time when a specific program is transmitted on the basis of a catalogue of content selected by the media service provider.

The European Commission’s proposal introduces a basic tier of obligations for all audiovisual media services including non-linear (on-demand) services. The basic obligations relate to minimum harmonized rules such as the protection of minors, human dignity and qualitative rules concerning advertising. All audiovisual media services are subject to the country of origin principle. In addition, Member States shall promote access to European works in on-demand services. This is a strong political signal that on-demand services should help to promote European productions and cultural diversity even though this provision does not require “quotas.”<sup>40</sup> Having said that, it is worth noting clearly that, as regards VoD services, most OECD countries currently do not view this as broadcasting because of its two-way communication characteristic and thus do not subject it to broadcasting-related laws.

In Canada, the independent regulator, CRTC, has been forborne from applying the Broadcasting Act (licensing and other requirements of part II of the Act) to “broadcasting services delivered and accessed over the public Internet” in 1999 and “mobile television broadcasting service via the public Internet” in 2006. In the 2006 decision, CRTC clarified that IPTV which makes use of the Internet Protocol, but is delivered over a private, managed network, does not fall under the New Media Exemption Order.<sup>41</sup>

### **Importance of a regulatory framework for IPTV**

The development of IPTV services has benefited from a regulatory framework in most countries which has facilitated access to broadband networks by new entrants through local loop unbundling as well as by light touch regulation and has, so far, managed to abstain from imposing any onerous requirements for the provision of IPTV. The continued success and more widespread development of IPTV will depend on the continuation of a regulatory framework which facilitates market entry of entrants in providing IPTV services. In Japan where IPTV is well developed, the law on “Broadcasting using telecommunications services” was enacted in 2001 to allow telecommunications operators to multicast live real-time channels. According to the law, only registration is needed for telecommunication operators to provide IP multicasting. In Europe, EU Member States have benefited from IPTV for several years and in some countries such as France, Italy and Spain, IPTV services enter the mass market. One major contributing factor to this success in Europe is its regulatory framework. Progress in recognising that convergence has broken the direct link between the provision of services and the underlying network has facilitated the development of IPTV.

### **Access to Local Loops**

Local loop unbundling, such as “full unbundling” and “line sharing”, allows ISPs to replicate local loops of incumbent operators on a cost basis while allowing service differentiation from the service offerings of the incumbents, and thus can stimulate new entry into the IPTV market. As noted earlier, in France Free, the most successful IPTV operator in the OECD with 1 260 000 subscribers at the end of 2006, has been using unbundled lines from France Telecom. To remain competitive, the company recently decided to roll out its own FTTH network. This Free case may provide an example of service-based competition inducing facilities-based competition. However, it is noted that a clear relationship between local loop unbundling obligations and infrastructure investment requires more in-depth research.

It can be expected that many EU countries will maintain LLU obligations as long as the incumbent telecommunication operator is considered as having market power in network access. This may change as alternative broadband Internet access networks are developed (cable modem, WiMax, broadband over powerlines, etc.), but it is as yet too early to forecast whether these alternative means of access will provide a real alternative to high speed Internet access or are more suited to niche markets.

In Japan, however, any fixed-line access network operator is subject to local loop unbundling obligation regardless of the kind of underlying access line (*i.e.* copper, HFC, fibre, etc.) if the subscribers of the operator account for more than 50% of the total number of subscribers of a prefecture designated by the government (MIC). In the EU countries, “wholesale unbundled access to metallic loops and sub-loops for the purpose of providing broadband and voice services” is a relevant market for *ex ante* regulations. The ‘metallic loops and sub-loop’ is the physical twisted metallic pair circuit in the fixed public telephone network. Nevertheless, if there is significant market power in access markets it is likely that LLU requirements will remain an obligation.

Another question is whether cable TV operators’ hybrid fibre coaxial (HFC) networks are under the same LLU obligation as twisted copper pair in the context where cable TV operators are also providing telecommunication services (voice and Internet access services). In Canada, the regulator CRTC decided in

1998 that it would approve the rates and terms under which incumbent cable as well as telephone companies provide higher speed access to their telecommunications facilities to ISPs. In Japan, as noted above, the LLU regulation applies to all kinds of fixed-line access networks including HFC. In the EU, LLU obligation applies to operator(s) with significant market power having a physical twisted metallic pair circuit in the fixed public telephone network. Therefore, cable TV's HFC network falls outside LLU obligations. In this situation, legislators in the Netherlands have approved a proposal to force domestic cable companies to open their networks to competitors. The "cable network unbundling" (CNU) initiative replicates the local loop unbundling (LLU) scenario in traditional telecommunications networks.<sup>42</sup>

## IV. COUNTRY INFORMATION

Table 2. Consolidated table for IPTV markets in OECD member countries

| Country        | Operator                   | IPTV service name  | Service offerings  | Coverage  | Technical Architecture |                   |  | Number of subscribers                                  |
|----------------|----------------------------|--------------------|--|---|------------------------|-------------------|--|--|
|                |                            |                    |  |   | Access ownership       | Access technology | STB+PVR                                  |  |
| Austria        | Telekom Austria            | aonDigitalTV       | Scheduled TV, VoD  | 87% of Austria                                    | Own network            | ADSL              | Yes                                      | Commercial launch in Mar 2006                          |
| Belgium        | Belgacom                   | Belgacom TV        | Scheduled TV, VoD  | nationwide  | Own network            | ADSL2+, VDSL      | To be introduced (Currently network PVR) | 73 000 at end of 2006                                  |
| Canada         | Bell Canada                |                    | scheduled TV and audio                                       | Toronto, Ottawa and Montreal                      | Own network            | VDSL              |  |  |
|                | Aliant                     | Aliant             | scheduled TV and audio, VoD                                  | Major cities in Eastern Canada                    | LLU                    | ADSL              | Yes                                      |  |
|                | SaskTel                    | Max Interactive TV | HD/SD scheduled TV, radio, VoD                               | Saskatchewan                                      | Own network            |                   |  | 43K at end of Dec 2005                                 |
|                | MTS                        | MTS TV             | scheduled TV, VoD  | Manitoba  | Own network            |                   |  | 55K at end of Mar 2006                                 |
| Czech Republic | Telefónica O2              | O2 TV              | Scheduled TV, VoD  | nationwide  | Own network            | ADSL2+            | No                                       | 3,500 on 12 Oct 2006 (commercial launch on 1 Sep 2006) |
| France         | Free Telecom (Iliad Group) | Free               | HD/SD Scheduled TV, VoD, Media center, WiFi/GSM mobile phone | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            | Yes                                      | 2.28m end December 2006                                |
|                | France Telecom             | Orange TV          | Scheduled TV, VoD, Media center, WiFi/GSM mobile phone       | National, but must be within 2.5km of a FT switch | Own network            | ADSL2+            | Yes                                      | 577K end December 2006                                 |
|                | Neuf Cegetel               | Neuf TV            | HD/SD scheduled TV, VoD, Media center, WiFi/GSM mobile phone | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            | Yes                                      | 300K end Dec 2006                                      |
|                | Telecom Italia             | AliceTV            | Scheduled TV   | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            | No                                       | n/a  |
|                | T-Online France            | Club Internet TV   | Scheduled TV, VoD, Media center                              | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            | Yes                                      | n/a  |

| Country     | Operator                               | IPTV service name | Service offerings  | Coverage   | Technical Architecture                          |                    |             | Number of subscribers                |
|-------------|--|-------------------|--|--|---|--------------------|-------------|--------------------------------------|
|             |  |                   |  |  | Access ownership                                | Access technology  | STB+PVR     |                                      |
| Germany     | Hansenet (Telecom Italia's subsidiary) | Alice homeTV      | Scheduled TV, VoD  | Region of Hamburg and city of Lubeck                               | Own network, LLU from DT                        | ADSL2+             | No          | Commercial launch in May 2006        |
|             | DT                                     | T-Home            | HD/SD scheduled TV, VoD, Media center, WiFi/GSM mobile phone | T-Home Complete (VDSL) in 10 metropolitan areas                    | Own network                                     | VDSL, ADSL2+       | Yes         | Commercial launch in Oct 2006        |
| Hungary     | T-Online                               | T-Home TV         | EPG, PVR, VoD  | Technically feasible ADSL subscribers in Budapest & 5 major cities | Own network                                     | ADSL 2+            | Yes         | NA                                   |
|             | TV-Net                                 | TVteve            | EPG, PVR, VoD, online food ordering                          | Technically feasible ADSL subscribers in Budapest                  | LLU from T-Com                                  | ADSL 2+            | Yes         | NA                                   |
| Italy       | FastWeb                                | FastWeb           | HD/SD scheduled TV, VoD, Media center                        | FastWeb's broadband subscribers in more than 113 cities            | FastWeb's own FTTH, LLU from TI                 | FTTH, ADSL2+, ADSL | Yes         | 191K at end May 2006                 |
|             | Telecom Italia (TI)                    | Alice Home TV     | scheduled TV, VoD(HD Scheduled by 2006), Media center        | 75 major cities, as of 5 Nov 2006 <sup>43</sup>                    | Own network                                     | ADSL2+             | Yes         | Commercial launch in Dec 2005        |
| Japan       | BB Cable                               | BBTV              | 41 scheduled TV, VoD   | Yahoo!BB broadband subscriber                                      | Own network                                     | Fibre, ADSL        |             |                                      |
|             | KDDI                                   | HikariONE         | 30 scheduled ch., VoD  | HikariPlusnetDI ON subscriber                                      | Own network                                     | Fibre              |             |                                      |
|             | Online TV (NTT East)                   | 4th MEDIA         | Over 59 scheduled ch.  | FletsHikariPremium subscriber                                      | Own network                                     | Fibre              |             |                                      |
|             | ICAST (NTT West & ITOCHU)              | On-Demand TV      | HD/SD scheduled TV   | FletsHikariPremium subscriber                                      | Own network                                     | Fibre              |             |                                      |
| Netherlands | KPN                                    | Mine TV           | HD/SD scheduled TV, VoD, Media center                        |  | Own network                                     | ADSL2+             | Yes         | IPTV offer launched in May 2006      |
|             | Tele2                                  | Tele2.tv          | scheduled TV, VoD, Catch-up TV                               |  | LLU from KPN                                    | ADSL2+             | Network PVR | 148 000 as of 31/03/2007             |
| Portugal    | Novis (Clix)                           | SmarTV            | Scheduled TV,VoD   | Major cities   | LLU from the incumbent                          | ADSL2+             | No          | -                                    |
| Spain       | Telefonica                             | Imagenio          | scheduled TV, VoD  | Major cities and province capitals                                 | Own network                                     | ADSL, ADSL2+       | No          | About 300K in Oct 2006 <sup>44</sup> |
|             | Jazztel                                | Jazztelia TV      | scheduled TV, VoD  |  | Own fibre network, LLU from Telefonica          | ADSL2+             | No          |                                      |
| Sweden      | Telenor with Viasat                    | Bredbandsbolaget  |  | Major cities   | Own fibre and LAN network, LLU from TeliaSonera | ADSL, VDSL, FTTH   |             |                                      |
|             | TeliaSonera                            | TeliaSonera       | scheduled TV,VoD   | 15 Major cities  | Own fibre & xDSL network                        | ADSL2+, FTTH       |             |                                      |
|             | SkyCom                                 | FastTV            | scheduled TV, VoD  | Major cities   | Fibre network from over 20 municipal networks   | FTTH               |             |                                      |

| Country     | Operator  | IPTV service name              | Service offerings                         | Coverage                                | Technical Architecture |                   |  | Number of subscribers                   |
|-------------|---|--------------------------------|---|---|------------------------|-------------------|--|---|
|             |   |                                |   |   | Access ownership       | Access technology | STB+PVR  |   |
|             | Telenor   | Canal Digital                  | scheduled TV, VoD, multi-TV <sup>45</sup> | Major cities                            | FTTH                   | FTTH              | Yes  |   |
| Switzerland | Swisscom  | Bluewin TV                     | scheduled TV, VoD, PinP, Mediacycenter    | 75% of households                       | Own network            | ADSL, VDSL        | Yes  | 20K (Commercial launch on 1 Nov 1 2006) |
|             | Video Networks (merged with Tiscali UK in Aug 2006) | Homechoice (Triple play brand) | 35-85 scheduled TV, VoD                   | London, Stevenage                       | LLU from BT            | ADSL              | No   | Between 4K and 10K in 2006              |
| UK          | BT  | BT Vision                      | 30 DTT ch., VoD                           | BT broadband subscriber                 | Own Network            | ADSL              | Yes, for 'catch-up TV' for last weeks TV programme | Commercial launch in Dec 2006           |
|             | Video Networks (merged with Tiscali UK in Aug 2006) | Homechoice (Triple play brand) | 35-85 scheduled TV, VoD                   | London, Stevenage                       | LLU from BT            | ADSL              | No   | Between 4K and 10K in 2006              |
| US          | AT&T (merged with BellSouth in Dec.2006)            | U-Verse TV                     | Scheduled TV, VoD, mediacycenter          | San Antonio, TX, Corona, CA             | Own network            | VDSL2 (FTTN)      | Yes  | 3K (AT&T announcement in Oct 2006)      |
|             | SureWest  | Digital TV                     | HD/SD Scheduled TV, VoD                   | Sacramento (CA) region                  | Own network            | ADSL2+, Fibre     |  | 64K                                     |
|             | Verizon   | FiOS TV                        | HD/SD Scheduled TV, VoD                   | 200 US cities among 10 states (12/2006) | Own network            | APON/BPON         |  | 725K(as of 12/2006)                     |

## AUSTRALIA

### Market

There are no IPTV services in Australia which meet the definition adopted in this paper. Although there are several VoD and broadcast-style IPTV services which can be viewed on a television, these are primarily accessed via a PC. Some offer VoD only (ReelTime, Anytime), one is broadcast-only (TPG), and at least one offers both (BigPond TV/Movies).

Download caps and excess usage charges are standard in the Australian Internet market. So as to avoid penalising users who wish to access bandwidth-intensive video services, some content providers have partnered with ISPs to provide un-metered downloads of their movies and television programmes. Other content providers operate independently, and at least one is planning to sell its own networked set-top box in future (ReelTime).

TransACT Communications operates a fibre-to-the-home network in the suburb of Forde in the Australian Capital Territory which can offer an all-IP VoD service, but this is very limited in scale.

Access to hybrid fibre-cable systems (in the major cities) and the rollout of ADSL2+ services across Australia have encouraged the growth of higher-speed connections. 24% of all Internet subscribers now obtain download speeds in excess of 1.5Mb/ps (Australian Bureau of Statistics, March 2007).

## **Regulation**

The competition authority in Australia, Australian Competition and Consumer Commission (ACCC) has “declared” Telstra<sup>1</sup>'s unbundled local loop and line sharing service. The ACCC declaration allows other operators to install xDSL equipment at the Telstra exchange and provide their own ADSL and ADSL 2+ services. While there is no declared wholesale xDSL (bitstream) service, Telstra currently offers such a wholesale service on commercial terms

The current regulatory framework for broadcasting in Australia excludes from the definition of broadcasting service, a service that makes television programs or radio programs available using the internet. As a result, a service solely broadcast across an IPTV platform (and not using frequencies in the spectrum allocated for “broadcasting services”) may fall outside the definition of broadcast service and would (in principle) not require a broadcasting licence. Ultimately however, whether or not a service constitutes “broadcasting” which requires a broadcast licence will depend on case by case assessment by the regulator (Australian Communications and Media Authority) of the particular service being offered.

In terms of access to content, the ACCC noted that it would want to ensure that traditional incumbents cannot inhibit the emergence of new players or products by using their existing market power to tie up access to compelling content. Section 50 of the Trade Practices Act (TPA) prohibits companies from entering any arrangements that result in a substantial lessening of competition and Section 47 of the Act also provides that exclusive dealing that causes a substantial lessening of competition is illegal. However the ACCC recognized that exclusive agreements for the supply of content exist and are not necessarily anti-competitive; for example, free-to-air broadcasters have traditionally competed heavily for exclusive rights to content as a means of differentiation among themselves, without raising competition concerns.

## **AUSTRIA**

### **Market**

| <b>Operator</b> | IPTV service name | Service offerings | Coverage       | Technical Architecture |                   |                 |          | Number of subscribers      |
|-----------------|-------------------|-------------------|----------------|------------------------|-------------------|-----------------|----------|----------------------------|
|                 |                   |                   |                | Access ownership       | Access technology | STB + DTT Tuner | STB +PVR |                            |
| Telekom Austria | aonDigitalTV      | Live TV, VoD      | 87% of Austria | Own network            | ADSL              |                 | Yes      | Commercial launch: 03/2006 |

Telekom Austria launched its “aonDigitalTV” video-over-DSL service in Vienna in early March 2006 with a package of 40 basic TV channels, 10 premium channels (including adult) and a 150 movie VoD service. With 87 % ADSL coverage in Austria, the company says it will now embark on a controlled service roll-out to other metropolitan areas. Video is being delivered in MPEG-2 using Amino set-top boxes. Migration to MPEG-4 encoding, user-generated contents, and peer-to-peer video is expected in the future.

<sup>1</sup> Owner of the existing copper access network

**BELGIUM***Market*

| Operator | IPTV service name | Service offerings | Coverage   | Technical Architecture |                   |                 |  | Number of subscribers |
|----------|-------------------|-------------------|------------|------------------------|-------------------|-----------------|--|-----------------------|
|          |                   |                   |            | Access ownership       | Access technology | STB + DTT Tuner | PVR                                      |                       |
| Belgacom | Belgacom TV       | Scheduled TV, VoD | nationwide | Own network            | ADSL2+, VDSL      | No              | To be introduced (Currently network PVR) | 73 000 at end of 2006 |

Belgacom, the incumbent telecom company in Belgium has offered IPTV services through Belgacom TV since June 2005 throughout Belgium. Belgacom is offering IPTV services to more than 73 000 customers at the end of June 2006.<sup>46</sup> Belgacom delivers more than 70 IPTV channels through its "Classic +" service including national and a range of international channels for EUR 9.95 per month. In addition, Belgacom TV offers the "Select" package of 15 new channels for EUR 14.94 per month as well as on-demand services with more than 300 movies available from EUR 2 to EUR 5 per movie. In May 2005, Belgacom outbid cable and TV companies for the rights to broadcast Belgian football, paying about EUR 36m a year for three years.

Belgacom provides IPTV, and other triple play services, over ADSL2+ and a VDSL network that delivers 9 to 15 Mbps of capacity. Over this infrastructure, IPTV is multicast to consumers using MPEG-2 compression technology. The company considers that the market is not demanding HD at the moment because not many people have HD television sets, and that without HDTV Belgacom TV can be differentiated from Cable TV because cable TV is still analogue.

**CANADA***Market*

| Operator | IPTV service name  | Service offerings         | Coverage                       | Technical Architecture |                   |                 |          | Number of subscribers  |
|----------|--------------------|---------------------------|--------------------------------|------------------------|-------------------|-----------------|----------|------------------------|
|          |                    |                           |                                | Access ownership       | Access technology | STB + DTT Tuner | STB +PVR |                        |
| Aliant   | Aliant             | Live TV and audio, VoD    | Major cities in Eastern Canada | LLU                    | ADSL              | No              | Yes      |                        |
| SaskTel  | Max Interactive TV | HD/SD Live TV, radio, VoD | Saskatchewan                   | Own network            |                   |                 |          | 43K at end of Dec 2005 |
| MTS      | MTS TV             | Live TV, VoD              | Manitoba                       | Own network            |                   |                 |          | 55K at end of Mar 2006 |

Bell Canada offers its digital TV services through its group company Bell ExpressVu, which was formed in 1997 and traditionally offered satellite TV services. In 2004, it started offering digital TV via VDSL in the cities of Toronto, Ottawa and Montreal.<sup>47</sup> The Eastern Canadian incumbent, Aliant Inc., launched in 2005 its Aliant IPTV service in parts of Newfoundland, Nova Scotia and in Labrador, offering about 150 TV channels and 70 channels of digital music. SaskTel is the first provider in North America to offer High Definition TV, "Max HD Ultimate" over an Internet Protocol network. Max HD Ultimate includes 27 Max HD channels, 13 regular theme packages, and music. In January 2003, MTS, the

incumbent telecommunication operator in the province of Manitoba, launched MTS digital TV service bundled with its DSL service for its residential customers in Winnipeg at the end of September 2003.

### **Regulations**

Regarding access to broadband Internet access networks, the independent regulator, Canadian Radio-television and Telecommunications Commission (CRTC) decided in 1998 that it would approve the rates and terms under which incumbent cable as well as telephone companies provide higher speed access to their telecommunications facilities to ISPs.<sup>48</sup>

In 1999 the CRTC determined that “*new media broadcast undertakings*” which offer “*broadcasting services accessed and delivered over the Internet*”<sup>49</sup>, would be exempt from licensing or other requirements in the Broadcasting Act (Part II). In the 1999 exemption order, the CRTC did not specifically differentiate IPTV from media accessed over the Internet, although it clearly referred to media accessed through the public Internet rather than services using IP for delivery. In 2006 in the context of a decision on mobile television service, the CRTC in a footnote clarified that its 1999 exemption did not apply to IPTV *i.e.* content delivered over a private, managed networks.<sup>50</sup> The CRTC also determined that mobile television broadcasting services converting television signals to a format compatible with mobile browsers and handsets and sending the converted video contents via the public Internet to the Internet gateway of mobile carriers, and then to user’s handsets via wireless transmission, fall within the New Media Exemption Order, and are not subject to licensing by the CRTC. An important finding of the CRTC which could be valid in many countries reluctant to allow new technologies to flourish was that:

“The Commission based its 1999 decision to exempt new media broadcasting undertakings from licensing on several factors. One of these factors was that new media were making a positive contribution to the attainment of the objectives of the Act by enhancing opportunities for Canadian expression. The Commission also found that a significant amount of Canadian content was present on the Internet and that this content was being created and made available in the absence of regulation. Further, the Commission found that local Canadian content was important to the development of Canadian new media businesses.”<sup>51</sup>

The CRTC also determined in an earlier Public Notice on 17 January 2003 that Internet retransmission undertakings should remain exempt from requirements under Part II of the Broadcasting Act, considering that the Internet retransmission service was too immature for CRTC to develop conditions of exemption or a licensing framework.<sup>52</sup> Internet retransmitters receive over-the-air broadcast signals, convert them to a digital format, and make them accessible through an Internet website. An Internet user selects a retransmitted broadcast signal by clicking on the appropriate link.

“Broadcasting” is defined in section 2 of the Broadcasting Act as ‘any transmission of *programs*, whether or not encrypted, by radio waves or other means of telecommunication for reception by the public by means of *broadcasting receiving apparatus*, but does not include any such programmes that is made solely for performance or display in a public place.’ “Program” is also defined as “sounds or visual images, or a combination of sounds and visual images, that are intended to inform, enlighten or entertain, but does *not* include visual images, whether or not combined with sounds, that *consist predominantly of alphanumeric text*.” Based on this legal definition CRTC concluded in its New Media Notice on 17 May 1999 that services available on the Internet which consist predominantly of alphanumeric text do not fall within the scope of the Broadcasting Act and are thus outside the CRTC’s jurisdiction, and that the services where the potential for user customisation is significant (where end-users have an individual, or one-on-one experience and where they create their own uniquely tailored content) also do not fall within the scope of the definition of broadcasting.<sup>53</sup> On the other hand, CRTC clarified that the “broadcasting receiving apparatus” includes personal computers, or televisions equipped with Web TV boxes to the extent that those devices are capable of being used to receive broadcasting.<sup>54</sup>

**CZECH REPUBLIC****Market**

| Operator      | IPTV service name | Service offerings | Coverage   | Technical Architecture |                   |                 |          | Number of subscribers                                  |
|---------------|-------------------|-------------------|------------|------------------------|-------------------|-----------------|----------|--|
|               |                   |                   |            | Access ownership       | Access technology | STB + DTT Tuner | STB +PVR |  |
| Telefónica O2 | O2 TV             | scheduled TV, VoD | Nationwide | Own network            | ADSL2+            | Yes             | No       | 3 500 on 12 Oct 2006 (commercial launch at 1 Sep 2006) |

The incumbent Czech telecom operator, Telefónica O2 Czech Republic, launched IPTV service, “O2 TV,” a basic packages of a multicast service (O2 TV Entertainment and O2 TV Cinema) and video-on-demand unicast service, throughout the Czech Republic to the existing 400 000 broadband subscribers on 1 September 2006. The company is initially offering 30 channels using MPEG-4 codec within its basic packages, O2 TV Entertainment and O2 TV Cinema. The company has 3 500 subscribers as of 12 October 2006.<sup>55</sup> The company is gradually upgrading its network with ADSL 2+ technology for IPTV.<sup>56</sup>

**FRANCE****Market**

| Operator                    | IPTV service name | Service offerings                                       | Coverage  | Technical Architecture |                   |                 |                   | Number of subscriber |
|-----------------------------|-------------------|---|---|------------------------|-------------------|-----------------|-------------------|----------------------|
|                             |                   |   |   | Access ownership       | Access technology | STB + DTT Tuner | STB +PVR          |                      |
| Free Telecom (Illiad Group) | Free              | HD/SD live TV, VoD, Media center, WiFi/GSM mobile phone | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            | Yes             | Yes               | 2.28m in Dec 2006    |
| Orange France               | Orange TV         | Live TV, VoD, Media center, WiFi/GSM mobile phone       | National, but must be within 2.5km of a FT switch | Own network            | ADSL2+            | Yes             | Yes <sup>57</sup> | 577K in Dec 2006     |
| Neuf Cegetel                | Neuf TV           | HD/SD live TV, VoD, Media center, WiFi/GSM mobile phone | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            | Yes             | Yes               | 300K in Dec 2006     |
| Alice France                | AliceTV           | Live TV   | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            | Yes             | No                | n/a                  |
| T-Online France             | Club Internet TV  | Live TV, VoD, Media center                              | Within 2.5km of unbundled FT switch               | LLU from FT            | ADSL2+            |                 | Yes               | n/a                  |

France is the largest IPTV market in OECD member countries with more than 2.6 million subscribers. The ISP Free was the first operator to provide triple play services (IPTV, VoIP,<sup>58</sup> broadband Internet access) on the French market in December 2003. The company started to offer improved triple-play communication services and the first high-definition (HD) IPTV video services in Europe via a new Freebox (modem) in March 2006. The new Freebox offering consists of two set-top boxes, a multimedia box called HD Freebox and a network box called ADSL Freebox. This new Freebox integrates several advanced technologies including ADSL 2+, High-Definition television (HDTV), WiFi MIMO, a DTT tuner, mobile telephony over WiFi, and a number of other functionalities. The HD Freebox contains an SD and HD decoder (for receiving IPTV video services) and a digital terrestrial television (DTT) tuner (used to access the 18 DTT channels, including TF1 and M6), SCART, S-Video and composite S-video

connectors, an HDMI connector (to connect an HD-Ready television), an S/P-DIF and digital audio output (to connect a hi-fi), and three antennas (for wireless connection to the ADSL box).

France Telecom launched an IPTV service, “MaLigne TV,” in December 2003 and had over 577 000 subscribers at the end of December 2006. MaLigne TV currently offers 200 channels, including premium channels in conjunction with TPS and Canal+, as well as video-on-demand services. France Telecom has unified its communications services under the “Orange” brand since 1 June 2006 which consists of video-over-DSL (formerly “MaLigne TV”), Internet access (formerly “Wanadoo”), and WiFi/GSM mobile handset using its fixed and mobile networks via a set-top box (“Orange Live box”).

In an effort to differentiate its multiple play services, France Telecom improved portability of content. For example, a video series produced by Orange is available to users of IPTV, PDAs, PCs, and mobile phones. Orange found that out of 1.5 million mobile subscribers who watch two-minute short-form video content on a mobile phone, about half a million of them also watch 23 minute long-form versions on its IPTV service. The company also notes that portability of content also benefits Orange because the use of one platform attracts customers to take up other platforms across the portfolio.

Neuf Cegetel had over 300 000 IPTV (Neuf TV) subscribers<sup>59</sup> and 2 172 000 active ADSL customers, more than 18% of the French market (December 2006). Neuf has been providing its triple play services on an ‘à la carte’ basis via its set-top box and offers access to more than 200 channels including all free-to-air digital terrestrial TV (DTT) channels, and to nearly 150 additional channels on an optional basis, including the leading premium packages.<sup>60</sup> In 2006, the company upgraded its set-top box to include a TV High-Definition (HD) decoder and started to offer video-on-demand (VoD) service. The set-top box includes digital recording and time-shift viewing, videophone, audience ratings, a programme guide, channel thumbnails, information services (traffic, weather, people news, horoscopes, etc.), RSS feeds, voicemail, radio portals, etc. Other providers include Telecom Italia France offering IPTV service using unbundled lines from France Telecom via a TV set-top box. T-Online France offers an IPTV service through its Club Internet service including more than 150 live TV channels, PVR with up to 50 hours of record time, and more than 1 000 VoD programmes over DSL.

### **Regulations**

Under the Broadcasting Law of 9 July 2004 which transposed EC Directives, any *television service* channel needs to sign an agreement with or make a simple declaration to CSA (*Conseil Supérieur de l’Audiovisuel*) regardless of the underlying transmission infrastructure (cable networks, satellite, Internet, ADSL, mobile telephony networks, etc.). Television service channels with an annual budget for TV programmes lower than EUR 150 000 are exempt from having to sign an agreement and fall within the simple declaration system.

“Television service” is defined in the Broadcasting Law as ‘services destined to be received simultaneously by the public and whose main programming is composed of an organised series of programmes with images and sounds’.<sup>61</sup> According to the CSA, video-on-demand service is not a television service due to its two-way interactivity, and thus falls outside the authority of CSA. Video clips are not a television service because they are not “an organised series of programmes.” However, an “Internet video” service, if it streams television services one-way from an Internet website to a subscriber’s PC over the public Internet, is regarded as a television service because the legal definition of television service has no relation to the type of underlying transmission networks or TV signal receiving devices. A PVR (private video recorder) service, which allows users to record live TV programmes onto a hard disk within a set-top-box or network server so that the users view/rewind/stop the live TV programmes at any time they choose, may also fall within the television service as long as the live TV programmes are

transmitted one-way to the general public even though the users may not watch such programmes at the time the TV signal arrives at the user's TV signal reception device.

Operators of electronic communications networks including cable TV and xDSL who deliver television services to users are bound to make a declaration to the CSA. The network operators also have to declare to ARCEP (*Autorité de Régulation des Communications Électroniques et des Postes*) when they set up their networks.

## GERMANY

### Market

| Operator                               | IPTV service name | Service offerings                                       | Coverage  | Technical Architecture   |                   |                 |          | Number of subscribers         |
|--|-------------------|---|---|--------------------------|-------------------|-----------------|----------|-------------------------------|
|  |                   |   |   | Access ownership         | Access technology | STB + DTT Tuner | STB +PVR |                               |
| Hansenet (Telecom Italia's subsidiary) | Alice homeTV      | Live TV, VoD  | Region of Hamburg and city of Lubeck            | Own network, LLU from DT | ADSL2+            | No              | No       | Commercial launch in May 2006 |
| DT                                     | T-Home            | HD/SD live TV, VoD, Media center, WiFi/GSM mobile phone | T-Home Complete (VDSL) in 10 metropolitan areas | Own network              | VDSL, ADSL2+      | No              | Yes      | Commercial launch in Oct 2006 |

HanseNet, Telecom Italia's subsidiary launched its IPTV service in Germany in 2006 and plans to offer service to 14 German cities by the end of 2006. Alice homeTV services are delivered via a 25 Mbps line connection using ADSL2+. Customers can receive 100 television channels (60 free TV and 40-pay TV channels) plus access to 600 movies on demand.<sup>62</sup> Deutsche Telekom Group's T-Com subsidiary began commercial launch of its T-Home triple-play service in October 2006, over Deutsche Telekom's VDSL network (offering customers up to 50 Mbps) to 10 cities across Germany. The IPTV offering includes more than 100 free and pay-TV channels, video-on-demand, digital video recording (DVR) and live high definition television (HDTV) using a set-top box with a capability of MPEG4 video encoding and interactive features of Microsoft IPTV middleware. The live TV contents include "Bundesliga on PREMIERE," featuring live matches from the 1st and 2nd German football leagues.

Deutsche Telekom's focus is on VDSL and VDSL2+ as a requisite for HDTV services and as a basis for further developments, e.g. in the area of 3D.

### Regulations

The National Regulatory Authority, BNetzA (Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railways), was planning to lift existing local loop unbundling requirements on certain optical fibre lines in April 2005. This proposal was changed as a result of intervention by the EC. Whereas BNetzA argued that VDSL, as a new network, was not a substitute for other xDSL technologies, the European Commission argued that upgrading a network did not result in a new market and as a result VDSL remained a substitute to other xDSL technologies. Furthermore, the EC argued that the costs of investment should not be a factor in forbearance since investment costs could be taken into account when determining the appropriate access price.<sup>63</sup>

**HUNGARY*****Market***

| Country | Operator | IPTV service name | Service offerings                   | Coverage  | Technical Architecture |                   |         | Number of subscriber |
|---------|----------|-------------------|-------------------------------------|---|------------------------|-------------------|---------|----------------------|
|         |          |                   |                                     |   | Access ownership       | Access technology | STB+PVR |                      |
| Hungary | T-Online | T-Home TV         | EPG, PVR, VoD                       | Budapest and 5 major cities<br>ADSL subscribers if technologically feasible | own network            | ADSL 2            | Yes     | NA                   |
|         | TV-Net   | TVtévé            | EPG, PVR, VoD, online food ordering | Budapest<br>ADSL subscribers if technologically feasible                    | LLU from T-Com         | ADSL 2            | Yes     | NA                   |

IPTV service was launched in late 2006 in Hungary. At first, T-Online, a subsidiary of the incumbent telecommunication operator and TV-Net, a middle size CATV service provider entered the market.

T-Online Magyarország announced on 17 October, 2006 that – a first in Hungary – they would start to provide, in co-operation with T-Com, IPTV service. The incumbent's commercial IPTV offer, T-Home TV, has been available since November 2006, Tvtévé IPTV service "TV-Net" was launched at the same time.

Currently T-Online offers a basic and an extended IPTV package with 24 and 43 channels respectively and movie and adult content in different premium packages. Pricing is quite similar to CATV monthly fees. It starts from EUR 13-25 and ends up around EUR 40 on a monthly basis. Subscription fees include the costs of a home gateway and a set top box with 80GB HDD and the installation. For an additional EUR 30 and EUR 3 monthly fee a second set top box is also available.

TV-Net offers also 2 packages, the first one is Internet subscription combined with IPTV (46 channels) for around EUR 40 monthly fee, the other one contains phone services as well for around EUR 50. Subscription fees include the costs of a home gateway and a set-top box. For an additional EUR 3 monthly fee a second set top box is also available. For extra fees of EUR 7 and EUR 11 premium channel packages can be ordered too.

Two other service providers announced (but still have not started) their IPTV service for ORTT (National Radio and Television Commission, the Hungarian regulatory authority for the media): ACTEL Kft. and DIGIT IPTV Kft.

***Regulations***

The Hungarian regulatory framework for telecommunications and media contains no explicit reference to IPTV services. In a decision made in 2006 the ORTT (National Radio and Television Commission, the Hungarian regulatory authority for the media) indicated that it considers the IPTV service as a kind of "broadcast distribution" (Broadcasting Act 2. § 26). This category is normally used to define cable broadcast retransmission. As a result of this qualification, IPTV services operating in Hungary are

also obliged to register at the ORTT, and are subject to the same must carry rules as cable operators, and also are entitled to receive funding from the Broadcasting Fund, a fund dedicated *inter alia* to the development of the Hungarian broadcast distribution sector.

## ITALY

### Market

| Operator            | IPTV service name | Service offerings                           | Coverage  | Technical Architecture          |                    |                   |          | Number of subscribers         |
|---------------------|-------------------|---|---|---------------------------------|--------------------|-------------------|----------|-------------------------------|
|                     |                   |   |   | Access ownership                | Access technology  | STB + DTT Tuner   | STB +PVR |                               |
| FastWeb             | FastWeb           | HD/SD Live TV, VoD, Media center            | FastWeb's broadband subscribers in more than 113 cities | FastWeb's own FTTH, LLU from TI | FTTH, ADSL2+, ADSL | Yes <sup>64</sup> | Yes      | 191K at end May 2006          |
| Telecom Italia (TI) | Alice Home TV     | Live TV, VoD(HD live by 2006), Media center | 75 major cities, as of 5 Nov 2006 <sup>65</sup>         | Own network                     | ADSL2+             | No                | Yes      | Commercial launch in Dec 2005 |

Italy's IPTV pioneer, Fastweb, has been providing triple-play including IPTV services since 2001 by using its own access fibre optic network in some Italian cities. Subsequently, Fastweb extended its IPTV network by using an access system based on unbundled ADSL and ADSL2+ reaching 113 cities. The IPTV offer includes free-to-air and satellite channels as well as a catalogue of more than 5 000 on-demand video titles. FastWeb has content deals with most major premium providers. In April 2006, FASTWEB launched a 20Mbps high-speed Internet offering via ADSL2+ which provides on-demand replay of programmes for three days after broadcast.<sup>66</sup> The company had a total broadband subscriber base of 793 700 subscribers at the end of March 2006<sup>67</sup> with about 191 000 subscribers for IPTV.<sup>68</sup> Telecom Italia launched its IPTV service in December 2005 and by May 2006 the operator was offering a triple-play service in more than 60 Italian cities with a speed of 20 Mbps. Telecom Italia's Sky Italia's content deal allows it to offer premium movie channels. Telecom Italia plans to offer High Definition (HD) in the second half of 2006, including HD PVR. In 2007, two more operators have planned the launch of IPTV offers. In particular, Wind has announced its IPTV launch mid-2007, while Tiscali plans to launch its own IPTV offer during 2007.

## JAPAN

| Operator                  | IPTV service name | Service offerings | Coverage                      | Technical Architecture |                   |                 |          | Number of subscribers |
|---------------------------|-------------------|-------------------|-------------------------------|------------------------|-------------------|-----------------|----------|-----------------------|
|                           |                   |                   |                               | Access ownership       | Access technology | STB + DTT Tuner | STB +PVR |                       |
| BB Cable                  | BBTV              | 41 live TV, VoD   | Yahoo!BB broadband subscriber | Own network            | Fibre, ADSL       |                 |          |                       |
| KDDI                      | HikariONE         | 30 live ch., VoD  | HikariPlusnetDION subscriber  | Own network            | Fibre             |                 |          |                       |
| Online TV (NTT East)      | 4th MEDIA         | Over 59 live ch.  | FletsHikariPremium subscriber | Own network            | Fibre             |                 |          |                       |
| ICAST (NTT West & ITOCHU) | On-Demand TV      | HD/SD live TV     | FletsHikariPremium subscriber | Own network            | Fibre             |                 |          |                       |

As of end August 2006, there were four IPTV operators providing IP multicast live TV programming. Japan's IPTV service provider, On Demand TV is trialing High-Definition (HD) live TV broadcasting and VoD services over optical fibre networks. The company plans to add 60 new MPEG4 (H.264/AVC)-based HDTV channels on top of its existing MPEG2-based Standard-Definition TV programming during the second half of 2006. On Demand TV is a joint venture of Nippon Telegraph and Telephone (NTT) West of

Osaka and ITOCHU Corporation. In Japan, many telecommunications operators are also providing VoD services to either their own broadband subscribers or all Internet users. NTT Communications is providing “OCN Theatre,” a VoD service, to its subscribers of CoDenHikari triple-play services. Casty is offering “casTY,” a VoD service, to its broadband subscribers of TEPCO Hikari for free. “TVbank,” and “GyaO” services provided by TVbank and USEN respectively are offering free VoD services to any Internet users.

### **Regulations**

In Japan, the law of “Broadcasting using telecommunications services” was enacted in 2001 to allow telecommunications operators to multicast live TV channels. According to the law, registration is needed for telecommunication operators to provide IP multicasting. With regard to unbundling obligations on local loops, any fixed-line access network operator is subject to local loop unbundling obligations regardless of the kind of underlying access line (*i.e.* copper, HFC, fibre etc.) if the subscribers of such an operator account for more than 50% of the total subscribers of a prefecture designated by the Minister of the MIC in Japan.

## **KOREA**

### **Market**

In July 2006, HanaroTelecom started to offer “hanaTV,” a pure ‘Download & Play’-based VoD service which offers more than 22 000 high-definition video films from 50 content providers including Sony Pictures and Walt Disney Television. The service is provided through a set-top box connected to a TV set, allowing time-shifted viewing. The downloaded video cannot be transmitted to DVD. The video signal is compressed with a H.264 codec. Its subscriber base had reached 486 375 as of May 2007. KT provides “Mega TV” service, an upgraded version of the existing TV portal service, starting July 2007 excluding scheduled broadcasting of television programmes. Mega TV is expected to provide quality VoD service including high-definition contents and interactive services including Internet banking, games, news search.

### **Regulation**

The Broadcasting and Telecommunication Convergence Promotion Committee was established under the Office for Government Policy Coordination in June 2007, in order to streamline the regulatory framework for converged communications services. The Committee provides opinions on major issues such as IPTV and reorganisation of regulatory institutions including integration of the Ministry of Information and Communication (MIC) and Korea Broadcasting Commission (KBC). An Ad-Hoc Broadcasting and Communication Committee was also formed in the National Assembly in January 2007, and has been discussing how to integrate the two organisations and to draft a law regarding IPTV.

## **NETHERLANDS**

### **Market**

| Operator | IPTV service name | Service offerings                | Coverage | Technical Architecture |                   |                 |             | Number of subscribers           |
|----------|-------------------|----------------------------------|----------|------------------------|-------------------|-----------------|-------------|---------------------------------|
|          |                   |                                  |          | Access ownership       | Access technology | STB + DTT Tuner | STB +PVR    |                                 |
| KPN      | Mine TV           | HD/SD live TV, VoD, Media center |          | Own network            | ADSL2+            | No              | Yes         | IPTV offer launched in May 2006 |
| Tele2    | Tele2.tv          | Live TV, VoD, Catch-up TV        |          | LLU from KPN           | ADSL2+            | No              | Network PVR | 148000 as of 31/03/07           |

KPN, the incumbent fixed and mobile operator in the Netherlands launched its "Mine" IPTV service in May 2006, offering more than 60 standard-definition TV channels, 70 digital radio channels and on-demand movies. Mine service includes PVR service which can store up to 100 hours of TV programming in the set-top box and allows subscribers to pause and rewind live TV. Mine service also has a 'missed programme' feature which enables subscribers to see programmes they have missed on the three Dutch public channels up to a month after airing. Pressing the 'My Info' button will give viewers up-to-the-minute news as well as weather and regional traffic reports. The TV channels are based on MPEG2 and delivered over an ADSL2+ network. The operator plans to migrate to MPEG4 in the future. To accommodate high-speed Internet Access Services and IPTV, KPN upgraded its ADSL network to ADSL2+ in the second quarter of 2005.

Tele2, a Swedish-based pan-European telecommunications company, acquired the Benelux business of Versatel, an alternative fixed-line telecom provider in the Netherlands.<sup>69</sup> Tele2's IPTV service, Tele2.tv, is bundled with broadband Internet and telephony services. Tele2.tv provides 50 live TV channels, hundreds of VoD, a catch-up TV service for channels 1, 2, 3 and one football channel to broadcast all live Eredivisie matches.<sup>70</sup>

### **Regulation**

KPN, which is subject to local loop unbundling obligations, filed a suit against OPTA, the Dutch regulatory agency, to force cable operators to open their networks. Legislators in the Netherlands have approved a proposal to force domestic cable companies to open their networks to competitors. The new proposal is effectively a "cable network unbundling" and replicates the local loop unbundling (LLU) scenario in traditional telecoms networks.

## **PORTUGAL**

### **Market**

| Operator     | IPTV service name | Service offerings         | Coverage     | Technical Architecture |                   |  |          | Number of subscribers |
|--------------|-------------------|---------------------------|--------------|------------------------|-------------------|--|----------|-----------------------|
|              |                   |                           |              | Access ownership       | Access technology | STB + DTT Tuner                        | STB +PVR |                       |
| Novis (Clix) | SmarTV            | Triple play, live TV, VoD | Major cities | LLu from the incumbent | ADSL2+            | STB only (in Portugal there is no DTT) | No       | -                     |

There is also a new triple play service offered by AR TELECOM since 2006, based on its own Tmax technology, a digital wireless technology with very high transmission capacity, based on standard DVB-T and standard IP.

**SPAIN****Market**

| Operator   | IPTV service name | Service offerings | Coverage                           | Technical Architecture                 |                   |                 |          | Number of subscribers                |
|------------|-------------------|-------------------|------------------------------------|--|-------------------|-----------------|----------|--------------------------------------|
|            |                   |                   |                                    | Access ownership                       | Access technology | STB + DTT Tuner | STB +PVR |                                      |
| Telefonica | Imagenio          | live TV, VoD      | Major cities and province capitals | Own network                            | ADSL, ADSL2+      | Yes             | No       | About 300K in Oct 2006 <sup>71</sup> |
| Jazztel    | Jazztelia TV      | live TV, VoD      |                                    | Own fibre network, LLU from Telefonica | ADSL2+            | No              | No       |                                      |

The incumbent telecommunication operator, Telefonica, is providing IPTV service delivered over its own ADSL network to a set-top box as part of its bundled services, and has indicated that it will invest between 2004-2008 EUR 8 billion to expand its broadband Internet service in Spain.<sup>72</sup> Jazztel, an alternative telecommunication operator, has a nationwide IPTV service, Jazztelia TV, using ADSL2+. Jazztel TV offers 30 channels, which will be expanded by the 22 digital terrestrial TV channels (DTTN) in the near future.

**SWEDEN****Market**

| Operator            | IPTV service name | Service offerings                    | Coverage        | Technical Architecture                          |                   |                 |     | Number of subscribers |
|---------------------|-------------------|--------------------------------------|-----------------|---|-------------------|-----------------|-----|-----------------------|
|                     |                   |                                      |                 | Access ownership                                | Access technology | STB + DTT Tuner | PVR |                       |
| Telenor with Viasat | Bredbandsbolaget  | Live TV, VoD                         | Major cities    | Own fibre and LAN network, LLU from TeliaSonera | ADSL, VDSL, FTTH  | No              |     |                       |
| TeliaSonera         | TeliaSonera       | Live TV, VoD                         | 15 Major cities | Own fibre & xDSL network                        | ADSL2+, FTTH      | No              |     |                       |
| SkyCom              | FastTV            | Live TV, VoD                         | Major cities    | Fibre network from over 20 municipal networks   | FTTH              | No              |     |                       |
| Telenor             | Canal Digital     | Live TV, VoD, multi-TV <sup>73</sup> | Major cities    | FTTH  | FTTH              | No              | -   |                       |

Bredbandsbolaget (B2), a leading broadband communication provider in Sweden, offers triple-play services over ADSL2+. In November 2004, Bredbandsbolaget started offering video services over their network. More than 44 live TV channels and VoD services for films and other content are available as well as interactive EPG. Subscribers receive premium channels from Viasat, a satellite TV provider. The Swedish incumbent TeliaSonera<sup>74</sup> offers multiple-play services of video, voice (fixed and mobile) and data. Broadband speeds are relatively high as users are able to connect at 24 Mbps of connectivity. The basic IPTV service includes 23 channels and VoD services.<sup>75</sup> FastTV offers Internet access, broadband television services including more than 50 digital TV channels, video-on-demand, and EPG to a large

number of households in cities across Sweden, Denmark and Norway. The total number of IPTV subscribers in Sweden was estimated at around 40 000 in May 2006.

Canal Digital already leads the market for satellite and cable television services and the company has been quick to recognise the potential for IPTV to help achieve the company's vision of every individual receiving a personalised TV offering. Canal Digital deployed IPTV set-top boxes to subscribers' homes to offer full IPTV services in 2005. Their set-top box can be used to stream video to other televisions around the home using existing coax cable infrastructure, reducing the costs for operators in deploying IPTV.<sup>76</sup>

## SWITZERLAND

### Market

| Operator | IPTV service name | Service offerings               | Coverage          | Technical Architecture |                   |                 |     | Number of subscribers                 |
|----------|-------------------|---------------------------------|-------------------|------------------------|-------------------|-----------------|-----|---------------------------------------|
|          |                   |                                 |                   | Access ownership       | Access technology | STB + DTT Tuner | PVR |                                       |
| Swisscom | Bluewin TV        | Live TV, VoD, PinP, Mediacenter | 75% of households | Own network            | ADSL, VDSL        | No              | Yes | 20K(Commercial launch on 1 Nov, 2006) |

The Swiss fixed-line incumbent Swisscom began its IPTV service, Bluewin TV, in November 2006. Swisscom was one of the first European operators to adopt Microsoft IPTV Edition as its middleware.<sup>77</sup>

## UNITED KINGDOM<sup>78</sup>

### Market

| Operator  | IPTV service name              | Service offerings  | Coverage                 | Technical Architecture |                   |                 |  | Number of subscribers         |
|---|--------------------------------|--------------------|--------------------------|------------------------|-------------------|-----------------|--|-------------------------------|
|   |                                |                    |                          | Access ownership       | Access technology | STB + DTT Tuner | PVR  |                               |
| Video Networks (merged with Tiscali UK in Aug.2006) | Homechoice (Triple play brand) | 35-85 live TV, VoD | London, Stevenage        | LLU from BT            | ADSL              | No              | No   | Between 4K and 10K in 2006    |
| BT  | BT Vision                      | VoD, 30 DTT ch,    | BT broadband subscribers | Own network            | ADSL              | Yes             | Yes, for 'catch-up TV' for last week's TV programmes | Commercial launch in Dec 2006 |

Homechoice (Tiscali) is a UK-based consumer video-on-demand service using ADSL to provide video and Internet access. In 2003, it expanded its VoD services to include terrestrial and some of the available freeview TV channels, and telephone services. BT plans to launch its IPTV service BT Vision before the end of 2006 with about 30 digital terrestrial TV (Freeview) channels and pay-per-view video-on-demand. The service does not provide live TV channels multicast over broadband connection, which allows BT's ADSL network to be used without any upgrade. Its set-top box has a Freeview digital decoder, and an 80 hour Personal Video Recorder (PVR). The PVR system will offer a "Catch-up TV" option so that viewers can watch a selection from shows that they have missed. The set-top box also enables viewers to access the BT Vision video on demand (VoD) using a broadband Internet connection. The VoD offer includes a huge library of films.

## ***Regulations***

### *Network regulation*

The Communications Act 2003 (“the CA”) separates the licensing and regulation of television content from the delivery of content and the infrastructure used to deliver it while the provision of electronic communications services (ECS) and networks (ECN) is subject to a general authorisation regime. An ECS is a service, the principal feature of which is the conveyance of signals of any kind over an ECN which includes a hybrid fibre coaxial cable, fibre-optic cable, satellite, twisted copper wire, or a 3G wireless network. Since 25 July 2003 when the new EU communications regime was implemented in the United Kingdom individual licences were replaced by a General Authorisation regime, including, cable TV.

The reorganisation of BT, as part of its agreement with OFCOM, to include a new Access Services Division (ASD) will make available a set of access products which cover fibre access such as Wholesale Ethernet Service (WES) and Partial Private Circuit access products. These products will be available in the context of LLU to new entrants.<sup>79</sup>

### *Content regulation*

The definition of ECS excludes services which are content services (*i.e.* the provision of material, such as information or entertainment to be conveyed by the ECS). As regards television content, it is an offence to provide a licensable television service without the appropriate licence. The delivery technology is not a determining factor when deciding whether a TV service is licensable or not. The onus is on the provider of a service (such as a TV channel) to determine whether that service requires licensing or not. Once licensed, the television service must comply with all the rules relating to the content and scheduling of programmes and advertising.

The UK regulator, Ofcom, licenses individual television services (*i.e.* individual TV channels). Each service is licensed separately. A cable TV system operator who aggregates and simply transmits a certain number of TV channels is not subject to the licensing regime, provided that the cable TV system operator does not broadcast its own TV channels. Market entry of a system operator is up to private contracts between a system operator and individual TV service providers.

Television services are licensed differently depending on whether they are carried on a digital terrestrial multiplex or made available by means of an electronic communications service (ECS) over an electronic communications network (ECN). Services carried on a digital terrestrial multiplex are licensed as a Digital Television Programme or Additional Services (DTPS or DTAS).<sup>80</sup> Services carried over an ECN are licensed as Television Licensable Content Services (TLCS).

The TLCS category of licence is relevant to any television service made available by means of an ECN. Ofcom recognises three types of service which can be provided under a TLCS license. The nature of service can either be editorial, teleshopping or self-promotional. An editorial service is a normal programme service, with conventional programme material and scheduled advertising. Section 232 of the CA sets out that a service is licensable as a TLCS if it consists of television programmes, is available for reception by members of the public, and it is distributed by means of an ECN. The TLCS is therefore a “pure” content licence in the sense that the service is licensable because of what it consists of (“television programmes”) and by virtue of being available for reception by members of the public, regardless of the nature of the ECN by means of which the service is distributed. The ECN could be satellite or cable, or any other ECN.

Section 233 of the CA sets out what a TLCS is not. It is not a two-way service, a service provided within a single premise or to a closed user group. On-demand services are not licensable because they are

not “available for reception by members of the public”. Sub-section 3 of section 233 also contains the clause which allows Ofcom to distinguish between content on the Internet (such as websites or web casts) and ‘conventional’ television channels (whether made available in a familiar way or not) and to exclude the Internet services from Ofcom’s regulatory powers. There is an exemption (sometimes referred to as the “Internet” exemption) which excludes any website material provided as part of another service (for example, a website which is accessed via an ISP which also provides its own in-house content) but also material provided from a stand alone site, whether it be text, web cast or video images, which is not provided for the purpose (wholly or mainly) of making available TV or radio programmes for reception by members of the public.<sup>81</sup>

The crucial point in distinguishing between a licensable TV service and unlicensable web content is whether the “service” (of which the TV service forms part) is provided wholly or mainly for purposes which consist in making available television (and/or radio) programmes. The approach of the Communications Act 2003 allows Ofcom to distinguish, for the purpose of licensing and regulating TV content, between TV content which is ‘more like’ conventional TV (requires licensing) and TV content which is ‘more like’ web content (does not require licensing), and leaves Ofcom some room to interpret where to draw the line. The flexibility built into the Communications Act 2003 means that Ofcom has the scope to take a view on ‘borderline’ services on a case by case basis, considering each set of circumstances in the light of the criteria in the legislation and its regulatory principles.

In the case of Home Choice, an xDSL-based alternative provider in the UK market who offers a triple-play service including video services containing 55 linear TV channels and video-on-demand services, the linear TV channels are licensable as TLCS in the case of TV channels in cable TV service, whilst the Video-on-demand services are not. Since the Home Choice only aggregates and broadcasts TV channels as a system operator without its own TV channels, it is not subject to the Television Licensable Content Services licensing regime. The linear TV channels involved were all already TLCS licence holders when Home Choice started its business.

## UNITED STATES

### Market

| Operator                                 | IPTV service name | Service offerings   | Coverage                          | Technical Architecture |                        |                 |          | Number of total subscribers |
|--|-------------------|---|-----------------------------------|------------------------|------------------------|-----------------|----------|-----------------------------|
|  |                   |   |                                   | Access ownership       | Access technology      | STB + DTT Tuner | STB +PVR |                             |
| AT&T (merged with BellSouth in Dec 2006) | U-Verse TV        | Live TV, VoD  | 9 States                          | Own network            | VDSL2 (FTTN)           | No              | Yes      | 100K                        |
| SureWest                                 | Digital TV        | HD/SD Scheduled TV, VoD                                       | Sacramento (CA) region            | Own network            | ADSL2+, Fibre          |                 |          | 60K                         |
| Independent LEC                          | Digital TV        | SD Scheduled TV   | NY, NJ, KS, MN, IA, UT            | Own network            | DSL                    | No              | No       | 5-50k                       |
| Verizon                                  | FiOS TV           | HD/SD Scheduled TV, Digital Voice and data, Programming Guide | 1 700 communities among 16 States | Own network            | APON/ BPON GPON (FTTH) | No              | No       | 71 million                  |

In late June 2006, AT&T launched its U-verse TV service consisting of SD and HD TV channels delivered to PVR-enabled set-top boxes using the Microsoft TV IPTV Edition over a Fibre-to-the-Node network.<sup>82</sup> U-verse TV is offered with AT&T Yahoo! high-speed Internet access service. AT&T will allow its customers to integrate programming, music, and photos between their TV and PC through a single set-top box. TV broadcast channels are distributed via a two-way switched IP architecture (IP multicast), using MPEG4 (H.264) encoding. Currently, U-verse services are offered in over 15 markets.

Verizon's video service, FiOS TV, delivers HD and standard broadcast video using QAM (Quadrature Amplitude Modulation) technology, similar in many respects to high-definition digital cable video delivery, as opposed to Internet Protocol. This is why it is sometimes pointed out that FiOS TV is not an IPTV service. However, Verizon's programming guide, as well as its VoD, voice telephony, and data services are delivered using IP over the fiber connection. Verizon has a PVR-enabled set-top box that will allow its FiOS TV customers to watch recorded shows on up to 2 other television sets in their house without the need for a separate PVR-capable set-top box for each room. FiOS TV service includes a number of tiers from 140 channels to 372 channels, VoD and a Movie Package (47 movie channels).

In addition, many small LECs offer IPTV service in the United States, including SureWest and dozens of others. These services, which generally run over non-upgraded DSL networks, provide fewer channels and few if any interactive features. However, they provide price competition to established cable- and satellite-based providers and bundling with voice and data services.<sup>83</sup>

Comcast, the largest MSO (Multi System Operator) in the United States, announced in May 2007 that they would conduct an IPTV trial. With over 24 million basic cable subscribers nationwide<sup>84</sup>, Comcast will conduct the test in an undisclosed 50 000 homes passed using HFC (hybrid fibre coaxial) and when DOCSIS 3.0 (Data Over Cable System Interference Specification) gear becomes available later this year.<sup>85</sup> Expected downstream speeds are up to 100 megabits per second and one trial will provide voice, video and data over a single, high-bandwidth IP connection.<sup>86</sup>

In July 2005, Time Warner did a six month pilot project to roughly 9 000 subscribers for a service known as Broadband TV. The test included customers with both cable and high speed Internet services, whereby 75 cable TV channels (the entire expanded basic tier) were available using IP through their Road Runner broadband connection, to be viewed through their PC. The channels could be viewed after downloading Real Player media player onto their PC and logging into a specially designated website with their account number.<sup>87</sup>

### ***Regulations***

In March 2004, the FCC released a Notice of Proposed Rulemaking to examine issues relating to services and applications making use of Internet Protocol (IP), including but not limited to voice over IP (VoIP) services (collectively, 'IP-enabled services').

With respect to wireline entrants, the Communications Act of 1934 as amended provides new entrants with about four options for entry into the multichannel video programming distributor (MVPD) market. They can provide video programming to subscribers via radio communication, a cable system or an open video system, or they can provide transmission of video programming on a common carrier basis. If a telephone company (common carrier) wants to provide video programming to subscribers using radio communication then they would be subject to provisions relating to radio, but not subject to cable communications requirements. Open video systems (OVS) combine features of common carriers and cable systems in providing video programming. If demand exceeds capacity, an OVS operator is limited to providing programming to one-third of the capacity of its own system, and is obligated to allocate the other two-thirds to unaffiliated video program providers. The Act requires the Federal Communication

Commission (FCC) to define regulations to prohibit OVS operators from unjustly or unreasonably discriminating among video program providers. It is noted that very few providers choose to offer service as open video systems. Other new entrants could choose also to deliver multichannel video programming through the use of other technologies, such as DBS or SMATV (satellite master antenna television).

The Act defines “video programming” as “programming provided by, or generally considered *comparable* to programming provided by, a television broadcast station”<sup>88</sup> and “other programming” as “information that a cable operator makes available to *all* subscribers generally.”<sup>89</sup> In this context, Internet video which is streamed over the Internet one-way to subscribers may not be consistent with the definition of “video programming” if its quality is not comparable to television quality.<sup>90</sup>

A cable operator in the United States is subject to general cable franchise requirements from franchising authorities at the state or local level. Telecommunication companies have claimed that the single biggest obstacle to widespread competition in the video services market is the requirement that a provider obtain an individually negotiated local franchise in each area where it intends to provide service. AT&T and Verizon who are deploying fibre optic cabling to offer IPTV services have been actively lobbying federal, state lawmakers to create national video franchises or streamlining the local franchising process in order to enter TV markets more quickly. As of December 2006, in at least 11 states (Alaska, California, Connecticut, Delaware, Hawaii, Indiana, Kansas, New Jersey, North Carolina, South Carolina and Texas), a state-level agency is involved in the franchising process, but application requirements and local participation vary widely among these states. While the specific laws in each state are different, those states that adopted laws have generally streamlined the franchising process and provided time limits within which franchises must be granted. In December 2006, the Federal Communications Commission adopted an order which implemented section 621 of the Communications Act by prohibiting franchising authorities from unreasonably refusing to award competitive franchises.

AT&T Inc. (previously SBC), on the other hand, maintains that its IPTV service “U-verse TV” is an “information services” and not a “cable service,” thus is not subject to local cable franchising requirements. According to AT&T, U-verse TV is a switched, point-to-point, two-way network that will allow each subscriber to interact directly with the network and select specific programming, which the network then transmits to that particular subscriber. This is in contrast to point-to-multipoint broadcast-like transmissions employed by incumbent cable operators, which simultaneously send all their channels to all subscribers’ homes at once, and rely on set top equipment to allow each household to view those channels it has selected.<sup>91</sup> The Federal Communications Commission has not ruled on the regulatory status of any IPTV service.

## NOTES

- <sup>1</sup> Fixed-line telecommunications operators include network operators and ISPs leasing fixed-line network.
- <sup>2</sup> In this paper, the Standard Definition (640 pixels x 480 interlaced lines at 60 frames per second or its international equivalent) has been selected as the baseline for “broadcast quality.”
- <sup>3</sup> <http://video.msn.com>
- <sup>4</sup> <http://www.cbsnews.com/>
- <sup>5</sup> The paper is not aimed at trying to define or determine the regulatory treatment of IP-based television services.
- <sup>6</sup> The Focus Group on IPTV at the International Telecommunication Union (ITU) defined “Internet Protocol TV (IPTV)” as “multimedia services such as television/video/audio/text/graphics/data delivered over IP based networks managed to provide the required level of Quality of Service (QoS)/Quality of Experience (QoE), security, interactivity and reliability. [ITU Strategy and Policy Unit Newslog – IPTV Meeting in Korea: Global Vision of IPTV ([www.itu.int/osg/spu/news/newslog/IPTV+Meeting+In+Korea+Global+Vision+Of+IPTV+.aspx](http://www.itu.int/osg/spu/news/newslog/IPTV+Meeting+In+Korea+Global+Vision+Of+IPTV+.aspx))]
- <sup>7</sup> This does not imply that the VoD offerings, which have not been subject to regulations (or subject to only limited regulations) should be subject to broadcast-type regulations. Rather, it may mean that traditional broadcast regulations should be deregulated due to higher levels of competition in the market when the VoD services turn out to replace broadcast television services.
- <sup>8</sup> The focus on physical networks is useful for many reasons, though there seems to be no reason to discount a service solely because it passes in whole or in part over the public Internet. As transmission bandwidth increases and computer buffering techniques improve, a similar quality of experience can be attained over the public Internet, as we have seen in the telephony world with Voice over IP.
- <sup>9</sup> Television broadcasters only need to comply with the legislation of the Member State in which they are established. Member States cannot restrict the reception and retransmission on their territory of television broadcasters from other Member States, with some exceptions.
- <sup>10</sup> The technical description in this part is comprehensively based on two articles, Patrick Pfeffer, IPTV Technology and Development Predictions, DETECON Consulting (February 2006) and Nate Anderson, Television is changing (March 12, 2006) (<http://arstechnica.com/guides/other/iptv.ars>).
- <sup>11</sup> Rolf Ollmar, Sencore Bridgetech. USA, Testing IPTV Delivery from the Head-end to the Home, IBC2006 Conference Publication, p.354.
- <sup>12</sup> In ATM networks, encoded video streams are encapsulated within ATM cells.
- <sup>13</sup> MPEG-2 TS (Transport Stream) can carry multiple encoded formats such as MPEG-2, MPEG-4 AVC, VC-1.

- 14 Kenelm D. Deen Kenelm D. Deen, TANDBERG Television, UK, contribution and distribution over IP networks, IBC2006 Conference Publication, p.8.
- 15 VDSL or VHDSL (Very High bit rate DSL) is an xDSL technology providing faster data transmission over a single twisted pair of wires. The maximum available bit rates are achieved at a range of about 300 meters (1000 ft), which allows for 26 Mbit/s symmetric access or up to 52Mbit/s down and 12Mbit/s up asymmetric access. Currently, the standard VDSL uses up to 4 different frequency bands, two for upstream (from the client to the telco) and two for downstream. The standard modulation technique is either QAM (Quadrature amplitude modulation) or DMT (Discrete multitone modulation) which are not compatible, but have similar performance. The current mostly used technology is DMT. (<http://en.wikipedia.org/wiki/VDSL>).
- 16 VDSL2 (Very-High-Bit-Rate Digital Subscriber Line 2, ITU-T G.993.2 Standard) is an access technology that exploits the existing infrastructure of copper wires that were originally deployed for POTS services. It can be deployed from central offices, from fibre-fed cabinets located near the customer premises, or within buildings. ITU-T G.993.2 VDSL2 is the newest and most advanced standard of DSL broadband wireline communications. Designed to support the wide deployment of Triple Play services such as voice, video, data, high definition television (HDTV) and interactive gaming, VDSL2 enables operators and carriers to gradually, flexibly, and cost efficiently upgrade existing xDSL-infrastructure. VDSL that permits the transmission of asymmetric and symmetric (Full-Duplex) aggregate data rates up to 200 Mbit/s on twisted pairs using a bandwidth up to 30 MHz. VDSL2 deteriorates quickly from a theoretical maximum of 250 Mbit/s at 'source' to 100 Mbit/s at 0.5 km and 50 Mbit/s at 1 km, but degrades at a much slower rate from there, and still outperforms VDSL. Starting from 1.6 km its performance is equal to ADSL2+. (<http://en.wikipedia.org/wiki/VDSL2>).
- 17 See Cable Europe (formerly ECCA) website ([www.cable-europe.com](http://www.cable-europe.com)).
- 18 *National Cable & Telecommunications Association (NCTA), 2006 Industry Overview* ([http://i.ncta.com/ncta\\_com/PDFs/NCTAAnnual%20Report4-06FINAL.pdf](http://i.ncta.com/ncta_com/PDFs/NCTAAnnual%20Report4-06FINAL.pdf)).
- 19 Tekrati Research News, "Is Triple-Play Financial Suicide for Europe's Incumbent Telcos ?" (June 19, 2006) (<http://software.tekrati.com/research/News.asp?id=7295>).
- 20 Total Telecom, "To IPTV or not to IPTV, that is the question", based on Ovum research (17 Oct 2006) (<http://www.totaltele.com/View.aspx?t=2&ID=86840>).
- 21 Tekrati Research News, "IPTV Subscriber Base Set for Explosive Growth, Says iSuppli ?" (Aug 3, 2006) (<http://software.tekrati.com/research/News.asp?id=7558>).
- 22 Tekrati research news, "Global IPTV Subscribers to Total over 36 Million in 2009, Says Multimedia Research Group" (May 18, 2006) (<http://telecom.tekrati.com/research/News.asp?id=7044>).
- 23 Total Telecom, "IPTV subscribers to hit 50.5 mln in 2010 – study" (13 Oct 2006) (<http://www.telecompaper.com/news/article.aspx?ld=144701&type=full&yr=2006>).
- 24 Tekrati research news, "IPTV Subscribers in Western Europe to Reach 16.7 Million by 2010, Says Gartner" (April 10, 2006) (<http://software.tekrati.com/research/News.asp?id=6801>).
- 25 As of June 2006 the DSL market accounted for 8 subscribers per 100 inhabitants and cable modems 9.8 subscribers.
- 26 AT&T and Verizon's analogue telephone service will continue to be provided as priced and billed the same before.
- 27 *Ip TVnews analyst*, October 2006, p.4.

28 Ibid..

29 Town of Greenwich, Connecticut, recently upgraded its entire metropolitan area network to fibre and Ethernet-based network in November 2006.  
([http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news\\_view&newsId=20061109005571&newsLang=en](http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20061109005571&newsLang=en)).

30 The PVR allows viewers to watch programmes anytime they want (time-shifted viewing). In addition, operators enables the PVR to copy a recorded TV show to other devices such as a PC, portable media player, mobile handset, or DVD with the permission of each content owner so that subscribers can watch video programmes anywhere they want (place-shifted viewing).

31 The DTT tuner inside a set-top-box allows subscribers to receive over-the-air digital terrestrial TV signals.

32 The WiFi/GSM phone works as a cordless phone at a WiFi hotspot facilitated by shared access to neighbouring IPTV set-top boxes and as a normal mobile phone outside hotspots.

33 *ipTVnews analyst*, October 2006, p.5.

34 Tekrati research news, “Video-on-demand Market Poised for Explosive Growth, Says iSuppli” (1 September 1, 2006) (<http://industry.tekrati.com/research/News.asp?id=7746>).

35 Tekrati research news, “Personal Video Recorders Winning over Consumers and Pay-TV Service Providers, Says In-Stat” (5 June, 2006) (<http://software.tekrati.com/research/News.asp?id=7183>).

36 Tekrati research news, “Datamonitor: 187 million Digital TV households in Europe and the U.S. by 2010” (28 August, 2006) (<http://telecom.tekrati.com/research/News.asp?id=7721>).

37 Transferring recorded programming to others for their viewing in another location has been viewed by some as going beyond the fair-use time-shifting exception.

38 Rand Europe, “Impacts of the EC Proposals for Video Regulation”, 20 September 2006, p. 3.  
(<http://www.ofcom.org.uk/research/tv/reports/videoregulation/vidregexec.pdf>).

39 Unofficial consolidated version of the Audiovisual Media Services Directive, Chapter I, article 1(c)  
([http://ec.europa.eu/comm/avpolicy/docs/reg/modernisation/proposal\\_2005/avms-unoff-en.pdf](http://ec.europa.eu/comm/avpolicy/docs/reg/modernisation/proposal_2005/avms-unoff-en.pdf)).

40 Frequently Asked Questions: The Commission Proposal for a Modernisation of the Television without Frontiers Directive, “Will there be “quotas” for European content on the Internet?”  
(<http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/06/208&format=HTML&aged=0&language=EN&guiLanguage=en>).

41 CRTC Broadcasting Public Notice CRTC 2006-47; Regulatory framework for mobile television broadcasting services footnote #2  
(<http://www.crtc.gc.ca/archive/ENG/Notices/2006/pb2006-47.htm#footnote2>).

42 <http://www.cedmagazine.com/article/CA6384715.html>.

43 <http://www.alice.it/alicehometv/index.html>.

44 [http://blog.itvt.com/my\\_weblog/2006/10/19/index.html](http://blog.itvt.com/my_weblog/2006/10/19/index.html).

45 The Canal Digital’s set-top box can be used to stream video to other televisions around the home using existing coax cable infrastructure.

- 46 <http://www.tvover.net/2006/10/11/Ruckus+Wireless+To+Provide+WireFree+Belgacom+IPTV.aspx>.
- 47 <http://www.point-topic.com/content/bmm/profiles/vod/Bell+Canada.htm>.
- 48 Telecom Decision CRTC 98-9, Regulation under the Telecommunications Act of Certain Telecommunications Services Offered by “Broadcast Carriers,” Ottawa, 9 July, 1998, summary paragraph 2.
- 49 Public Notice CRTC 1999-197, Exemption order for new media broadcasting undertakings, 17 December 1999. (<http://www.crtc.gc.ca/archive/ENG/Notices/1999/PB99-197.HTM>).
- 50 Broadcasting Public Notice CRTC 2006-47, Regulatory Framework for Mobile Broadcasting Services, Ottawa, 12 April 2006, paragraph 29, footnote 2.
- 51 CRTC, Broadcasting Public Notice CRTC 2006-47, Regulatory Framework for Mobile Broadcasting Services, Ottawa, 12 April 2006, paragraph 36.
- 52 Broadcasting Public Notice CRTC 2003-2, Internet retransmission, 17 January 2003, para. 76-79. (<http://www.crtc.gc.ca/archive/ENG/Notices/2003/pb2003-2.htm>).
- 53 Telecom Public Notice CRTC 99-14, Broadcasting Public Notice CRTC 1999-84, New Media (“New Media Notice”) 17 may 1999., p. 2 (summary).
- 54 New Media Notice (supra note 32), para. 41.
- 55 [http://www.broadbandtvnews.com/archive\\_cen/121006.html](http://www.broadbandtvnews.com/archive_cen/121006.html)
- 56 <http://www.iptv-news.com/content/view/798/64/>
- 57 [http://www.francetelecom.com/en/financials/investors/presentations/other/att00002433/20051201\\_Misc\\_Content\\_V30\\_DK.pdf](http://www.francetelecom.com/en/financials/investors/presentations/other/att00002433/20051201_Misc_Content_V30_DK.pdf), p.8.
- 58 Free’s voice offering includes unlimited calls to landline phones in mainland France and to 14 international destinations, and mobile telephony.
- 59 <http://www.point-topic.com/content/bmm/profiles/vod/neuf.thm>.
- 60 Neuf Cegetel, press release, 10 February 2006 ([http://www.groupeneufcegetel.fr/html/en/Press/With\\_156000\\_new\\_ADSL\\_subscribers\\_in\\_the\\_fourth\\_quarter\\_of\\_2005\\_Neuf\\_Cegetel\\_is\\_now\\_France\\_Telecom\\_s\\_leading\\_competitor\\_on\\_the\\_residential\\_broadband\\_and\\_market.html](http://www.groupeneufcegetel.fr/html/en/Press/With_156000_new_ADSL_subscribers_in_the_fourth_quarter_of_2005_Neuf_Cegetel_is_now_France_Telecom_s_leading_competitor_on_the_residential_broadband_and_market.html)).
- 61 Law 86-1067, article 2 and 33.
- 62 <http://www.alice-dsl.de/kundencenter/export/de/residential/produkte/fun/optionen/index.html>.
- 63 European Commission letter of 21.8.2006 to BNetzA.
- 64 In November 2005, Fastweb has ordered a new generation of set-top box from Advanced Digital Broadcast that will combine terrestrial and Internet protocol television services. (<http://informatv.com/articles/2005/11/16/fastwebtooffer/>).
- 65 <http://www.alice.it/alicehometv/index.html>.

- 66 Iptvnews analyst, June 2006, p.4. ([http://www.digitalmediapublishing.co.uk/media/files/iptv-june\\_online.pdf](http://www.digitalmediapublishing.co.uk/media/files/iptv-june_online.pdf)).
- 67 [http://www.point-topic.com/content/bmm/profiles/vod/FastWeb.htm&comp\\_id=1190&g=4](http://www.point-topic.com/content/bmm/profiles/vod/FastWeb.htm&comp_id=1190&g=4).
- 68 Iptvnews analyst, June 2006, p.4. ([http://www.digitalmediapublishing.co.uk/media/files/iptv-june\\_online.pdf](http://www.digitalmediapublishing.co.uk/media/files/iptv-june_online.pdf)).
- 69 [http://findarticles.com/p/articles/mi\\_m0ECZ/is\\_2005\\_Sept\\_8/ai\\_n15403011](http://findarticles.com/p/articles/mi_m0ECZ/is_2005_Sept_8/ai_n15403011).
- 70 <http://www.tele2.nl/webwinkel/tv/meer/specificaties-van-tele2-tv.xml>.
- 71 [http://blog.itvt.com/my\\_weblog/2006/10/19/index.html](http://blog.itvt.com/my_weblog/2006/10/19/index.html).
- 72 <http://www.point-topic.com/content/bmm/profiles/vod/Telefonica.htm>.
- 73 Canal Digital's set-top box can be used to stream video to other televisions around the home using existing coax cable infrastructure.
- 74 TeliaSonera is the result of a merger in 2003 between the Swedish and Finnish telecommunications companies, Telia and Sonera. Telia has a history as a national telephone monopoly before privatisation. Sonera on the other hand used to have a monopoly only on trunk network calls, while most (approx. 75%) of local telecommunication was provided by private local companies. The separate brand names Telia and Sonera have continued to be used in the Swedish and Finnish national markets respectively.
- 75 Okamoto and Reynolds (2006), "Multiple play: Pricing and Policy Trends", (DSTI/ICCP/TISP(2005)12/FINAL)
- 76 [http://www.cambridgenetwork.co.uk/pooled/articles/BF\\_NEWSART/view.asp?Q=BF\\_NEWSART\\_187515](http://www.cambridgenetwork.co.uk/pooled/articles/BF_NEWSART/view.asp?Q=BF_NEWSART_187515).
- 77 Light Reading, "Swisscom Finally Launches IPTV" (1 Nov 2006) ([http://www.lightreading.com/document.asp?doc\\_id=109583](http://www.lightreading.com/document.asp?doc_id=109583)).
- 78 This general description of the UK's regulatory situation related to television contents broadly refers to information from Ofcom and its website. Whilst this note makes reference to the UK and European legal framework, it should not be taken as an exhaustive account of all the legal provisions related to television broadcasting.
- 79 Ofcom, Telecommunications Statement, 23 June 2005 ([http://www.ofcom.org.uk/consult/condocs/telecom\\_p2/statement](http://www.ofcom.org.uk/consult/condocs/telecom_p2/statement)).
- 80 Any service available for reception by members of the public carried on a digital terrestrial multiplex must be licensed (either as a 'programme service' or an 'additional service'). Services carried on a multiplex are by the nature of the platform transmitted 'one to many' and there is no direct return path or easy crossover to, for example, an online environment.
- 81 Extract from the Explanatory notes to section 233 of the Communications Act 2003. Explanatory notes are published by the Government in conjunction with Acts of Parliament. Explanatory notes do not form part of the Act and do not have legal force, but are intended to assist the reader in understanding the legislation.
- 82 It appears that a DVR is not included with AT&T's basic service tier. (see AT&T U-Verse TV U100, <https://uma.sbc.com/uma/Pages/moredetails-U100.jsp?show>).

- 83 Independent and competitive LECs providing IPTV service in the US, (not including AT&T and Verizon) *include*: Manti Communications in San Pete County, UT; Liberty Digital in Iowa; Consolidated Telecommunications in Minnesota; Twin Valley Telephone in Kansas; Warwick Valley Telephone in New York and New Jersey; Silver Star Communications in Wyoming.
- 84 Press Release, “Comcast Reports First Quarter 2007 Results” (April 26, 2007) <http://www.cmcsk.com/phonenix.zhtml?c=147565&p=irol-newsArticle&ID=991144&highlight>
- 85 DOCSIS 3.0, the latest version of cable’s high speed data standard provides the ability to virtually bond multiple 6-megahertz channels to act as if they were a single channel.
- 86 MultiChannel News, “Comcast to Take IPTV for a Spin” Todd Spangler (5/4/200) <http://www.multichannel.com/index.asp?layout=articlePrint&articleID=CA6439264>
- 87 Kathryn Balint, Union-Tribune, “For Television via Internet, Future is Now” (July 13, 2005), <http://www.signonsandiego.com/news/business/2005070713-9999-1b13iptv.html>
- 88 47 U.S.C. 522(6).
- 89 47 U.S.C. 522(14). According to a description in the 1984 US legislative history, “other programming service” does not include information that is subscriber specific.
- 90 This legal estimation is based on footnote 245, Cable Modem Declaratory Ruling (supra note 5).
- 91 IP-Enabled Services, SBC Comments, at 24-25.