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CONDITIONAL ACCESS SYSTEMS: IMPLICATIONS FOR ACCESS

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FOREWORD

The following report was presented to the Working Party on Telecommunication and Information Services Policies (TISP) in September 1997 and was subsequently forwarded, in March 1998, to the Committee for Information, Computer and Communications Policy (ICCP), who agreed to its declassification through a written procedure.

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MAIN POINTS

Digital television, whether delivered via terrestrial transmissions, via satellite transmissions, via cable, or via some other medium, will be an important component in the audio-visual market. In addition to traditional video programming and entertainment, digital television platforms will likely be important as means of access to other categories of content and for electronic commerce as well. Many services provided via digital television platforms will be encrypted in order to protect the intellectual property rights of the creators and packagers of content. Thus, conditional access systems will be an important component of digital television delivery platforms and will likely have an impact on actual and potential competition among platforms. Conditional access systems offer a means of ensuring that only authorised subscribers are able to view a particular package of programming. They serve as gateways for the delivery of audiovisual information. As a result, conditional access service operators can play an important gatekeeper role. In the case of digital direct broadcast satellite (DBS) services, conditional access systems can change the broadcasting market structure significantly.

This paper considers all conditional access systems, whether they use satellites or terrestrial infrastructures. Promoting competition among service providers and availability of a diverse range of programming to the public is an important policy goal. If a provider of conditional access or related services were able to exercise market power, this goal could be compromised. To examine the question of whether conditional access systems pose a competitive threat, the paper first describes the characteristics of conditional access systems, including possible scenarios for multiple conditional access systems to function side by side. An overview of how digital DBS services is provided in the OECD area and the availability of competing delivery systems in the multi-channel video programming distribution market is shown in the Annex.

I. INTRODUCTION

Broadcasting services in the GII-GIS

In the context of the GII-GIS (Global Information Infrastructure-Global Information Society), it is increasingly clear that infrastructures for broadcasting must also be viewed as important for the provision of a range of services. In many OECD countries, cable television systems[1] are considered as an alternative information infrastructure for carrying communication services, including telephony.[2] At the same time, the broadcast of content services, broadly defined to include services beyond pure entertainment services, are expected to play an important role on broadband information infrastructures.[3]

Broadcasting services are here defined as point-to-multipoint transmission of information by electronic means. Traditional examples include the broadcast of television and radio services from terrestrial towers, satellites and cable television systems. More recently, the development of packet switched data networks, such as the through Internet, has brought forth a range of new "broadcasting-like" services.[4] In technological terms, broadcasting services have been considered as different from telecommunication services. Compared to telecommunications, their volume and quality developed gradually, with the entry of privately owned broadcasters vitalising domestic markets to some extent.[5]

Satellite and cable television have vastly increased the number of channels available throughout the OECD area. In OECD Europe, the number of analogue satellite channels increased from 38 in 1990 to 262 in 1995. In some countries that lack private terrestrial broadcasting companies, 30 channels are available on cable television systems.[6] According to Eurostat, 22.6% of households with televisions subscribed to cable television in 1994 in the European Union, compared to 12% in 1988. In 1994, 10.1% of EU television households were connected to analogue satellite dishes.[7]

Developments in digital television are leading to more fundamental changes for broadcasting services. Digital direct broadcast satellite (DBS) services are already being developed and will significantly increase the number of channels available. In the United States, digital DBS services began in June 1994, and three licensees are currently offering service.[8] Another four have applied for licenses.[9] DBS services were offered in Australia in 1995 and began in Europe and Japan in 1996. DBS will be supplemented by digital terrestrial television, which will make it possible to expand the number of channels significantly. In the United Kingdom, for example, the government announced in 1995 plans to award six new digital terrestrial multiplexes by 1997, once appropriate legislation had been approved and frequencies allocated.[10] All but half of one multiplex has now been allocated, and services were expected to begin around summer 1998. Canada approved 23 new licenses in September 1996 for speciality channels, some of which will only become operational once digital compression technologies are introduced in 1997. Table 1 shows the digital broadcasting implementation schedules for certain OECD countries.

Table 1. **Digital television broadcasting initiatives**

Country		**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000 ---**
Australia	Satellite		◆ January					
Belgium	Satellite			◆ May				
Canada	Satellite		----- Licensed -----			----- Implementation: to be decided-----		
	Terrestrial			Δ September				○ 1999-2000
Denmark	Satellite			◆ June				
	Terrestrial		----- Licensed -----			----- Implementation: to be decided -----		
Finland	Satellite			◆				
	Terrestrial					○		
France	Satellite			◆ April: CanalSatellite December: TPS, AB Sat				
Germany	Satellite			Δ July: DF1	□ Autumn: Start standard setting			
Hungary	Terrestrial							○ 2005
Japan	Satellite			◆ June: PerfecTV!				
	Terrestrial							○ Before 2000
Korea	Satellite			◆ KBS				○ 2001
Norway	Satellite				○ Telenor			
Sweden	Terrestrial				----- Launch in 1997 -----			
United Kingdom	Satellite					○ BskyB		
	Terrestrial					◆ Summer: British Digital Broadcasting and existing UK public broadcasters		
United States	Satellite	◆ June: DirecTV/ USSB		◆ March: EchoStar		----- 4 additional entities to be granted -----		
	Terrestrial			□ Unified specification for terrestrial DTV		Application for DTV licenses		○ Simulcast: see note 2006: full conversion to DTV

Symbols: ◆ Service commencement. Δ Licenses granted. ○ Planned start of implementation. □ Standards setting.

Note: In the US, digital television (DTV) licensees must simulcast 50% of their analogue channel video programming by April 2003, 75% by April 2004, and 100% by April 2005. Full conversion to DTV and recovery of the analogue spectrum is set for 2006, but the FCC will review DTV progress every two years and may adjust the recovery date based on its findings.

Source: "*GII-GIS (Global Information Infrastructure - Global Information Society): Policy Requirements*", OECD, 1997; Fifth Report and Order in MM Docket No. 87-268, United States, April 1997.

Digital television, whether delivered via terrestrial transmissions, via satellite transmissions, via cable, or via some other medium, will be an important component of the GII-GIS. In addition to traditional video programming and entertainment, digital television platforms will likely be important as means of access to other categories of content and for electronic commerce as well.[11] Many services provided via digital television platforms will be encrypted in order to protect the intellectual property rights of the creators and packagers of content. Thus, conditional access systems will be an important component of digital television delivery platforms and will likely have an impact on actual and potential competition among platforms.

Scope of the paper

This paper aims to stimulate discussion on how policy makers may approach conditional access system and navigational assistance issues, in the audiovisual services market.[12] It highlights the role of delivery systems for audiovisual services such as digital DBS services. A delivery system might be described simply as a pipe that carries information, since transmission technology is of little concern to viewers. However, as conditional access systems interface directly with viewers, the role that the delivery system for digital DBS can play in the market is of some interest.

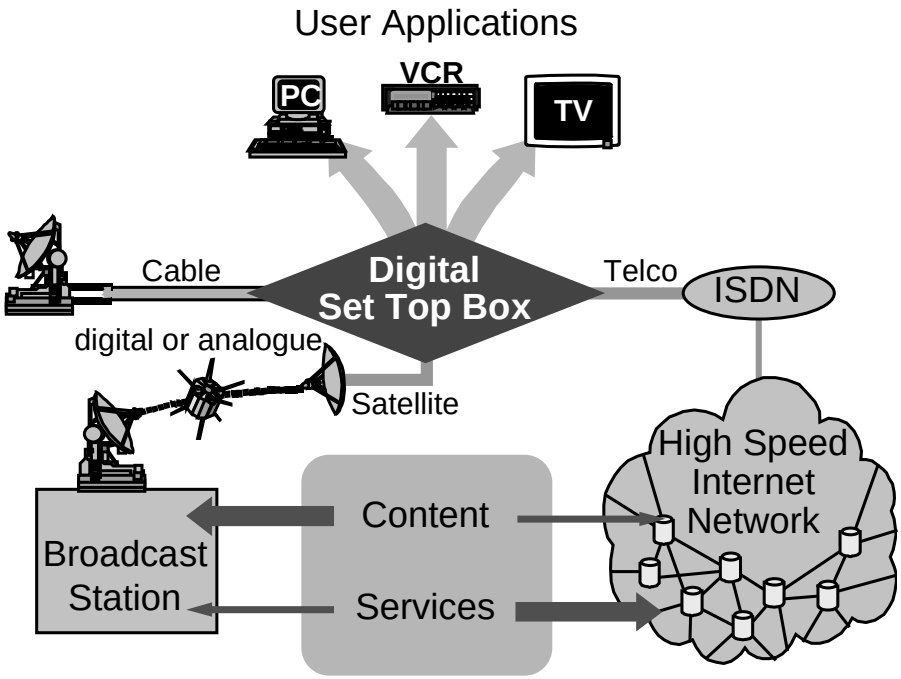
Here, a conditional access system is defined as the means of ensuring that only authorised subscribers can view a particular package of programming, which is transmitted in encrypted/scrambled form.[13] The key for decrypting/unscrambling the programming is transmitted in encrypted form, and the conditional access system ensures that only authorised subscribers are able to gain access to the key.[14] This paper covers all conditional access systems, irrespective of whether they use satellites or terrestrial infrastructures (see Figure 1).

Conditional access systems ensure that only authorised subscribers are able to access a particular package of programming. This paper addresses the question of whether control of the conditional access system can be a source of market power, permitting the controlling entity to restrict anticompetitively the access of viewers to content or content providers to viewers. Similar questions may arise in the case of electronic programme guides, other application software, and the application software interface. In these situations it is important to consider the possibility that control of the function in question confers on the provider the ability to restrict competition. It is worth recalling that in July 1995 the European Commission refused the NSD (Nordic Satellite Distribution) plan because it could dominate the Scandinavian multi-channel video programming distributors market.[15] It pointed out that NSD would exercise unacceptable gateway powers in the relevant markets and restrict potential market entry.[16]

This paper begins with the assumption that promoting competition among service providers and availability of a diverse range of programming to the public is an important policy goal. If a provider of conditional access or related services were able to exercise market power, this goal could be compromised. Whether a conditional access provider can exercise market power depends on several factors, including the cost of implementing multiple conditional access systems, the size of the relevant market, rival providers' access to programming, and user costs of switching from one system to another or subscribing to multiple systems.

In order to examine the question of whether conditional access systems pose a competitive threat, the paper first describes the characteristics of conditional access systems.

Figure 1. **Interrelationships among the main elements of global multimedia information networks**



Source: Background document for Global Information Networks: Realising the Potential, Ministerial Conference, Bonn, 6-8 July 1997.

It then raises some policy issues and highlights one particular approach to conditional access systems regulation[17]. Conditional access raises issues similar to those raised for new entrants to telecommunication markets. The possibility that conditional access might result in gateway control has led some regulators, such as Oftel in the United Kingdom, to compare conditional access systems to the local loop in telecommunication networks. For example, if a conditional access service operator was linked to Multiplex A, and refused conditional access to Multiplex B who wants to enable Multiplex A's subscribers to receive Multiplex B programmes, without purchasing or renting an additional set-top box, there might be a distortion of competition. In this context, it has been stated in EU Directive 95/47/EC that conditional access systems must not abuse their gateway power and that access must be available on an open, transparent and non-discriminatory basis.

Moreover, as alternative policy approaches are discussed, the paper emphasises the importance of protecting against theft of audiovisual services. Without protection against theft of services, or piracy, content providers will be reluctant to distribute their creative product via conditional access systems. For example, piracy in the area of conditional access services was mentioned in the Ministerial Declaration at the European Ministerial Conference in July 1997.[18] It was raised in the context of the proposed directive for the legal protection of encrypted services in the European market. The scope of the proposed directive covers all services that are supplied on a conditional access basis: this includes traditional pay-TV (and radio), video-on-demand, audio-on-demand, electronic publishing and a wide range of online services, all of which are offered to the public on a subscription or usage-related basis.[19] Without protection against piracy, content providers will be reluctant to distribute their creative product via conditional access systems.[20] This would compromise the basic goal of promoting competition and diversity of programme content.

The main reason given for government intervention in conditional access systems is promotion of wide user choice to ensure that the public at large can benefit fully from the potential of various audiovisual services, including digital television. In itself, competition may be sufficient to ensure that the gateway power of conditional access systems is not abused, although many regulators feel that safeguards will still be required.

Structure of the paper

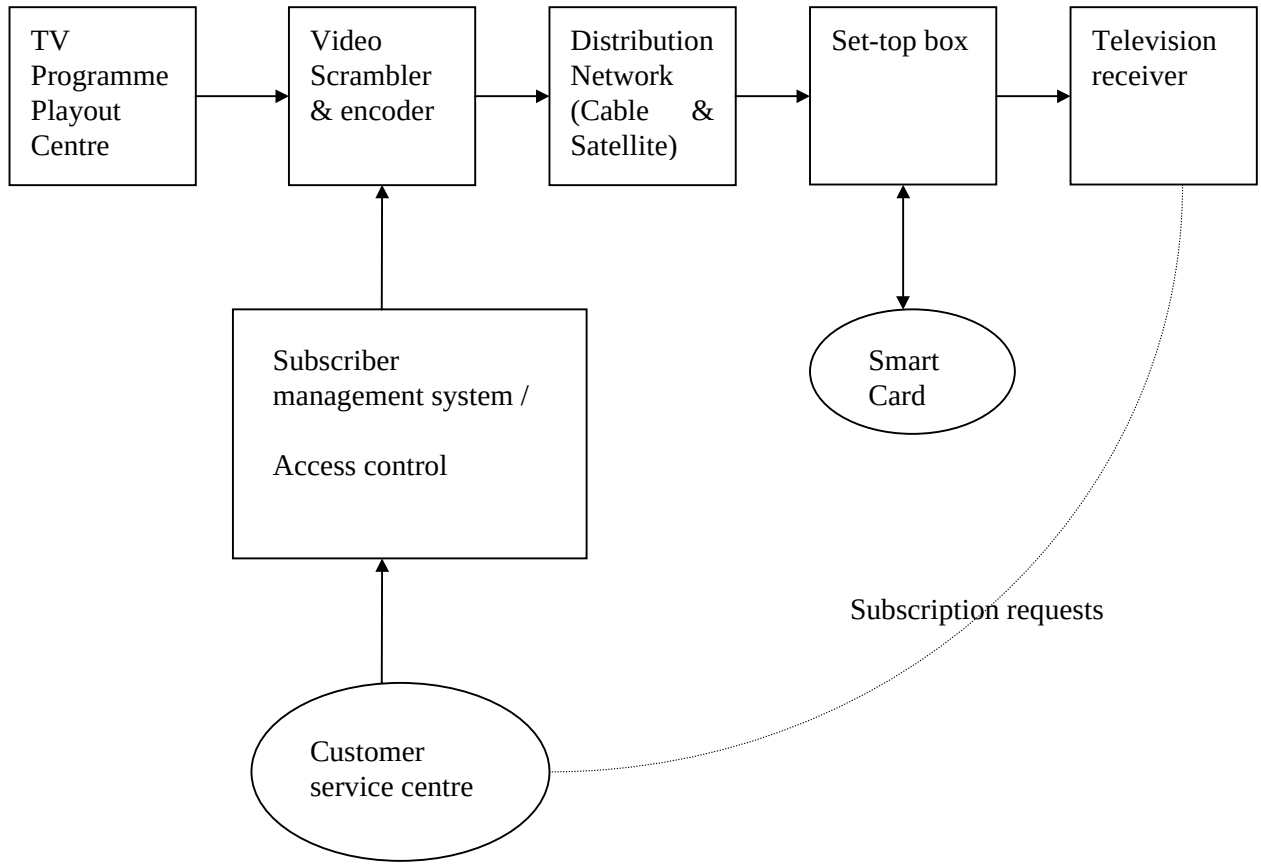
Following this Introduction, Section II overviews conditional access systems in the OECD area. Section III lists and analyses some policy issues for conditional access and navigational assistance. The Annex describes the multi-channel video programming distribution market in the OECD area, providing figures on television households, cable households, and analogue and digital satellite households.

II. CONDITIONAL ACCESS SYSTEMS

What is a conditional access system?

A conditional access system ensures that only authorised subscribers are able to view a particular programming package. A conditional access system is installed in the set-top box or integrated receiver decoder. This is an electronic box, which contains the necessary hardware, software, and interfaces to select, receive, unscramble and view the programmes. Figure 2 shows a typical conditional access system. This paper highlights two separate services covered in a conditional access system: they include (a) encryption and decryption of the key needed to decrypt programme material which the subscriber is authorised to receive and (b) subscription management. Because signals are scrambled, only those viewers with a valid contract are authorised to unscramble and view the chosen programmes. Moreover, when the viewer chooses programmes, the information is stored and updated on a database, which includes subscriber details, method of payment, and services purchased. Thus, conditional access technology supports not only pay television but also other audiovisual services transmitted over broadcast networks, such as software downloaded from satellite.[21] Box 1 describes the situation of conditional access service provisions for digital DBS services in the OECD area.

Figure 2. **Typical arrangement for conditional access**



Source: Ross Kelso, "Opening up access to broadband media services", RMIT, Australia.

Box 1: Conditional access systems for digital DBS services in the OECD area

The situation is quite different in North America, Europe and Japan. In the **United States,** digital DBS service providers have different conditional access systems.[22] The companies DirecTV/USSB are an exception and are treated as a single provider, in that they provide complementary products. The fact that DirecTV and USSB share an orbital slot increases the incentives for them to share a conditional access system. Subscribers use the same receiving equipment for the two services, which provide different programmes. In order to receive all of the most popular programmes, a customer must subscribe to both services.

In **Canada**, persons subscribing to existing satellite services will not generally be able to receive digital DBS services, which use a different transmission technology, and consumers will therefore not be able to switch easily to another service.[23] Their conditional access system is designed for use within Canada because copyright and regulatory constraints limit the areas in which the service may legally be provided. In the case of ExpressVu, it is clearly stated that set-top boxes and smart cards from EchoStar's network system will not be programmed to receive the Canadian ExpressVu signals, just as ExpressVu set-top boxes will not be programmed to receive the US signals in order to ensure the network services are sold only in their respective countries.[24]

In **France**, there are three large digital DBS service operator groups: CanalSatellite, Télévision par satellite (TPS), and AB Productions. TPS and AB Sat launched their packages in December 1996. AB Sat and CanalSatellite signed a Simulcrypt (see Box 4) agreement in April 1997, which allowed CanalSatellite's subscribers to receive AB Sat programmes. Both operators share the same smartcard and AB Sat pays an access fee to CanalSatellite.

In **Germany,** the MMBG (Multimedia Betriebsgesellschaft) consortium, which includes Deutsche Telekom, CLT, Bertelsmann, Canal Plus, RTL, ARD, ZDF and Debis, use the SECA technology for conditional access. They compete against the Kirch Group, which promotes the Irdeto technology based on its d-box decoder. As of February 1997, the Kirch group's DF1 is Germany's main digital DBS services provider. However, when Première, the first pay television channel, owned by Canal Plus, Bertelsmann, and Kirch, launches pilot services using the Mediabox developed by Canal Plus, competition between conditional access systems will accelerate.[25]

Deutsche Telekom and Kirch had discussions about broadcasting DF1 programmes over Deutsche Telekom's cable television network, and the Kirch-Gruppe, Bertelsmann, and Deutsche Telekom jointly agreed to broadcast digital television programmes also via the cable network. Viewers will then be able to receive all programmes including those offered by ARD and ZDF by means of a decoder, i.e. using the d-box developed by Kirch-Gruppe. The programmes will be offered in a non-discriminatory way, which means that all those offering digital television programmes will be able to use the d-box.

Spain has adopted rules to ensure compatibility of conditional access systems so that a single set-top box provides access to all digital DBS services. Technical specifications have not yet been set. CanalSatellite and the DTS consortium, which includes the national telecoms operator Telefonica, the public broadcaster Television Espanola (TVE) and the Mexican TV group Grupo Televisa, will compete in this market.[26] CanalSatellite launched services in January 1997 with a Mediabox decoder.

In **Japan**, after the launch of PerfecTV! in June 1996, the Ministry of Posts and Telecommunications in October 1996 asked existing and expected digital DBS service operators to examine the possibility of implementing a universal integrated receiver and decoder. In the near future, viewers who bought the integrated receiver and decoder for PerfecTV! may be able to receive JSkyB. Other digital DBS service operators are expected to make their services as compatible as possible. DirecTV is planning to develop a universal integrated receiver and decoder system that is compatible with PerfecTV! and JSkyB, which have different conditional access systems.[27]

III. CONDITIONAL ACCESS AND NAVIGATIONAL ASSISTANCE: POLICY IMPLICATIONS

Gateway characteristics

Conditional access systems are a gateway for delivering audiovisual services and possibly other information services as well[28]. When video programming services are encrypted, and providers can charge for access to their services, consumers can signal by their willingness to pay the value that they place on the services. This can increase the diversity of programming provided and improve the efficiency of the programme production and distribution sectors. In this context, conditional access systems can change the broadcasting market structure markedly. However, some fear that the company that first offers conditional access services -- the "first mover" -- will succeed in acquiring a *de facto* monopoly, on the assumption that most viewers will buy only one set-top decoder.[29] As Oftel in the United Kingdom has argued, "If conditional access systems prove expensive to duplicate and if the issue of conditional access is not sufficiently addressed in the regulatory regime, it might then be possible for one company to dominated the delivery of broadband channels by satellite, and by extension by an expanded terrestrial system as well."[30]

The question of potential domination of the digital programming delivery market by a single entity cannot be assessed accurately without also examining the role of exclusive programming rights. Moreover, even if one concludes that regulation of conditional access services is needed in some circumstances, the question remains of how to do so while providing consumers with a wide range of programming without stifling innovation and without threatening the security of the conditional access system.

Services providing navigational assistance may also be crucial. Gateways and navigational assistance are considered as separate functions although in practice they may often be bundled. The application software such as electronic programme guides, which is often provided together with conditional access services, is a typical example of a navigational assistance tool. This paper deals with both issues together under the issue of potential risks of distortion of competition in audiovisual services linked with digital set-top boxes. There exists a navigational assistance on Internet: Internet search engines and Web browsers are obviously very important for access to information on the Web. Users may use more than one browser or search engine even if they access the Internet via a single service provider.

These characteristics may raise particular policy challenges. The following discussion of policy implications is based on recent developments in some countries.[31] It is expected that discussion will be elaborated by considering future policy developments in other countries.

Gateways in the convergence environment

The various network infrastructures can be used for any content: images can be transmitted via telecommunications networks and telephone calls can be transmitted via audiovisual networks. Efforts

are being made to develop a systematic approach to regulatory frameworks for communications networks, including telecommunications and broadcasting, as multimedia services transmission or delivery platforms.

For example, Oftel in the United Kingdom has proposed a concept of broadband switched mass-market services which goes beyond broadcasting. It considers the broadcasting market model as a value chain involving content creation/service provision/network provision/consumer equipment.[32] In Canada, the Canadian Radio-television and Telecommunications Commission (CRTC) considers it timely to review and update the broadcasting regulatory framework to ensure that the rules for competition treat all distributors fairly,[33] and in July 1997, the CRTC proposed to make new regulations relating to broadcasting distribution undertakings (BDUs).[34] The proposed regulations are intended to replace in full the existing cable Television Regulations of 1986, and would apply to three distinct types of BDUs, namely, all cable distribution undertakings, all direct-to-home satellite distribution undertakings and those radiocommunication distribution undertakings that provide a broadband, subscription-based service.

Some argue that the technical convergence in which network infrastructures will be used in various ways requires further consideration. For example, different approaches will be needed according to whether the application will be used for private use (messaging, telephony or group software applications) or public (broadcasting on content) use. For private use, privacy protection remains crucial, and for the latter, freedom of expression tempered by editorial responsibility is considered as a key principle. On the other hand, there is the view that media and content should be treated differently,[35] in which it is emphasised that the framework for providing services cannot be easily converged considering the difference between private communications and communication to the public.

Conditional access systems may be used as gateways for more than one delivery mechanism. For example, they may be used not only for digital direct broadcast satellite (DBS) services but also for digital terrestrial television and point-to-point communication. In some cases, encrypted programmes, irrespective of broadcast and non-broadcast services, may be received from different mechanisms (cable, satellite, terrestrial broadcasting, MMDS) via the same set-top box. While in the manufacturing sector various companies are developing set-top boxes for digital DBS services, we can note that TeleTV is not operational and also that there are no universal set-top boxes being made. The reasons may be that digital to analogue conversion will be needed as long as there is a large installed base of analogue TV receivers, and that there is a trade-off between the lower cost for a set-top box capable of processing signals delivered by a single medium and the higher cost of a universal box with signal processing circuitry for several media.

This situation has policy implications. In the United Kingdom, for example, measures were taken to implement the European Union's Advanced Television Standards Directive which sets a European framework for broadcasting and which has been implemented in the United Kingdom by means of secondary legislation, published guidelines and the Conditional Access Class Licence. In addition, conditional access for all digital broadcast services and services using switched telecommunications networks is to be included in a single unified framework as of 1 April 1999, if not earlier.[36]

In Australia, the DVSTG (Digital Video Services Task Group) reached a number of conclusions in 1996 regarding the need for a co-ordinated approach to the development of digital delivery systems for satellite, cable and microwave-delivered service as well as general broadcasting transport technologies. One of the principles is that future standards for digital video and associated services should provide for consumer equipment to have a common interface, allowing for the use of multiple conditional access systems, so as to support manufacturers' proprietary conditional access systems.[37] It asserts that no transport service provider or operator should be allowed to present a barrier to the customer, or interpose a

relationship between a customer and a service or content provider.[38] According to the Australian regulatory change as of 1 July 1997 satellite subscription television broadcasting licences will be subject to the condition that their domestic reception equipment and subscriber management systems are accessible by other satellite broadcasting services.[39]

Safeguards against abuse of dominant positions

Ensuring that the conditional access service operators do not obtain a monopoly-like position in the audiovisual service providers market is considered important. This may be accomplished via competition among rival conditional access providers or, in some circumstances, it may require government intervention. This approach appears to require that every conditional access service provider stand ready to provide service to every programmer. This "common carrier" approach is one of several possible methods of ensuring that conditional access providers do not exercise market power. For example, Article 4(c) of Directive 95/47/EC stipulates that:

"Member states shall take all the necessary measures to ensure that the operators of conditional access services, irrespective of the means of transmission, who produce and market access services to digital television services:

- Offer to all broadcasters, on a fair, reasonable and non-discriminatory basis, technical services enabling the broadcaster's digitally transmitted services to be received by viewers authorised by means of decoders administered by the service operators, and comply with Community competition law, in particular if a dominant position appears.

- Keep separate financial accounts regarding their activity as conditional access providers."

The Directive neither prohibits proprietary systems nor mandates a common interface conditional access system. It does not treat issues relating to subscriber management systems or electronic programme guides. In 1997, the European Commission will undertake a review of Directive 95/47/EC. In this review, it is expected that consumers and new entrants will want stronger rules for open access to conditional access technology, while large incumbent media groups will argue that commercial negotiation is sufficient.

It is important that the different Member States of the EU have policies which are consistent with the single market concept. In the United Kingdom, in this context, it is emphasised that digitalisation will not remove the potential for gaining market power by acquiring gatekeeper roles, including control over conditional access. Even if dominant players agree on some aspects of standards for the delivery platform, they might still create barriers to entry by competitors.

The background may be that BSkyB was perceived to dominate pay television programmes distributed to cable television systems, as well as being the sole analogue/digital DBS service provider. There is concern that a first mover could dominate the broadcasting market by controlling conditional access systems. It is also possible that BSkyB's exclusive rights to popular movies and sports programming account for its dominant position in British pay television distribution.

In this context, the UK Department of Trade and Industry (DTI) proposed in application of EU Directive 95/47/EC an accounting separation between the licensee's conditional access business and its other business activities, and its customer management and technical services. The intention is to ensure that technical services are provided on a fair, reasonable and non-discriminatory basis.[40]

The UK regulations governing conditional access services for digital television, which implement EU Directive 95/47/EC, came into force on 7 January 1997. Oftel subsequently published guidelines on its enforcement of the regulations. During the implementation process, the DTI had come to realise that it was too simple to talk of regulating conditional access, but instead announced that it would treat encryption/authorisation activities separately from subscriber management activities. Oftel's key objectives for draft guidelines are shown in Box 3. These objectives may raise a variety of questions.[41]

Box 3: Oftel's key objectives for draft guidelines on the regulation of the provision of conditional access for digital television services

(a) Control of conditional access technology is not used to distort, restrict or prevent competition in television and other content services. This is particularly relevant where a conditional access service provider has an associated programming supply business and is also providing conditional access services to its competitors (or would-be competitors).

(b) Control of conditional access technology does not lead to artificial restrictions on consumers' choice of equipment, the range of services available via the equipment or the packaging of services.

(c) Consumers have hassle-free access to services delivered in more than one way without incurring unnecessary additional expense.

(d) Consumers have access to comprehensive information about the range of services available, and how to select them, so they have the widest choice possible.

(e) Control of the proprietary conditional access technology is not exploited through excessive pricing for the use of that technology.

Source: Office of Telecommunications, Press release, 19 December 1996.

Digital DBS services

This section describes the debate on DBS conditional access, focusing on two alternative technical approaches -- Multicrypt and Simulcrypt -- and on the issue of how providers and users of conditional access services might subsidise consumer acquisition of the set-top box.[42] As noted above, market size, programme access conditions, and signal security considerations, as well as other factors, will effect the choice of whether and how to regulate conditional access. This section examines issues on (a) Multicrypt and Simulcrypt, and (b) Subsidy.

Multicrypt and Simulcrypt

In Europe, the Digital Video Broadcasting (DVB) group has produced a scrambling/unscrambling standard, but the rest of the conditional access system, such as transmission of information concerning subscriber rights, has not been standardised. To handle the co-existence of services using different conditional access systems, the DVB group has explored two approaches: Multicrypt and Simulcrypt (Box 4 and Figure 3).

EU Directive 95/47/EC on the Use of Standards for the Transmission of Television Signals leaves room for both solutions. The Simulcrypt proponents already had a system for conditional access on the market and intended to make agreements with programme providers to use their system. The Multicrypt proponents prefer a more open approach, where a single conditional access arrangement is not interposed between programme providers and viewers.[43]

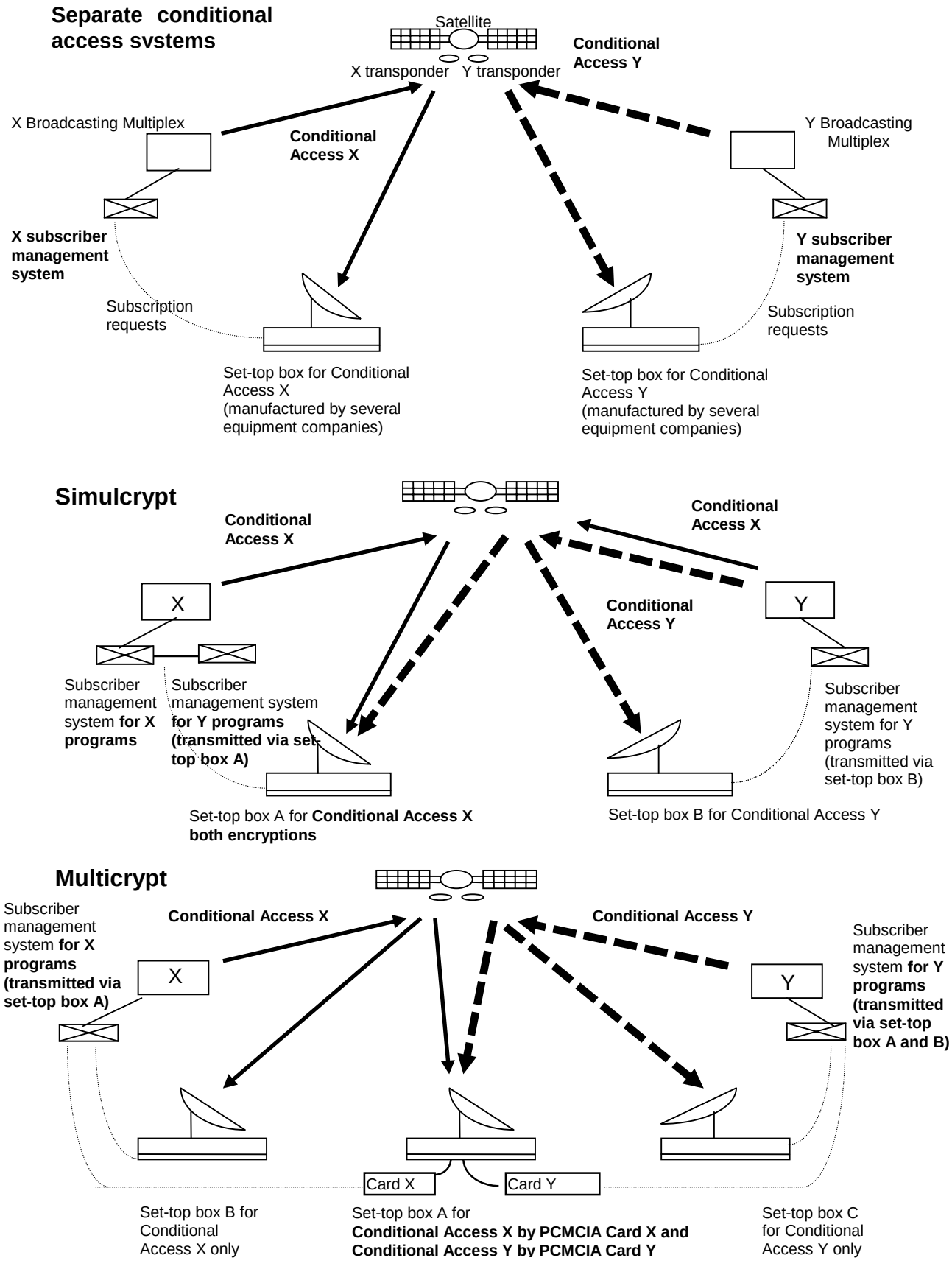
Box 4: Multicrypt and Simulcrypt

The DVB forum proposed two techniques for handling several co-existing conditional access systems. Multicrypt is a common interface approach that would allow detachable conditional security modules to be connected to the set-top box. By inserting different IC cards (usually PCMCIA cards), viewers could use the same set-top box to choose among programmes using different conditional access systems. Simulcrypt is a method whereby scrambled signals can be sent simultaneously to receivers using different conditional access systems but the same DVB unscrambling algorithm. Broadcasters transmit to the target set-top box by sending all of the necessary messages simultaneously. Simulcrypt enables service operators to send signals comprehensible to decoders that do not all have the same conditional access system.

Proponents of Simulcrypt argue that Multicrypt would make the production of set-top boxes more costly. They also assert that, without proprietary technology, companies will not take the large financial risk necessary to get decoders to consumers.

On the other hand, proponents of Multicrypt argue that there should be a common interface between the consumer's basic receiver unit and the access module unit to ensure that no conditional access service operator will obtain a dominant market position.[44] They assert that with Simulcrypt, conditional access service operators will have an incentive to close out competing programme providers by denying them access to the set-top boxes.

Figure 3. **Separate conditional access systems, Simulcrypt and Multicrypt**



Subsidy issues

The purchase or rental of set-top boxes is sometimes subsidised in order to stimulate the digital DBS service market. See the detail in Table 5 in the Annex. How will the cost of the subsidy be recovered? In the following paragraphs, it is assumed that multiple conditional access service operators use the same set-top box. This assumption does not always have to be true, for example, considering the case in which one conditional access service operator such as EchoStar subsidises its set-top box on its own.

Oftel's consultative document considers a number of arrangements:[45]

a) The subsidy could be covered by the conditional access service operator alone.[46] This option is simple. However if this conditional access system is also used by other broadcasters, competing broadcasters would obtain a "free ride" from the broadcaster supplying the subsidy to the conditional access system.

b) All broadcasters using the conditional access system would pay on a comparable basis towards the recovery of the set-top box subsidy. This option would not distort the broadcasting market, but computing contributions may be complex.

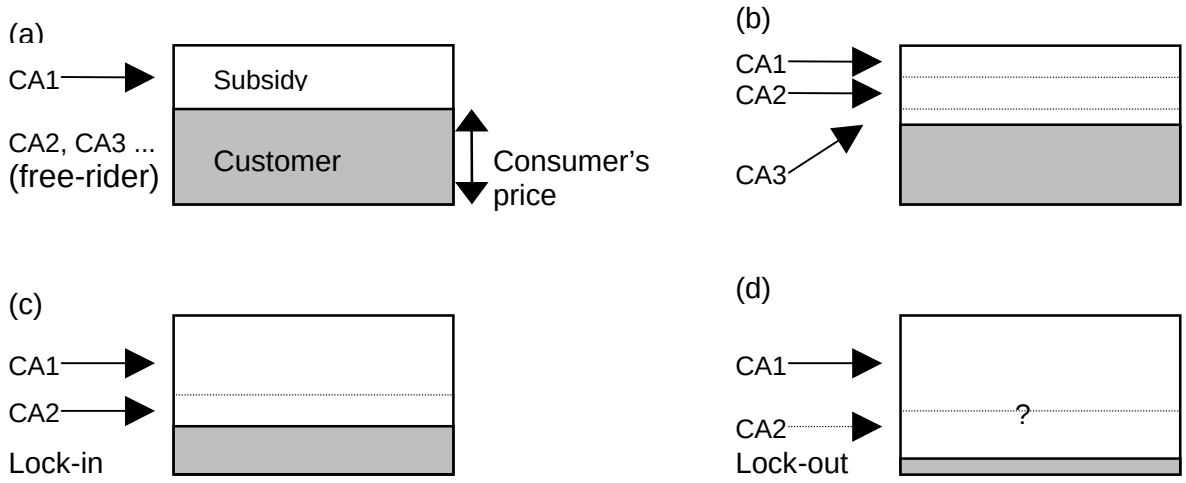
c) The conditional access service operator would enter into a "lock-in" contract with the customer for a designated period. In this case, customers' freedom of choice of services could be reduced, as they would be obliged to obtain broadcast services through the specific conditional access service operator for the designated period.

d) The conditional access service operator would enter into a "lock-out" contract with the customer for some designated period. In this case, the customer would sign an exclusivity deal with the conditional access service operator and could not receive any other broadcaster's digital DBS services for a designated period.

These four arrangements are illustrated in Figure 4. Generally speaking, a conditional access service operator (CA1) has an incentive to provide the set-top box at a lower price in order to attract more customers. On the other hand, new entrants (CA2, CA3) would also wish to provide a reasonable share of the subsidy for set-top boxes in order to gain customers. It goes without saying that consumers prefer cheaper set-top boxes and more flexible choices.

In the case of arrangement a), CA1 covers the entire cost for the set-top box. As long as other factors, such as the DBS's competition with cable operators, are not taken into account, CA1 has no incentive to allow other conditional access service operators (CA2 and CA3) to participate in CA1's group without contributing to the cost of the subsidy. As a result, in order to recover the investment for the set-top box, CA1 would tend to set consumer prices for set-top boxes relatively high. In order to solve the free-rider problem, it is necessary to allocate the subsidy for the set-top box among CA1, CA2 and CA3. In view of the open access principle, arrangement d) may result in an abuse of dominant position by CA1.

Figure 4. **Subsidy arrangements**



Source: OECD.

Arrangements b) and c) are compromise solutions. For arrangement b), there is a concern about how to calculate the reasonable share of subsidy for CA2 and CA3 and how to define the term comparable. In their consultative document, Oftel seems supportive of arrangement c). In this arrangement, viewers are obliged to choose a specific conditional access operator (CA1) for a given period, in addition to the one to which they want to subscribe (CA2). At the end of the given period, they may choose only CA2's service. This is called a "lock-in" contract because viewers are obliged to choose from the same conditional access operator's group. This arrangement has the advantage of providing customers with cheaper set-top boxes and a greater number of programmes. The problem is the length of the designated period for the lock-in contract with CA1, since, unlike voice telephony service, content is crucial to a consumer's choice of digital DBS service.

Some point out a major drawback to arrangement (c). Operators' efforts to develop the market depend on investment by a few operators. It is correct that the effort should be shared among operators using the system, so any operator transmitting to a rented or subsidised set-top box pays a contribution to the renting or subsidising operator on equitable, reasonable and non-discriminatory terms. A solution of this type was adopted in the Simulcrypt agreement between AB Sat and Canal Satellite Numerique. AB Sat pays Canal Satellite for the set-top boxes it uses. This arrangement requires commercial agreement among players and may also need a regulatory framework if it is to take place on equitable, reasonable, and non-discriminatory terms. Directive 95/47 offers such provisions, and it is similar to Oftel scenario (b).

Subsidies do not necessarily require regulation to specify how set-top boxes are subsidised. It is also worth noting that in the course of setting guidelines for commercial availability of navigation devices, including set-top boxes, the navigation devices provision of the US 1996 Telecommunications Act (section 304) prohibits multichannel video programming distributors, whose subscription rates are regulated, from subsidising the price of set-top boxes.

Digital terrestrial television

Digital terrestrial television does not, in principle, have to depend on conditional access systems if it is provided on a free-to-air basis. In this case, the minimum requirement, at least during the transition from analogue to digital terrestrial television, is availability of digital to analogue converters that will permit display of digital television signals on the installed base of analogue television receivers. It is true that the digital set-top boxes needed to access various pay television services may also have the capability of converting digital television signals for display on analogue receivers. Whether pay television providers will find it profitable to provide this service and whether there is a case for government intervention, are important questions. The United Kingdom decision in application of EU Directive 95/47/EC to require that all set-top boxes must receive unscrambled free-to-air digital signals is relevant in this context.[47]

In some cases, free terrestrial television broadcasters need to send programmes in scrambled form, even if all set-top boxes are required to receive broadcasts of unscrambled terrestrial services. This can happen, for example, when a free terrestrial television broadcaster wants to restrict transmission to one country. In this case, it is necessary to develop reasonable criteria for the pricing of conditional access services between subscription broadcasters and free terrestrial television broadcasters. The regulation of conditional access service rates has been proposed to separate the pricing of conditional access services into the following two categories:

- Direct variable costs arising from the use of the conditional access system.

- Common costs of the system as a whole, allocated between free and subscription broadcasters.

The allocation of common costs can be complicated. According to Oftel, "... free-to-air broadcasters should not be expected to contribute more to the recovery of common costs than they would if those costs were shared out in proportion to the relative size of the incremental costs of each activity sharing those costs."[48]

Cable television

Several distribution technologies and providers are competing with cable television operators in the audiovisual services market. In many countries, penetration rates of cable television services are presently higher than those of digital DBS services, and customers may find a choice between cable television and digital DBS just as important as a choice among digital DBS programme packages.

At the same time, some cable television operators may receive programming via satellite in order to rebroadcast on their cable television infrastructure. In order to rebroadcast, they need the co-operation of the conditional access service operator, who must transfer control of the broadcast stream to the cable television operator. Cable television operators should not be required to incur unnecessary and unreasonable additional costs in order to offer an equivalent level of services. Any regulation of conditional access services would not necessarily have to be transposed to cable operators in the context of re-broadcasting.

Other audiovisual services

For **point-to-point communication**, market developments suggest that conditional access technology is likely to be used also to control access to digital services other than television broadcasting.[49] Digital television providers are also expected to offer additional services other than television broadcasting. Indeed, the US regulatory regime explicitly contemplates that DTV licensees may offer "ancillary and supplementary" services, subject to the requirements that these services not interfere with the basic television service offered and that licensees pay a fee for the spectrum used for ancillary and supplementary services. The US Federal Communications Commission (FCC) recently sought comments on how to implement the fee requirements.[50]

Oftel has proposed to modify the relevant licenses and bring the supply of conditional access services into one regulatory domain. This proposal was under discussion at the time of drafting.[51] Oftel's proposal would cover provision of conditional access for non-broadcast information services, non-broadcast interactive services such as games and home shopping, digital radio broadcasts and digital data broadcast such as software download services. Basically, conditional access service operators would be required to provide technical conditional access services on fair, reasonable and non-discriminatory terms that would enable audiovisual service providers to gain access to viewers through the set-top boxes. According to Oftel, "In view of the convergence of telecommunications and broadcasting markets, it is quite inappropriate for there to be one regulatory regime for conditional access services which applies in respect of digital television broadcasts and another which applies in respect of other services in the digital domain."[52] By amendments to the Value Added Data Services Class Licence, DTI and Oftel plan to cover these other non-broadcast digital services.

As noted above, regulation of conditional access service providers is not the only option. Depending on market structure and other aspects of the national regulatory regime, a more limited set of regulations may be appropriate or, alternatively, conditional access regulation may not be in the public interest. Others have argued that the review on how conditional access systems could be used in "point-to-point" networks would require a fundamentally different approach from conditional access system use for broadcasting infrastructures. For example, different approaches will be needed according to whether the application will be used for private use (messaging, telephony or group software applications) or public (broadcasting on content) use. For private use, privacy protection remains crucial, and for public use, freedom of expression tempered by editorial responsibility is considered as a key principle. Furthermore, there is another view, which is trying to deal with media and content differently.[53] In this view, it is emphasised that the framework of providing services cannot be easily converged considering the difference between private communications and communication to the public.

Analogue broadcasting is not covered in Oftel's proposed expansion of the regulatory regime, as supply of conditional access services for analogue broadcasting is an established market. Aside from the question of whether analogue broadcasting will also be integrated or not, it will be necessary to review some policy implications for analogue broadcasting in light of the development of conditional access technology. According to a study group of the Ministry of Posts and Telecommunications in Japan, the technological differences between analogue broadcasting satellite services and digital communications satellite services will be smaller in terms of the television receiver including the set-top box.[54]

Set-top boxes used for broadcast audiovisual services could also be used for services using telecommunications networks, and this may raise questions related to **Internet access**. They may not be related to content access but rather Internet access itself. For example, one device enabling users to access the Internet is the so called Web-TV set-top box, which connects a user's television to an Internet Access Provider (IAP) via the public switched telecommunication network (PSTN).[55] Originally, those who

purchased the set-top box also had to use Web-TV's Internet access services, i.e. they could not choose their IAP, as could a user with a PC and a modem connected to the PSTN. Subsequently, Web-TV changed their business practice and the technology, so that users could access the Internet via their service or that of another IAP. A major reason was probably the fact that other suppliers announced they would market set-top boxes with similar capabilities but would allow users to choose their IAP. This discussion of Internet access shows that there is actual and potential competition from cable, wireless cable, digital DBS, and the public switched telephone network. This is a case in which competition served to avert potential conditional access policy issues.

Management of subscriber information

Conditional access systems are being recognised as gateways with two functions. They provide two separate services: (a) encryption and decryption of the key needed to unscramble programme material which the subscriber is authorised to receive and (b) subscription management. For the first, the key needed to unscramble programme material is encrypted or decrypted, so that only viewers with a valid contract are authorised to unscramble and view programmes. For the second, when the viewer requests service by choosing programmes, subscriber information is stored and updated in a database that includes subscriber details, method of payment and services purchased.

The fact that subscriber information is stored in a database has raised concerns about security of information among broadcasters. Both programme providers and conditional access service operators are concerned about confidentiality of subscriber data. The former fear that the conditional access service operator, who is linked to other programme providers, may transmit detailed subscriber information to them. Conditional access service operators, for their part, are afraid of disclosing the encryption algorithms that are central to their businesses.

It is possible to avoid transmitting sensitive data (using numbers instead of names, addresses, etc.), and even very sensitive cases can be covered by confidential agreements when conditional access service operators need to exchange information, for example by card sharing. At present, other than establishing voluntary guidelines,[56] no definite solution to this problem has been found.[57] When an organisation provides conditional access services to its competitors in the market, it must be certain that the information gained by the provision of conditional access services will not be leaked to other parts of the business.[58] In the United Kingdom, the secrecy of subscriber information is backed by a provision in the class license for conditional access services.

There has also been discussion about subscriber authorisation, which is to send messages over the air to authorise particular subscribers or groups of subscribers to receive a particular service.[59] The policy issue is whether each broadcaster can undertake its own subscriber authorisation. First, system integrity must be considered, as sensitive information on consumers should remain confidential. Second, there is no reason for a conditional access service operator to have a monopoly on subscriber authorisation services. This issue is sensitive because conditional access systems are causing a change in the responsibilities of programme providers and distributors with respect to the handling of rights.[60] The division of responsibilities between a conditional access service operator and the Multiplex in the management of subscriber information has to be reviewed carefully. In particular, sensitive business information, such as the names and addresses of subscribers, is not necessary for conditional access service operators.

In order to make it possible to switch among different broadcasters, some smartcard options are being introduced, including independent smartcards and shared cards. According to Oftel, most

broadcasters prefer the latter solution, because it is less costly. In this context, a single card-issuing centre operated by a trusted third party seems to be the preferred solution. In Japan, ARIB (Association of Radio Industries and Business), a voluntary standardisation body, is currently considering technical standards in this respect; one promising option is to download the different conditional access systems on the set-top box using one slot.

Electronic programme guides

Through the application software installed in a set-top box, viewers are influenced in accessing different programmes. Close integration between the set-top box and the application software environment may mean that the operator controlling the application software will be able to affect the manner in which subscribers navigate around the programming and other services offered via the set-top box. This raises the question of whether a conditional access service provider can, by management of the electronic programme guide, lead or direct subscribers toward certain programme services and away from others. If this were possible, whoever designs the electronic programme guide may be able to distort competition among programme services on the system. It is therefore important to study service providers' incentives to engage in such behaviour as well as their ability to do so. In turn, this requires examination of whether subscribers can choose alternative electronic programme guides and whether individual electronic programme guides can be configured by the subscriber for easy access to the services that the subscriber values most highly. In the event of finding that subscriber choice is, in fact, significantly restricted by the operation of electronic programme guides, it would be necessary to consider the costs and benefits of a regulatory solution. It seems that the discussions on software operating systems will also have some similarities with those on conditional access systems, and policy makers will need to review this matter when defining public policies.[61]

Electronic programme guides (EPGs) are one relevant type of application software. Viewers can obtain access to audiovisual services, including television programmes, by using this navigational assistance tool. Here, EPGs are considered separate from conditional access systems, but reviewed similarly from the viewpoint of risks of distortion of competition in audiovisual services.

It should be noted that the conditional access services providers and EPG framework providers are not always the same. Depending on the equipment manufacturer, they may vary even for a single conditional access service operator. For example, both Thomson and Sony make the set-top box needed for receiving DirecTV/USSB programming, but each has a different EPG. In France, conditional access service in the TPS package is provided by France Telecom, the electronic programme guide is made and provided by TPS itself, and the application software is from Open TV, Thomson and Sun Microsystems. In Germany, ARD and ZDF operate satellite broadcasting without conditional access systems, but they own their electronic programme guides. The functions of conditional access service provider and EPG framework provider must be clearly differentiated.

There exist many EPG framework providers in the market. Some may be provided as a Multiplex pay channels service and include programme information for subscribers (e.g. Canal Satellite Numerique, TPS), or as a free service by a Multiplex to all viewers with the necessary software (e.g. ARD/ ZDF). Other types of EPGs may appear in the coming months, e.g. electronic versions of television journals. In the United States, different equipment providers for the DirecTV / USSB digital DBS system provide different EPGs. Moreover, in the case of non-proprietary transmission standards such as those in place for free terrestrial television, there are opportunities for audiovisual service providers. Some argue that it is realistic to expect that a limited number of EPG framework providers will

continue to have a strong market influence in the early stages of market development, because there are likely to be few EPG framework providers per delivery mechanism.

EPGs perform several functions. They provide programme scheduling information such as channel and time. They may provide an evaluation of the programme, and they provide a mechanism for the subscriber to navigate through the various channels offered and search for programming of a particular type. An EPG provider that is associated with one of the programme services offered via a conditional access system might have incentives to favour its own programme service. Whether this possible incentive needs to be curbed via regulation depends on several factors. Can the subscriber choose among alternative EPGs? Can the subscriber personalise his/her EPG in order to highlight preferred channels? Does the subscriber know that any programme reviews or other editorial content in the EPG are provided by one of the programmers? If the answer to these questions is "no," one would have to consider whether it is necessary and possible to define and enforce some concept of "neutrality" in EPG presentation of programme information. OFTEL advances such a concept, suggesting that EPG search and sort criteria should offer a neutral and impartial presentation of information to the viewer. [62]

One specific issue of wide concern is how EPGs for pay television service will provide information on and access to free-to-air digital terrestrial television signals. A threshold question here is whether the pay television set-top box in which the EPG is embedded can process these digital television signals. A regulatory authority could, of course, require this capability, but this is not mandatory. In the United States, free-to-air broadcast programming is extraordinarily popular, even in pay TV households. Given the value that pay TV subscribers place on free-to-air TV, it is quite possible that pay TV providers will want to highlight their retransmission of these signals rather than hide it. Moreover, viewers uninterested in pay TV will likely be able to acquire digital to analogue converters to receive digital terrestrial television signals on their analogue receivers.

It should also be remembered that EPGs are similar to search engines in that they can be personalised. When viewers personalise EPGs to display their favourite channels or themes, such individual choices should not be subject to public criteria. The ability to personalise the EPG may well reduce or eliminate concerns that the EPG provider will be able to disadvantage certain services by making them harder to access.

Other policy issues and conclusion

Discussion of conditional access systems for digital DBS services is still at a preliminary stage. The following are not directly linked to conditional access issues, but can be discussed as relevant policy issues. The first issue is whether digital terrestrial broadcasting can compete with other audiovisual services. As Table 1 indicated, digital terrestrial broadcasting will appear in the market after digital DBS and digital cable television services. For example, it is likely that digital cable will be first in the market in France and the United Kingdom (expected late 1997/early 1998). Digital satellite services are expected in the first half of 1998, with terrestrial services starting around mid-1998. The digital set-top box market will be much influenced by the future development of digital terrestrial television. If digital set-top boxes can also process and display digital terrestrial television signals, the transition from analogue to digital television is likely to be faster. In order to facilitate policy decisions, it is necessary to review the transition issues, since they are highly relevant to broadcasting policy matters. For example, in the context of a transition to digital broadcasting, it will be necessary to discuss if digital terrestrial broadcasting might need some type of safeguard in order to compete with other audiovisual services, including digital DBS.

Access to content is another important issue for audiovisual services including digital DBS. In some cases, viewers' capacity to receive video programming from terrestrial broadcasting is restricted.[63] Also, some broadcasting principles are not always compatible with competitive market principles, such as the guarantee of programme diversity and the obligation to serve the public interest. Might a safeguard solely for terrestrial broadcasting be justified by public interest obligations? Do digital DBS services have to meet the obligation to serve the public interest by providing specific programmes?[64] In future, it might be useful to exchange views on related issues, based on countries' experience.[65]

In the past, in the broadcasting market, there have been few multi-channel video programming distributors on the market, and new entry was extremely difficult. Each service provider provided similar programmes and tried to expand its share by differentiating products a little. Today, where multiple audiovisual service providers offer various programmes, the different actors are expected to respond to viewers' wishes by making the differences in the quality of their programmes clear. This trend is welcome. Conditional access systems allow service providers to collect payments for the use of their services, thus giving providers incentives to widen viewers' choices. It has to be ensured that control of conditional access systems does not lead to undue distortion of competition. The resulting competition, including that for quality programming, benefits viewers.

ANNEX: DIGITAL DIRECT BROADCAST SATELLITE SERVICES MARKET

In order to understand the importance of digital DBS and its potential for dominating the multi-channel video programming distribution market, other factors, such as the availability of competing delivery systems and the degree of access to programming, must also be considered. This Annex provides a preliminary overview of how digital DBS services are provided in the OECD area and the availability of competing delivery systems in the multi-channel video programming distribution market.

Digital DBS services

This section discusses digital DBS services. The term DBS services is used to describe satellite broadcasting services received by individuals in their homes via a satellite receiving dish.[66] Usually small (45.72 cm to 91.44 cm in diameter), these static satellite dishes are aimed at one position in the sky.

Digital DBS services do not include transmission provided by satellites to cable operators. Direct-to-the-home (DTH) services also exist and differ from digital DBS in that they involve existing satellite services that require larger moveable dishes and are often delivered in analogue format.[67]

The definition of DBS services is somewhat imprecise, and it is unclear whether they should be regarded from a regulatory perspective as telecommunications or broadcasting. In the United States, DTH service, which includes digital DBS, is regulated as a telecommunication service.[68] In Canada, the government asked the CRTC in May 1996 for a report on whether current definitions under the Broadcasting Act and the Telecommunications Act are sufficiently clear to enable new and emerging services to develop under a coherent regulatory approach or whether there is a need to review terms such as “broadcasting” and “telecommunications service”.

Under the present Canadian definition, programmes offered on a pay-per-view basis at the specific request of an individual are included in broadcasting.[69] However, true video-on-demand may perhaps not be included in broadcasting because programming will be delivered to a individual, and only to that individual, at a specified time.[70] In this paper, as long as signals are transmitted by satellite and received by individuals using a satellite dish in their homes, they are included in digital DBS services.

This Annex emphasises digital DBS services for several reasons. Digital compression allows operators to squeeze from 6 to 12 programmes into a bandwidth that carries only one analogue service, so that opportunities for broadcast services will expand significantly. The signals reach the home almost error-free over wider regions, including remote areas. According to Astra, digital compression will stimulate demand for services and therefore for capacity because the cost of satellite transmission per programme will be only 10-20% of what it previously was.[71]

New types of services are being planned, such as pay-per-view programming (or near-video-on-demand) whereby each movie is transmitted on several different channels with staggered starting times, for example every 15 minutes. Also, extra data capacity is likely to lead to new applications: for

example, a viewer watching a sports programme could call up statistics or player profiles and display them on screen during an event.

In a recent report, the FCC introduced the concept of multi-channel video programming distributors (MVPDs), a concept that was originally defined in the US Cable Act of 1992.[72] The statutory definition stated that a MVPD includes, but is not limited to, cable operators, MMDS (multi-channel multipoint distribution service) operators, DBS service operators, and television receive-only satellite programming distributors. Under the FCC definition, television broadcasters are not considered MVPDs.

In this Annex, digital DBS service operators are viewed as MVPDs. The FCC report also recognises several other distribution technologies and providers as potential competitors to cable television, such as DBS services,[73] home satellite dish services, wireless cable systems, local exchange telephone, SMATV (satellite master antenna television), broadcast television service, Internet video, and interactive video and data services.[74] While the definition of MVPDs does not include broadcast television services, it seems important to include them when examining competing technologies.

The digital DBS services market

This section compares the digital DBS services market to other multi-channel video programming services, highlighting penetration rates and price competition. Table 2 shows television households, cable, analogue and digital DBS services penetration rates in 1995. In Figure 6, MVPD subscribers represent total subscribers for cable television and analogue and digital DBS services. Data on the number of digital DBS subscribers is only available for the United States.

In the United States, compared with the penetration rate of cable + SMATV (65.1%), that of digital DBS services in September 1995 was quite low (4.2%) (Table 2 and Figure 6).[75] The DBS services in Table 2 include home satellite dish users, or C-band services. At the beginning of January 1997, the number of home satellite dish subscribers reached 2 255 861. The number is decreasing gradually, as digital DBS equipment is significantly less expensive than existing home satellite dishes.

The incumbent cable television systems are still the main MVPDs in terms of penetration rates (Table 3 and Figure 7). It is said that many cable television systems will be able to offer substantially more programmes than can be offered by digital DBS service providers if cable joins DBS systems in the widespread use of digital compression.[76] In addition, broadcast service remains the principal transmission medium for many households because it provides many programmes free of charge to all viewers.[77]

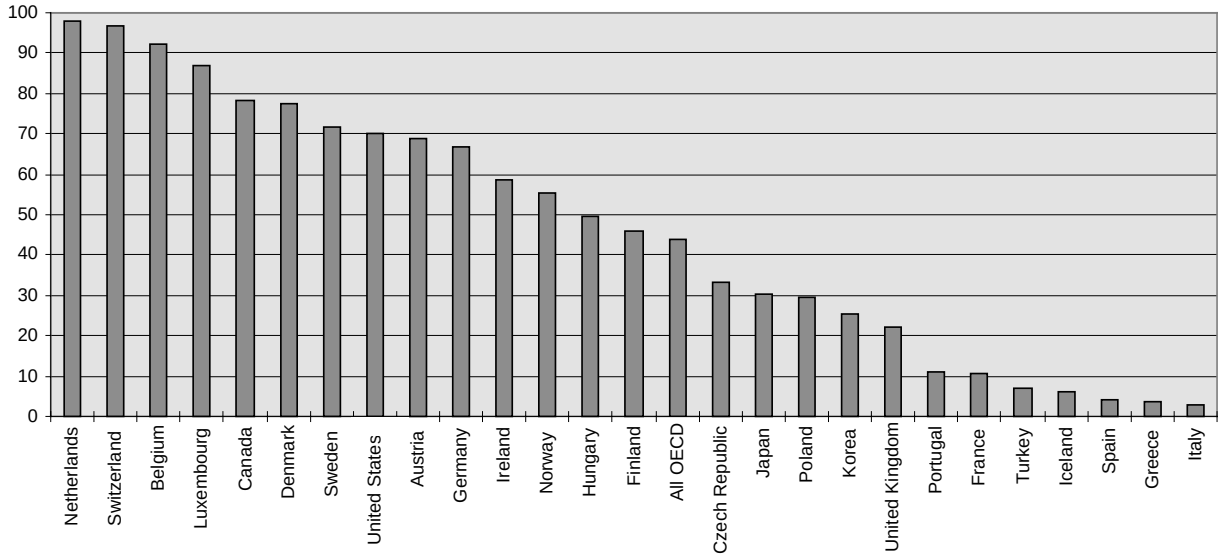
However, the number of homes subscribing to digital DBS services is growing rapidly. As Table 3 shows, it rose from 1.68 million in September 1995 to 3.53 million by September 1996.[78] Total DTH satellite subscribers grew from 1.8% of the MVPD total to 8.2% between 1992 and 1996.[79] In terms of numbers of subscribers, DirecTV/USSB and Primestar are the seventh (3.0%) and ninth (2.2%) largest MVPD companies in the United States. The other eight in the top ten are cable television multiple system operators (MSOs). According to the FCC, digital DBS companies such as DirecTV/USSB and Primestar projected lower subscription rates in recent months, but this could be interpreted as normal fluctuations in subscriptions.[80] Therefore cable television's share of total subscribers to multi-channel video programming distributors is decreasing, even though the number of cable subscribers is increasing.

Table 2. **TV households, MVPD subscribers, cable, analogue and digital DBS services penetration, 1995**

	Television households[1]		MVPD subscribers[3]		Cable television subscribers[4]			Analogue and digital DBS subscribers[5]		
	1995 Total (000s)	% of total households[2]	1995 MVPD Total (000s)	% of total TV households	1995 Total (000s)	% of total TV households	% of total MVPD	1995 Total (000s)	% of total TV households	% of total MVPD
Australia	6000	93.8	180	3.0	180	3.0	100.0	0	0.0	0.0
Austria	2648	85.4	1825	68.9	1035	39.1	56.7	790	29.8	43.3
Belgium	3968	99.0	3654	92.1	3629	91.5	99.3	25	0.6	0.7
Canada	10286	98.0	8066	78.4	7791	75.7	96.6	275	2.7	3.4
Czech Republic	3585	90.3	1190	33.2	640	17.9	53.8	550	15.3	46.2
Denmark	2061	86.8	1600	77.6	1383	67.1	86.4	217	10.5	13.6
Finland	1915	89.1	881	46.0	827	43.2	93.9	54	2.8	6.1
France	20500	90.9	2224	10.9	1496	7.3	67.3	728	3.6	32.7
Germany	32634	88.3	21807	66.8	15808	48.4	72.5	5999	18.4	27.5
Greece	3517	93.0	130	3.7	0	0.0	0.0	130	3.7	100.0
Hungary	3687	96.9	1832	49.7	1530	41.5	83.5	302	8.2	16.5
Iceland	84	88.6	5	6.2	1	1.4	23.1	4	4.8	76.9
Ireland	958	90.1	561	58.6	476	49.7	84.8	85	8.9	15.2
Italy	15864	75.3	480	3.0	0	0.0	0.0	480	3.0	100.0
Japan	34374	79.1	10490	30.5	3009	8.8	28.7	7481	21.8	71.3
Korea	12000	92.3	3073	25.6	2573	21.4	83.7	500	4.2	16.3
Luxembourg	136	99.0	118	86.8	116	85.3	98.3	2	1.5	1.7
Mexico	16000	77.7	1144	7.2	1144	7.2	100.0	0	0.0	0.0
Netherlands	6067	98.0	5950	98.1	5700	94.0	95.8	250	4.1	4.2
New Zealand	1009	80.7	1	0.1	1	0.1	100.0	0	0.0	0.0
Norway	1575	99.0	872	55.4	670	42.5	76.8	202	12.8	23.2
Poland	10200	. .	3018	29.6	1380	13.5	45.7	1638	16.1	54.3
Portugal	4004	96.4	445	11.1	59	1.5	13.2	386	9.6	86.8
Spain	11700	96.0	466	4.0	300	2.6	64.4	166	1.4	35.6
Sweden	3352	88.2	2398	71.5	1900	56.7	79.2	498	14.9	20.8
Switzerland	2623	75.1	2532	96.5	2400	91.5	94.8	132	5.0	5.2
Turkey	6760	50.7	482	7.1	404	6.0	83.8	78	1.2	16.2
United Kingdom	21176	92.1	4660	22.0	1420	6.7	30.5	3240	15.3	69.5
United States[6]	95900	99.4	67275	70.2	62450	65.1	92.8	4016	4.2	6.0
All OECD	334583	97.8	149415	44.7	118323	35.4	79.2	30283	9.1	20.3

1. 1994 data for Canada, France, Hungary, Ireland, Italy, Korea, New Zealand, Poland, Sweden and United Kingdom. 1993 data for total number of households.
2. Data for Belgium, France, Greece, Luxembourg, Netherlands, Norway and the United States are from OECD, *Communications Outlook 1997*. Other data are mainly from the International Telecommunications Union (ITU).
3. MVPD subscribers are the sum of cable television subscribers and analogue and digital DBS subscribers. Because of data availability, data for MMDS (multi-channel multipoint distribution service) and SMATV (satellite master antenna television) are not included in MVPD data, although these media are important MVPD services in some countries. See the exception in note 5.
4. 1994 data for Korea and Poland.
5. Data are not available for Australia, Mexico and New Zealand. Data for Canada and Korea is ITU data in 1993, which includes both DTH and SMATV.
6. The US data correspond to those in Table 3 (September 1995), and analogue and digital DBS subscribers are the sum of (7) DBS subscribers and (6) HSD (home satellite dishes: C-band) subscribers in Table 3.
Source: OECD, ITU, European Audiovisual Observatory, Eutelsat, MPT Japan, *Institutodas Comunicações de Portugal, Ministerio de Fomento*, Spain, FCC.

Figure 5. **MVPD subscribers percentage of total TV households, 1995**

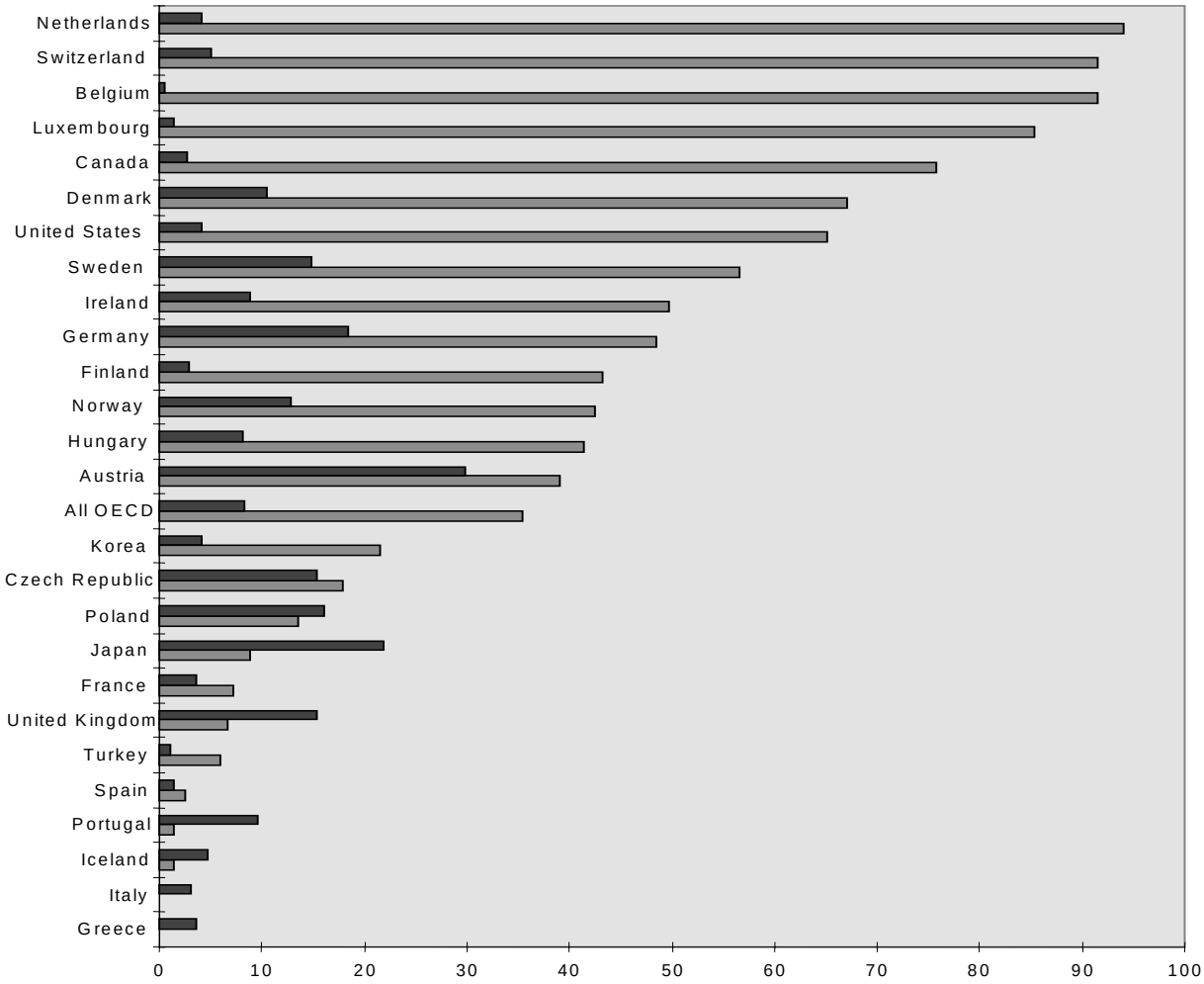


1. Note: MVPD (Multi-channel video programming distributors) subscribers means the sum of Cable television subscribers and analogue and digital DBS subscribers.

Source: OECD.

Figure 6. Cable television and DBS penetration, 1995

(upper DBS, lower cable)



Source: OECD.

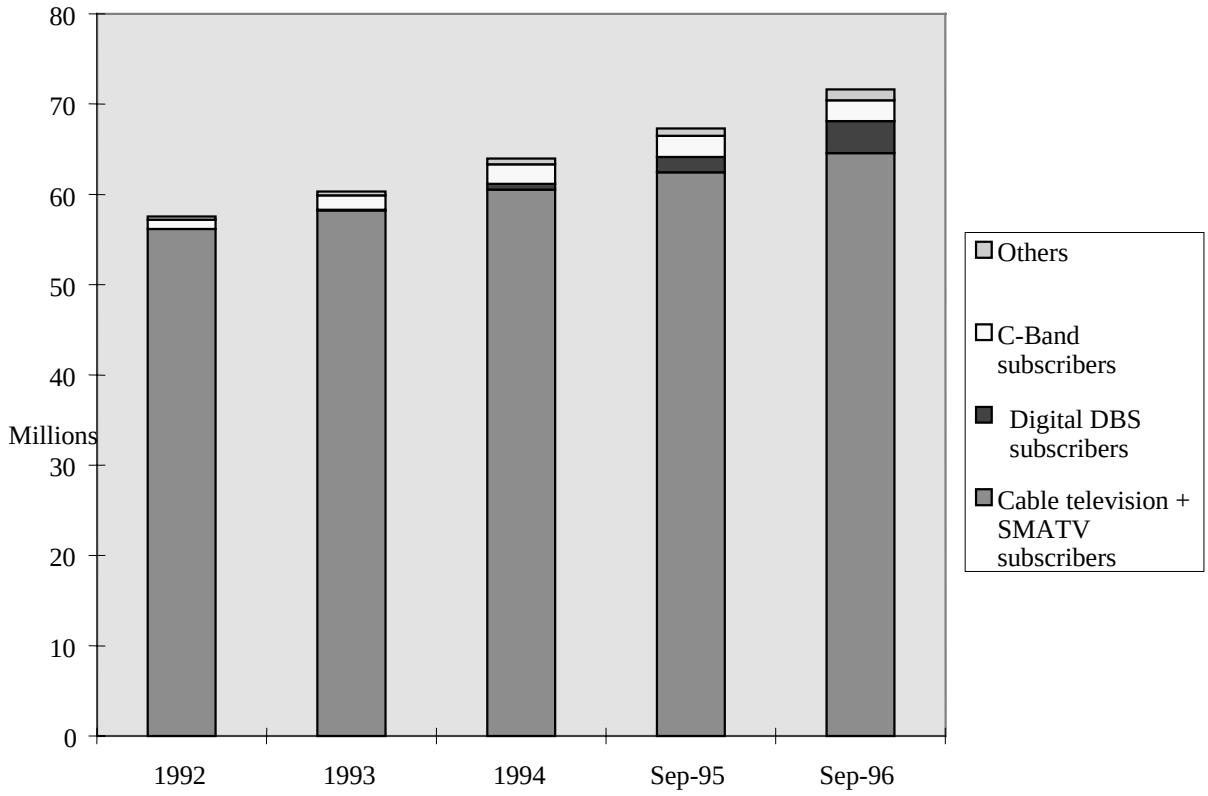
Table 3. **Digital DBS, cable television and C-band: Assessment of competing technologies in the United States, 1992-96**

Technology used	**Subscribers**				
	1992	**1993**	**1994**	**Sept. 1995**	**Sept. 1996**
(1) TV households	93 100 000	94 200 000	95 400 000	95 900 000	97 000 000
Pct. change		1.18%	1.27%	0.52%	1.15%
(2) MVPD households	57 530 000	60 283 000	63 936 620	67 275 350	71 628 540
Pct. change		4.79%	6.06%	5.22%	6.47%
Pct. of households	*61.79%*	*63.99%*	*67.02%*	*70.15%*	*73.84%*
(3) Cable subs.	55 200 000	57 200 000	59 700 000	61 500 000	63 525 000
Pct. change		3.62%	4.37%	3.02%	3.29%
Pct. of MVPD total	*95.95%*	*94.89%*	*93.37%*	*91.42%*	*88.69%*
(4) MMDS subs.	323 000	397 000	600 000	800 000	1 206 250
Pct. change		22.91%	51.13%	33.33%	50.78%
Pct. of MVPD total	*0.56%*	*0.66%*	*0.94%*	*1.19%*	*1.68%*
(5) SMATV subs.	984 000	1 004 000	850 000	950 000	1 050 000
Pct. change		2.03%	-15.34%	11.76%	10.53%
Pct. of MVPD total	*1.71%*	*1.67%*	*1.33%*	*1.41%*	*1.47%*
(6) HSD subs.	1 023 000	1 612 000	2 178 000	2 341 000	2 320 100
Pct. change		57.58%	35.11%	7.48%	-0.89%
Pct. of MVPD total	*1.78%*	*2.67%*	*3.41%*	*3.48%*	*3.24%*
(7) DBS subs.		< 70 000	602 000	1 675 000	3 525 000
Pct. change			760.00%	178.24%	110.45%
Pct. of MVPD total		*0.12%*	*0.94%*	*2.49%*	*4.92%*
(8) OVS subs.					2 190
Pct. change					
Pct. of MVPD total					*0.0%*
(9) VDT subs. (Trials)			6 620	9 350	0
Pct. change				41.24%	-100.00%
Pct. of MVPD total			*0.01%*	*0.01%*	*0.00%*

1. MVPD (Multi-channel video programming distributors).
2. MMDS (Multi-channel multipoint distribution service).
3. SMATV (Satellite master antenna television).
4. HSD (Home satellite dishes).
5. DBS (Direct broadcast satellite).
6. OVS (Open video system).
7. VDT (Video dial tone).

Source: FCC 1997.

Figure 7. **Composition of MVPD subscribers in the United States, 1992-96**

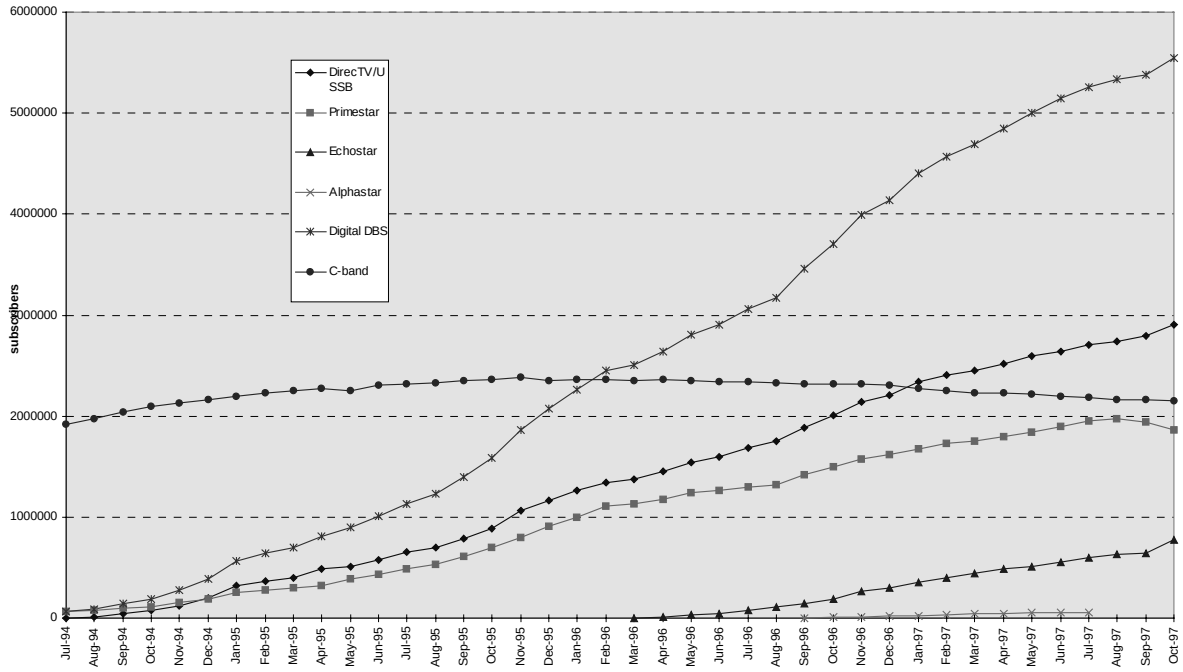


1. *Note*: Data for cable television and SMATV for other countries are not always grouped the same way. For example, ITU, *World Telecommunications Development Report 1996* combines SMATV and direct-to-home satellite.

Source: FCC 1997.

Figure 8 indicate trends for digital DBS subscribers in the United States. The increase in total digital DBS subscribers in 1996 can be explained by competition from two new digital DBS services, EchoStar and AlphaStar. Primestar, owned by a group of cable television companies, has been very successful, with over 1.5 million subscribers; it had over 40% of the digital DBS market until October 1996. EchoStar obtains subscribers at a rate comparable to the other DBS services primarily because it entered the market with very inexpensive hardware and programmes that have proven very popular with price-sensitive subscribers, and this has caused other providers to lower hardware and programme prices. AlphaStar, a medium-power Ku band service which requires a 1 m dish, had only 40 000 subscribers at the beginning of March 1997, six months after it was launched. EchoStar reached 40 000 subscribers in about three months. AlphaStar recently filed for bankruptcy protection.

Figure 8. **Digital DBS subscribers in the United States, July 1994-October 1997**



Source: FCC, DBS Dishcom, Sky Report.

In Europe, Eutelsat's 4th quarter 1995 estimate indicates that throughout Europe and the Mediterranean area, 17.9 million households out of the 270 million television households receive satellite television with individual satellite dish (DTH) services, including analogue and digital.[81] At the time of the estimate, subscribers to DBS services in European countries listed in Table 2 mainly received analogue services.

Table 2 and Figure 2 indicate that in Europe the DBS penetration rate varies, as does that of cable television. The penetration rate of "cable + DBS (MVPD)", in contrast to the free-to-air terrestrial broadcast television market, reflects the current status of subscription to audiovisual services. While the number of households with television sets is nearing the saturation point in many OECD countries, the MVPD service market, including digital DBS services, is expected to grow.

The mixture of cable television and DBS varies among Member countries. Generally speaking, the penetration rate of DBS services is relatively high in areas where the cable penetration rate is medium or low. For example, Austria has the highest DBS penetration rates in Europe, but has a low penetration level for terrestrial television and a mid-level for cable television. Poland, the United Kingdom and Portugal have relatively high DBS penetration but quite low cable television penetration. In Germany, the DBS market is well developed, with nearly 6 million households equipped; however, these are mainly in the eastern part of the country, which was less equipped in cable television.[82] On the other hand, the penetration rate for DBS services is quite low where cable television penetration is high, as in Belgium, Luxembourg, the Netherlands and Switzerland.

In certain cases, both cable television and DBS penetration rates are quite low. In Greece, the penetration rate for DBS services is low and cable television does not yet exist. Italy has one of the lowest penetration rates for DBS but a large number of terrestrial channels. The situation in Italy is partly due to heavy competition from terrestrial channels. The situation in Spain can be included in this category.

Statistics on the penetration rate of digital DBS services in Europe are unfortunately sparse. Germany's DF1 had forecast some 200 000 subscribers by late 1996, increasing to 700 000 by the end of 1997 and 3 million by the year 2000.[83] As of March 1997, DF1 had obtained fewer than 30 000 subscribers. Nevertheless, it is premature to say that the satellite market has reached a saturation point in Germany.

The diffusion of digital DBS services, like that of analogue DBS services, depends less on geographical factors than cable television systems do. The replacement of analogue DBS by digital standards raises a particular problem. Some European DBS providers, unsure of how customers will react, are reluctant to switch from analogue to digital DBS. In order to induce customers who already have analogue services to switch and to attract new ones who have thus far not subscribed, they will have to offer new services. The question is what value added digital services offer over analogue services and at what additional cost.

Table 4 and Figure 9 provide a breakdown of subscribers to competing technologies in Japan, following the methodology used in Table 3. In Japan, the penetration rate of cable plus satellite broadcasting (broadcasting satellite plus communications satellite) is quite low (39.98% in 1996) compared with the United States (73.84% in September 1996), expressed as a percentage of MVPD. This suggests that the digital DBS market will grow in future, and some industry projections indicate that in the year 2000 digital DBS subscribers will reach 4 million, compared with 6 million cable television subscribers.[84]

In Japan, satellite broadcasting has higher penetration than cable television, especially from two broadcasting satellites (BS): NHK (public) and WOWOW (private). These BS provide three channels in total; in order to watch WOWOW, it is necessary to rent a decoder in addition to subscribing to NHK services. A digital format is expected to be used for a second BS-4 satellite, due to be launched around 2000, while the analogue format was chosen for the first BS-4 satellite, launched in April 1997. In contrast, there are relatively few analogue CS (communications satellite) subscribers to two private multiplex systems, although they can provide from five to nine channels. The Ministry of Posts and Telecommunications has announced that digital terrestrial broadcasts will start before 2000, instead of before 2005 as previously planned, so there will be more players in the MVPD market.[85]

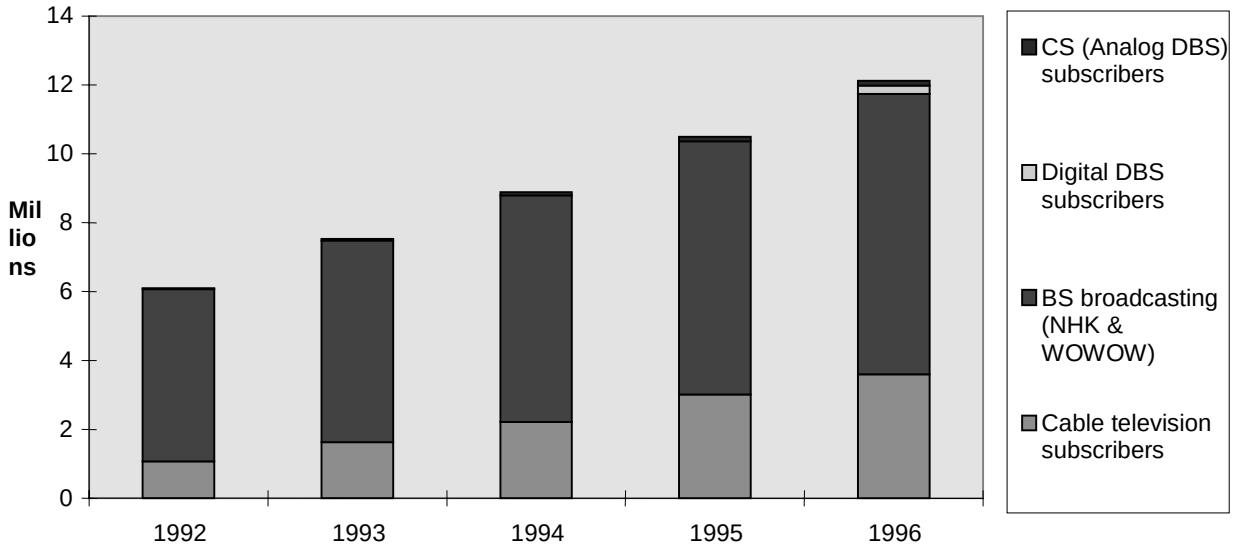
Table 4. **Analogue and digital DBS, cable television services: Competing technologies in Japan, FY 1992-96**

Technology used	**Subscribers**				
	1992	**1993**	**1994**	**1995**	**1996**
(1) TV households	33 449 000	33 810 000	34 122 000	34 374 000	35 816 000
Pct. change		1.08%	0.92%	0.74%	4.20%
(2) MVPD households	6 100 000	7 528 000	8 882 000	10 490 000	12 126 000
Pct. change		23.41%	17.99%	18.10%	15.60%
Pct. of households	*18.24%*	*22.27%*	*26.03%*	*30.52%*	*33.86%*
(3) Cable subs.	1 075 000	1 629 000	2 213 000	3 009 000	3 600 000
Pct. change		51.53%	35.85%	35.97%	19.64%
Pct. of MVPD total	*17.62%*	*21.64%*	*24.92%*	*28.68%*	*29.69%*
(4) BS (NHK) subs.	5 000 000	5 850 000	6 581 000	7 349 000	8 142 000
Pct. change		17.00%	12.50%	11.67%	10.79%
Pct. of MVPD total	*81.97%*	*77.71%*	*74.09%*	*70.06%*	*67.14%*
(5) BS (WOWOW) subs.	1 257 000	1 493 000	1 747 000	2 055 000	2 278 000
Pct. change		18.77%	17.01%	17.63%	10.85%
Pct. of MVPD total	*20.61%*	*19.83%*	*19.67%*	*19.59%*	*18.79%*
(6) Digital CS (Digital DBS) subs.[2]					236 000
Pct. change					*1.95%*
Pct. of MVPD total					
(7) Analogue CS subs.	25 000	49 000	88000	132 000	148 000
Pct. change		96.00%	79.59%	50.00%	12.12%
Pct. of MVPD total	*0.41%*	*0.65%*	0.99*%*	*1.26%*	*1.22%*

1. Data for cable subscribers are estimated.
2. Data for television households are number of NHK broadcast reception contracts.
3. The calculation of MVPD households excludes WOWOW households in addition to NHK households.

Source: Ministry of Posts and Telecommunications, 1997.

Figure 9. Composition of MVPD subscribers in Japan, 1992-1996



Source: Major policies of the Japanese Broadcasting administration, MPT 1997.

Price competition among digital DBS services

In order to receive digital DBS services, it is necessary to acquire a satellite dish and a set-top box and also to pay a monthly subscription fee for a package of signals from the licensed distributor.[86] Does price competition among digital DBS providers contribute to an increase in subscriptions? As competition has developed among digital DBS service operators, competition between digital DBS service operators and cable television operators has also increased. However, it is difficult to define how much impact digital DBS will have on the performance of cable television in a particular local market.[87] Table 5 compares the total annual price for digital DBS with cable television prices. For both, installation and equipment are divided by five and monthly subscription fees are multiplied by 12. As the table shows, DBS costs around USD 143 a year more than cable television in the United States.[88] The difference in the first-year cost is even greater.[89]

In the United States, competition has increased owing to price reductions by digital DBS service providers as well as to competition among cable television systems. The cost of digital set-top boxes has been a critical factor in penetration, but hardware producers expect that technological advances will result in decreased prices as mass markets for digital set-top boxes develop.

he hardware used by DirecTV/USSB is produced by various companies and sold by both satellite dealers and consumer electronics retailers. Prices started to decline in 1995, falling to as low as USD 149 after a USD 200 rebate, and were expected to continue to decline as other manufacturers began distributing their models. [90] However, except for rebates and promotions, it is unclear that prices will drop below USD 200.[91]

Table 5. **Digital DBS and cable television pricing, several service providers**

Currency: USD

	Basic service				Programming packages			Maximum number of channels[2]
Digital DBS service operator	Installation	Equipment	Monthly fee	Total per year	Cheapest package (per month)	Highest package (per month)	Movie PPV fee (per movie)	
United States								
Primestar rental option[3]	149	0	32.99	392.69	32.99	54.99	3.95	95
Primestar ownership option	149	199	30	429.6	22.99	44.99	3.95	95
DirecTV/USSB[4]	200	149	30	489.8	22.9	79.9	2.99	200
EchoStar[5]	200	199	25	429.8	25.0	50.0	. .	130
AlphaStar[6]	0	399	24.99	379.68	29.99	59.99	1.99	100
Europe								
CanalSatellite[7] (rental option only)	43.71	192.31	25	347.20	17.13	40.73	. .	33
DF1 rental option	. .	0	35.44	347.99	11.83	17.75	3.55	59
Japan								
PerfecTV![8]	22.68	688.4	24.21	432.78	6.48	40.49	2.43/8.10	99
Cable television operator								
US cable[9, 10]	27.00/13.52	. .	23.07	282.24/ 279.64	. .	. .	. .	70
France cable[10]	107.00		22.82	295.24	27.87	37.98		31
Germany cable[10]	31.23		7.44	95.54	. .	. .	. .	. .
Japan cable	285.00		21.99	320.88	10.24	14.23	. .	46
OECD cable	148.02	. .	17.39	238.23	. .	. .	. .	. .

1. Annual total: installation and equipment divided by five and monthly subscription fee multiplied by 12. The cost of monthly programme guides is also added.
2. Number of channels for cable does not include free channels.
3. For the Primestar rental option, the monthly subscription fee is multiplied by 11 because the first month is free.
4. For DirecTV/USSB, basic service only covers DirecTV service. For the programming packages columns, the price of the cheapest and highest packages of DirecTV and USSB is shown.
5. EchoStar does not have PPV, but has 15 premium channels for USD 25 a month.
6. AlphaStar provides several movie PPV packages; the cheapest one is shown.
7. Equipment for CanalSatellite includes antenna (FRF 600) and deposit (FRF 500). CanalSatellite provides four cinema options for FRF 55 a month.
8. Equipment for PerfecTV! is manufactured by various companies. Sony's price is used as an example. PerfecTV! provides several PPV cinema packages and the range of prices is shown.
9. For US cable television operators, data by Paul Kagan Associates give USD 23.07 as an average basic cable monthly fee in 1995. The data for installation prices in this table are provided by the OECD.
10. Prices for France are for Télécable in Paris. German prices are for "basic service", not "average service prices". Telekom is only responsible for the physical infrastructure. US prices are an average.

Source: OECD; homepages of Primestar, DirecTV, EchoStar, AlphaStar, CanalSatellite, and PerfecTV!; Lange, *op. cit., Paul Kagan Associates.*

Primestar does not require customers to buy the decoder or antenna. Leasing costs are included in the monthly subscription fee. EchoStar initiated service in March 1996, offering receiving equipment for USD 199 to customers signing up for a full year's programming (at USD 300). This was a much lower price than any offered for DirecTV/USSB's equipment at that time. When EchoStar entered with inexpensive hardware, DirecTV and USSB matched their hardware price.

In Canada, viewers are expected to pay about USD 729.90 to purchase the smaller home satellite equipment or to choose lease options. Monthly subscription fees are expected to be competitive with those of cable television.[92]

Germany's DF1 is offering a three-month advertising price of USD 27.22 for subscription to the complete programme. After three months it is automatically replaced by a subscription of at least one year at a monthly cost of USD 23.67 plus USD 11.78 for the d-box rental. The basic package covering 18 channels costs USD 11.83. The CanalSatellite basic service costs USD 25 a month, including monthly set-top box rental fee, and offers 11 television channels and ten radio stations. Five more options are available at monthly prices ranging from USD 5.72 to USD 9.62.[93] For the Nethold package, viewers would have to buy a decoder for USD 774.30. Monthly subscription fees would be around USD 28.68.[94] In all three cases, the monthly fee for digital DBS is not very different from cable television fees, but the annual total is much higher because of the high cost of equipment.

Overview of digital DBS channels in the OECD area

United States[95]

In the United States, there are currently three digital DBS services: Primestar, DirecTV/USSB, and EchoStar.[96] Echostar and DirecTv/USSB are BSS, while Primestar is a Ku band FSS service.

Primestar, launched in July 1990, is offered by a group of Cable TV multi-system operators (MSOs), operating from conventional satellites using 91.44 cm dishes. They started with 10 analogue DBS channels several years ago but converted to digital in 1994. In 1997, Primestar has applied to acquire the DBS capacity owned by News Corp / MCI. DirecTV and United States Satellite Broadcasting Company (USSB) are complementary services because subscribers use the same receiving equipment for both, and they offer mutually exclusive programming. Since June 1994, both operate from specially designed high-powered DBS satellites which are receivable with 45.72 cm dishes. In order to receive all of the most popular programming, a customer must subscribe to both services.

There were two new entrants in 1996. In March, EchoStar launched a 45.72 cm dish service operating from specially designed high-power satellites. Like DirecTV and USSB, EchoStar is finalising a deal to allow Dominion Video Satellite Inc. to use eight channels for religious programming. Another entrant was AlphaStar, which began service in July using a 91.44 cm dish operating a Ku band FSS service from fixed satellites.[97] Its service was the only one available to residents of Alaska and Hawaii. Alphastar went bankrupt in 1997.

Digital DBS operators in the United States have an obligation to reserve between 4% and 7% of their channel capacity for non-commercial programming in order to assure public access to diverse sources of information. They cannot currently distribute local broadcast signals because of technological and copyright law obstacles, so that digital DBS subscribers are required to obtain those signals over the air or

through basic cable subscriptions. Therefore, DBS operators emphasise both the technical quality of their digital service and unique programme offerings, such as comprehensive sports packages, to differentiate their services from cable television.

The technological obstacles to local retransmission of terrestrial television signals by satellite are diminished and there is some discussion in the United States regarding amending the copyright law to permit local retransmission. It is unclear whether this will happen or, even if it does, whether it will be profitable to retransmit large numbers of local television signals. Nevertheless, some industry participants have expressed an interest in doing so.

In the United States, the 1996 Telecommunications Act contains provisions to encourage open competition in the MVPD equipment market. In Section 629, the Act gives the FCC responsibility for adopting regulations to ensure the commercial availability of converter boxes and other navigation devices used by subscribers to multi-channel video programming.[98] The FCC is addressing the issue of how the configuration and distribution of set-top boxes affect competition among multi-channel video programming distributors.

The Act provides for rescinding such regulations when the FCC determines that the market for MVPDs is fully competitive, that the market for converter boxes and interactive communications equipment is fully competitive and that elimination of the regulations would promote competition and the public interest.

Section 629 also stipulates that the "Commission shall not prescribe regulations . . . which would jeopardise security of multi-channel video programming . . .". In its Notice of Proposed Rulemaking on commercial availability of navigation devices (converter boxes, etc.), the FCC sought comments on whether MVPDs that wish to retain control of security functions could provide such security functions separately from equipment (which could be commercially available) to perform other navigation device functions.[99]

Canada

Until February 1997, three licenses were given by CRTC for digital DBS providers, ExpressVu, Power DirecTV and Star Choice. ExpressVu was to begin broadcasting by the summer of 1997 and others some time in 1997.

ExpressVu Inc. is owned by BCE (Bell Canada Enterprises) Inc., Cancom (Canadian Satellite Communications Inc.) and WIC (Western International Communications Ltd.). Using the EchoStar technology, ExpressVu will offer over 75 channels including both Canadian and United States national programming, such as TSN, CBC, CTV, YTV, MuchMusic, US networks and pay TV and pay-per-view movies and events.

PowerDirecTV is partly owned by DirecTV. Like ExpressVu, it obtained a license in December 1995 to launch a digital DBS service. However on 1 February 1996, PowerDirecTV decided not to implement that license and thus will not compete in the Canadian market.

Approved in August 1996, Star Choice, a wholly owned subsidiary of Star Choice Communications Inc., will distribute programming from various English and French language television stations and multicultural channels, including national CBC, SRC and CTV television.[100] It is receiving technical support and will purchase consumer equipment and US programming signals from EchoStar

Communications Inc. In 1996, public hearings were held by CRTC for Shaw Communications and AlphaStar Canada.[101]

In Canada, the new digital DBS services provider must broadcast the basic service, which must include an English and French language CBC television signal and one CTV television signal. On the other hand, local and regional television programmes will not generally be available. To receive these signals, it will be necessary to use terrestrial television or cable television.[102]

Mexico

Following an agreement between the United States and Mexico in November 1996, Galaxy Latin America (GLA) and Sky Entertainment Services are expected to be the main digital DBS players in Mexico. GLA is currently offering DirecTV's 144 channel services in Mexico, Central and South America, and parts of the Caribbean. This is a multinational partnership that includes DirecTV International, Sogecable of Spain, Cisneros Group of Venezuela, MVS Multivision of Mexico, and Televisal Abril of Brazil. Since the summer of 1996, subscribers have received programming for free and will continue receiving free signals until a license is granted by the Mexican government.[103]

Sky Entertainment Services is operating services in Mexico. This is a service which will be offered by News Corp., Brazil's Globo, Mexico's Grupo Televisa and TCI International.[104]

Europe[105]

In **Austria**, there are no digital DBS services so far. Telekabel was experimenting with digital transmission from the DFS2 Kopernicus satellite to cable television systems, with local advertising inserted by cable operators.

In **Belgium,** cable television penetration is quite high, so digital DBS service providers are required to enter into agreements with cable companies. Since 1996, three digital DBS services, CanalSatellite, NetHold/Multichoice and VT-4 are available.

In French- and German-speaking communities, CanalSatellite invited the RTBF to join their package, because RTBF includes programming from local and community television stations and parliamentary news. The alliance between Canal Plus and the cable companies is having an impact on other French-speaking packages such as those of AB Productions, CLT and TF1.

In the Flemish community, negotiations are under way between Nethold Benelux and the cable companies, to set up a joint venture that would allow Nethold's Dutch package to be broadcast over the Flemish cable. VT-4, the Scandinavian Broadcasting System group's channel can also be received.

Since the NSD (Nordic Satellite Distribution) Plan was refused, **Denmark's** state broadcaster Danmarks Radio is keeping the NSD orbital position for its future digital station. Nethold began service covering all the Scandinavian area in 1996 and Kinnevik is expected to start in 1997.

In **Finland**, YLE, the Finnish public television company, and the Norwegian Telenor Satellite Services are broadcasting digital DBS services including YLE1, YLE2 and MTV 3 channels. Called Finland's TV, it broadcasts Finnish television programmes by YLE and MTV for Finnish-speaking people

in several areas of Sweden and in 1997 will broadcast all over Europe via satellite. It will broadcast for two years over a Eutelsat satellite and then over a Telenor satellite.

In **France**, three large digital DBS groups have emerged: CanalSatellite, Télévision par satellite (TPS), and AB Productions.

CanalSatellite is a subsidiary of Canal Plus, and started offering digital DBS services using the Astra satellite in April 1996. From the start in 1992 to spring 1996, the number of subscribers for analogue satellite television reached 320 000. For digital DBS services, it is reported that there were 60 000 orders for digital terminals by mid-June 1996. As of January 1997, 29 channels, including television channels, radio stations, and extra channels options, were on offer.

TPS comprises France Télévision (F2, F3), TF1, M6, Lyonnaise des Eaux, CLT and France Télécom. It will cover all French terrestrial networks by offering channels for movies, sports, news, youth, education, etc. TPS uses a conditional access system called Viaccess developed by France Télécom. It offers about 40 channels, including many existing ones (TF1, France 2 and France 3, M6, France Supervision, TV5 and possibly other French language channels such as RTBF and TSR) in addition to other speciality channels and is quite different from CanalSatellite.[106]

AB Sat is backed by the independent French AB Productions. It began test transmissions in April 1996, and hoped to run 28 channels by the end of 1996.

In **Germany,** in July 1997, the Kirch-Gruppe, Bertelsmann, and Deutsche Telekom jointly agreed to broadcast digital television programmes also via the cable network. Viewers would be able to receive all programmes including those offered by ARD and ZDF by means of the d-box decoder developed by Kirch-Gruppe. Above all for financial reasons, Deutsche Telekom had in the past refused to feed digital programmes into its cable television system. The recent agreement seems to have ended the long dispute over digital television. In April 1996, Kirch signed an agreement with the American group Viacom, which involved the broadcasting of MTV-Europe VH-1 and Nickelodeon in the DF1 package. In July 1996, Kirch also received the support of BSkyB, which agreed to buy 30% of Kirch's DF1, but their partnership terminated in March 1997. Kirch obtained a 57% stake in the Italian pay-TV group Telepiù.

DF1's digital programme package was launched on 28 July 1996, broadcast through the Astra satellite, and can be viewed using a conditional access system called Irdeto developed by BetaTechnik, a Kirch group company associated with Nokia. DF1 is currently only available to German households over the Astra satellite. DF1 currently offers 59 channels including pay per view films.

The German pay-TV channel Premiere,[107] which already has 1 million subscribers, launched on 15 February 1997 a pilot digital TV service available via cable and satellite to 30 000 homes in Germany via the Mediabox (SECA), the conditional access system developed by Canal Plus. In addition, there is the Pro Sieben Digital plan which will use Astra and the Irdeto "d-box". This digital package is thought to serve as an extension of the home shopping channel, a near-video-on-demand channel and several news channels.

Public broadcasters ARD-1 and ZDF were the first German channels to broadcast by Kopernikus satellite on 31 December 1995. ARD is planning to launch a digital DBS service, Prima TV, from mid-1997 with the backing of the Swiss Broadcasting Association. RTL Television and VH-1 Germany are already broadcasting in MPEG-2 via the Eutelsat II F1 and Orion 1 satellites.

In **Greece**, FilmNet Greece, which offers digital DBS pay per view services, is meeting with success, while terrestrial broadcasters suffer severe financial hardship.[108]

Ireland will benefit from the development of digital satellite services in the United Kingdom, especially BSkyB's digital package.

Telepiù, **Italy's** only pay television company, co-owned by Kirch, Nethold, and Finnivest, launched its first European digital DBS services, DStv, in March 1996, using the Irdeto d-box decoder. Since September 1996, a pay per view service featuring Italian league football matches has been available. RAI, the public broadcaster, has also booked two digital repeaters on Eutelsat.

The Orbit Satellite Television and Radio Network, owned by the Mawarid group, is broadcasting digital DBS services on Intelsat. Orbit is considering marketing part of its package in Europe, with its 5 million Arabic-speaking households. It is offering five television channels in Arabic, nine in English and four in French.

There are several plans by commercial broadcasters, including film producer and distributor Vittorio Cecchi Gori, possibly in co-operation with Murdoch. Mediaset is also planning digital DBS services.

For digital DBS services in the **Netherlands**, the music channel The Music Factory and the V10 Gold channel, both launched in 1995, are broadcast using Eutelsat II F3 satellite. For digital television in general, Philips, KPN and Nethold announced an agreement in June 1996 that will lead to the launch of a single digital package, Nethold Benelux, for the Dutch and Flemish markets.[109] Nethold will be able to access the cable television systems of Casema, whose 1.2 million subscribers make up 20% of the Dutch cable market.

The **Norwegian** satellite company, Telenor, launched a digital television channel in November 1995, which includes Denmark's DR-TV and TV2, Norway's NRK, and Sweden's SVT-1 and SVT-2. Telenor hopes to be able to provide its digital packages as a free service and to allow households to receive the programmes without a terminal in the next two or three years.

In **Poland**, Wisla TV, a regional channel, broadcasts in digital standard over the Eutelsat II F3 satellite.

Spain is considered as a promising market for digital DBS services, and two groups have been formed. One is Via Digital, formed by Telefonica, Grupo Televisa in Mexico, Television Espanola (TVE) as well as smaller Spanish media groups. They will launch digital DBS service in September 1997, using the Hispasat satellite system. The other is Sogecable, the broadcasting unit of the largest Spanish media group, Grupo Prisa, with the support of Canal Plus, Spanish private broadcaster Antena 3, Venezuelan and American TV groups Divtel and DirecTV.

Since 1993, Hispasat transmits over five DBS transponders for RTVE (2), Antena 3, Telecinco, and Sogecable. Via Digital will start digital DBS services in September 1997 with 80-90 channels using 11 transponders on Hispasat satellites 1-A and 1-B. Since 1995, Sogecable has been broadcasting an analogue package with five channels. On 30 January 1997, Sogecable launched digital DBS services with 20 channels, using a total of seven transponders on the digital Astra satellites 1E, 1F and 1G. It will ultimately contain some 40 television programmes and assorted services specifically targeting the Iberian peninsula. In order to ensure that Sogecable's programmes will make a smooth transition from analogue to digital, the existing Sogecable channels will be broadcast simultaneously on Astra until the end of 1997.[110]

Televisa, which already broadcasts the Galavision channel to Spain, has announced that it would be using the PanAmSat satellite to distribute an 80 channel digital package.

In **Sweden**, the government proposed to introduce eight digital terrestrial channels by late 1998, terminating analogue services by the year 2008. For digital DBS services, Nethold/Multichoice launched 73 channels in a digital package on the Astra 1E satellite, aimed at Scandinavian countries. It includes terrestrial television channels such as Kanal 2 (Denmark), TV Norge (Norway) and Kanal 5 and TV4 (Sweden).

After the Nordic Satellite Distribution (NSD) plan was refused in May 1996, the Kinnevick Group drew up an agreement with the Société européenne de satellites to stop broadcasting its channels through the Astra satellites. Kinnevick has announced no plans for the launch of a digital channel package. Two of the group's channels, TV6 and Z-TV, are already broadcast in MPEG-2, using the Tele-X satellite.

Telia Media has reserved six transponders on Eutelsat's Hot Bird 2 satellite, and 20 digital channels were to be available by autumn 1996 for subscribers willing to rent a Svensk Kabel terminal.

SSR-SRG, the **Swiss** public broadcaster, is authorised to broadcast its five terrestrial channels (SF1, SF2, TSR1, TSR2 and TSI) in digital form via Eutelsat. In March 1996, French AB Sat announced that it intended to buy a transponder on Eutelsat to launch a digital package of television channels for Switzerland, mainly for distribution to French-speaking cabled households.

The **United Kingdom** television group BSkyB currently provides 20 analogue broadcast channels and has about 4 million subscribers. BskyB expected to start offering digital services in the first half of 1998, using the Astra satellite, with a package of 500 channels, including near video-on-demand. Its plan was delayed mainly in order to guarantee its digital strategy and to face the problem of switching 4 million subscribers from the analogue to the digital world.[111] At the same time, BSkyB has proposed a joint venture with BT, Midland Bank and Matsushita to provide new interactive services such as home banking and home shopping, and possibly high-speed Internet access. The venture is called British Interactive Broadcasting.

Viacom also launched two digital channels using the Astra satellite in April 1996. The parliamentary channel broadcasts parliamentary news using the Intelsat satellite.

It was expected that digital services would be available on all three delivery platforms -- terrestrial, cable and satellite -- by the summer of 1998. In addition, leading actors in the cable industry also indicated that they intended to launch digital cable television services in late 1997. It is expected that digital terrestrial television services would be available from about the middle of 1998.[112]

Asia-Pacific area

In **Japan**, PerfecTV!, Japan's first digital TV service, was launched in June 1996 by Japan Satellite Systems and the Japanese trading companies Mitsui, Itochu, Sumitomo and Nissho Iwai. It offers 99 television channels and 106 audio channels. Competition would gain further momentum in 1997 with the planned launch of a digital DBS service, DirecTV Japan. In addition, JSkyB, mainly owned by News Corp., the Japanese software company Softbank, Sony and Fuji Television Network, planned to launch approximately 150 channels in 1998. In March 1997, News Corp. and Softbank agreed to sell a 21% stake in the Japanese broadcaster Asahi National Broadcasting to the Japanese publisher, Asahi Shimbun. PerfecTV and JSkyB have agreed to merge.

Nintendo, Microsoft and Nomura Research Institute planned to offer satellite on-line PC services in Japan by mid-1997 by setting up a joint venture. This would allow PC users to enjoy on-line services ranging from educational to home shopping and corporate services as well as access to the Internet and on-line services. Satellite delivery is motivated by the fact that nearly 10 million households are already equipped with satellite dishes. In addition, it allows by-passing high-priced phone communications, thereby making the service financially more attractive.[113]

At pan-Asian level, Star TV, owned by News Corp., has been providing one digital channel in Japanese since April 1996. The Japanese broadcaster TBS and the trading house Sumitomo agreed in early 1997 to launch Jet TV, a broadcaster that would offer Japanese programming to cable television systems and hotels in ten Asia-Pacific countries, thus rivalling Star TV, the satellite TV group of News Corp.

Korea has been providing digital DBS services since July 1996, using the Mugunghwa 1 satellite. KBS has two experimental channels broadcasting about five hours every day.

NOTES

1. In this document, a "cable television system" means a distribution plant, and a "cable television network" means a stream of programming.

2. "Current status of communication infrastructure regulation: Cable television", OECD, 1996 (http://www.oecd.org/dsti/gd_docs/s96_101e.html).

3. In Japan, for example, television broadcasting programming, including that for direct broadcast satellite and cable television system, accounts for 72.1% of the total revenue and 99.4% in hours of total audiovisual software distribution market. *Mediasoft*, Institute for Posts and Telecommunication Policy, p. 52, Japan, 1992.

4. *OECD Communications Outlook 1997*, Vol 2., p. 67. Each Member country has its own definition of "broadcasting". In the United States, for example, "broadcasting" services are those available without payment of a programming fee, and subscription services are excluded.

5. There are private terrestrial television broadcasting companies in all OECD countries except Austria, Hungary, Ireland and Switzerland. Private television broadcasting companies have been common in countries such as Australia, Canada, Japan and the United States for many years but are relatively new to some OECD countries. In 1980, there were only 18 private television channels in European OECD Member countries and 44 public channels. Between 1980 and 1990, only three new public channels opened compared to 66 new private channels (*OECD Communications Outlook 1997*, p. 69).

6. *OECD Communications Outlook 1997*, p. 72.

7. Eurostat, *Audiovisual Statistics Report 1995*, pp. 71-73.

8. USSB, DirecTV and EchoStar.

9. The FCC has issued six more DBS permits, two of which have been acquired by EchoStar. The four others are for Continental, Dominion, Tempo and MCI.

10. In this paper, Multiplex means the operators of the transmission networks, which can carry a number of different television channels at any one time. See Digital Terrestrial television fact sheet by Independent Television Committee. (http://www.itc.co.uk/factfile/dttweb.htm)

11. See "The Role of Telecommunications and Information Infrastructures in Advancing Electronic Commerce", DSTI/ICCP/TISP(98)8/FINAL.

12. The term audiovisual services market covers a broader field than multichannel video programming distributor (MVPD) market. MVPD includes, but is not limited to, cable operators, MMDS (multichannel multipoint distribution service) operators, DBS service operators, and television receive-only satellite programming distributors. Television terrestrial broadcasters are not currently considered as MVPDs.

13. It is shown as "encrypted form" simply in place of "encrypted/scrambled" hereinafter.

14. It is shown as “decrypting” simply in place of “decrypting/unscrambling” hereinafter.

15. This was a venture involving Norway’s Telenor, Sweden’s Kinnevik and Tele Danmark (each with a 33% share) in order to establish an infrastructure for the distribution of digital television channels.

16. European Commission, “The Broadband Infrastructure for Digital TV and Multimedia Services project (BIDS)” (http://www.idate.fr/actu/bids/BIDS-Denmark.html and http://www.idate.fr/actu/bids/BIDS-Sweden.html).

17. The paper's emphasis on the OFTEL approach is not meant to prejudge the issue of whether or how conditional access systems might be regulated in markets other than the UK.

18. http://www2.echo.lu/bonn/themepaper.html

19. Draft proposal for a European Parliament and Council Directive on the Legal Protection of Services based on, or consisting of, Conditional Access, Provisional version, 9 July 1997.

20. In Europe, some regulations discriminate between means of transmission, e.g. when terrestrial and cable broadcasting services are protected against illicit reception whilst satellite services do not enjoy such protection. Disparities between national regulations can cause obstacles to the free movement of goods and services. This issue must be also reviewed by viewpoints such as consumer protection (against fraud) and intellectual and industrial property rights (against piracy). See Draft proposal for a European Parliament and Council Directive on the Legal Protection of Services based on, or consisting of, Conditional Access, Provisional version, 9 July 1997.

21. In a sense, one could say that the conditional access system is the outcome of convergence technologies, which integrate telecommunications and computers to produce broadcast services. In order to circumvent the lack of two-way capability, digital DBS service operators use telephone lines for the return path for PPV and teleshopping. Data broadcasts, such as software download transmissions, are another example of convergence.

22 The FCC annual report on assessment of the status of competition in the market for the delivery of video programming, 2 January 1997 (hereafter, FCC 1997) (http://www.fcc.gov/Bureaus/Cable/Reports/fcc96496.txt).

23 CRTC, “What you should know”, *op.cit.*. It is suggested here that consumers should shop carefully before buying equipment and signing up with a specific distributor.

24 ExpressVu homepage (http://www.expressvu.com/story.html).

25 Some expect that the *de facto* rapprochement between Kirch and Canal Plus exists after the departure of Bertelsmann.

26 *Information Society Trends*, No. 64 (28.1.97-11.2.97) (http://www.ispo.cec.be/ispo/press.html).

27 *Nikkei*, 22 September 1997, *Asahi*, 30 September 1997.

28. It is increasingly recognised that there will be business opportunities for providing gateway services. However, while there is general agreement about the importance of gateway functions, the gateway service market may be quite varied, just are gateway owners are. Some expect gateway services to depend on infrastructure, so that revenue from provision of gateway services will be part of the total revenue of infrastructure providers. Others expect gateways to play a bridge role between information infrastructure providers and consumers, so there is a possibility that revenue from gateway services will increase, owing

to income from both content providers and information infrastructure providers. It will not be possible to estimate market size as long as the characteristics of gateways vary.

29. For example, Winston Maxwell, "Broadcasting/Telecoms Convergence Issues", International Chamber of Commerce, 17 October, 1996.

30. "Beyond the telephone, the television and the PC", Oftel, 1995 (http://www.oftel.gov.uk/superhwy/multi.htm).

31. Notably the United Kingdom policy developments. See Oftel, "The Regulation of Conditional Access for Digital Television Services", March 1997 (http://www.oftel.gov.uk/broadcast/conacc.htm), and Joint Oftel and DTI Notice and Consultation, July 1997 (http://www.oftel.gov.uk/broadcast/caccdti.htm).

32. "Beyond the telephone, the television and the PC", Oftel, 1995. A similar idea is introduced in KPMG, "Public issues arising from telecommunications and audiovisual convergence" (on behalf of DG XIII of the European Commission).

33. CRTC news release, "CRTC calls for comments on a new approach to the regulation of broadcasting distribution undertakings", 17 May 1996.

34. "Proposed Broadacasting Distribution Regulations", Public Notice CRTC 1997-84, 2 July 1997.

35. They argue that the challenges and players remain different between media and content, regardless of the source technology used to make that content available. Media are destined to become standardised world-wide for maximum efficiency, while content retains its cultural and social vocation open to the conflicting pressures of global unification of the diversity and values of each country or culture.

36. Oftel, March 1997, *op. cit.*

37. There is a view that common interface would be premature to promote as the only way of giving broad access to services while the use of common interface for different conditional access systems is considered interesting in technical terms.

38. Kelso, *op. cit.*

39. Licensing of Foreign satellite television Channels, Australian Broadcasting Authority, July 1997.

40. DTI, "The Regulation of Conditional Access Services for Digital Television; Final Consultation Paper on Detailed Implementation Proposals", 27 November 1996 (http://dtiinfo1.dti.gov.uk/digital/).

41. First, does objective (a) assume that every programmer has a guaranteed right of access to every conditional access system. Second, in objective (b), is there an implicit requirement to regulate the licensing of proprietary conditional access technology? Third, in objective (c), how is "unnecessary expense" defined, and is there an implied requirement for standards embodied in this objective?

42. The discussion draws heavily on the OFTEL approach in the United Kingdom and cannot necessarily be generalised beyond the British or European context.

43. Kelso, *op. cit.*

44. Recognising that conditional access systems can be shared by different information infrastructures including cable, satellite and wireless systems, Simulcrypt proponents are concerned that the use of a

common interface supporting different conditional access systems might lead to a situation where a conditional access system constitutes a barrier to access.

45. Oftel, *op. cit.*

46. In this section, the term "conditional access service operator" means the party providing the set-top box and thus includes the case where the broadcaster provides set-top boxes, typically for rental. However, as noted, a conditional access service operator such as EchoStar subsidises its set-top boxes on its own.

47. "The Regulation of Conditional Access for Digital Television Services: Oftel Guidelines", March 1997.

48. *Ibid.*

49. Draft proposal for a European Parliament and Council Directive on the Legal Protection of Services based on, or consisting of, Conditional Access, op.cit.

50. Notice of Proposed Rulemaking in MM Docket No. 97-247, FCC 97-414, adopted 18 December 1997.

51. "Joint Oftel and DTI Notice and Consultation", July 1997.

52. *Ibid.*

53. They argue that the challenges and players remain different between media and content, regardless of the source technology used to make that content available. Media are destined to become standardised world-wide for maximum efficiency, while content retains its cultural and social vocation open to the conflicting pressures of global unification of the diversity and values of each country or culture.

54. MPT press release, 28 February 1997 (http://www.mpt.go.jp/pressrelease/japanese/new/970228j701.html).

55. Web-TV's home page (http://webtv.net).

56. In September 1996, Japan's Ministry of Posts and Telecommunications established guidelines on the protection of subscribers' personal information in broadcasting for all broadcasting services, including digital DBS services. These guidelines, which follow the OECD's 1980 privacy protection guidelines, are intended to set minimum standards for handling subscriber's personal information. Conditional access service providers are included among the service providers covered by these guidelines. See MPT Press release, "Guidelines on the Protection of Subscriber's Personal Information in Broadcasting Issued", 27 September 1996 (http://www.mpt.go.jp/pressrelease/english/broad/news7-16-4.html).

57. Other issues, such as civil liability or criminal law, are not addressed here.

58. DTI, "The Regulation of Conditional Access Services for Digital Television; Final Consultation Paper on Detailed Implementation Proposals", 27 November 1996.

59. Oftel, "Conditional Access: Consultative Document on Draft OFTEL guidelines".

60. This can include the important area of piracy, which seems to be a major obstacle to development of the multichannel video programming distributors market.

61. The move towards greater vertical integration and concentration by major service operators in the audiovisual service industry may indeed be the result of market forces and competitive strategies based on real, sustainable competitive advantages and synergies, but it may also raise concern for open access

between services and customers. See OECD, "GII-GIS: Policy Recommendations for Action", May 1997 (http://www.oecd.org/dsti/gd_docs/e_97-gi1.htm).

62. Oftel indicates some objectives to be achieved: ensuring the independence and impartiality of a comprehensive EPG, ensuring equal access to the underlying information on programme schedules and, having separate EPGs for competing broadcasters' programme "bouquets". See Oftel, "Background: Questions and answers on conditional access issues".

63. For examples, see OECD, *Communications Outlook 1997*, Vol. 2, Part B.

64. For example, the United States is in the process of implementing the DBS public interest provisions of the 1992 Cable Act. DBS providers must set aside 4-7% of capacity for non-commercial educational programming.

65. For example: What type of safeguard should be considered? Will providers of digital set-top boxes for MVPDs find it profitable to include digital terrestrial television signal processing capability in the boxes?

66. CRTC, "What you should know about home satellite broadcasting services" (http://www.crtc.gc.ca/eng/info_sht/bdt13e.htm).

67. In the United States, the term DBS usually means digital satellite television services; see FCC 1997.

68. WTO Negotiations on Basic Telecommunications Service Schedule.

69. In the United States, pay per view programming is not considered broadcasting.

70. Industry Canada, Convergence policy statement, 10 July 1996 http://strategis.ic.gc.ca/cgi-bin/dec/wwwfetch?/ sgml/it02036e_pr115.sgml). According to Public Notice CRTC 1997-84, 2 July 1997, the CRTC established comprehensive rules for the provision of access by BDU (Broadcasting Distribution Undertakings) to Canadian pay and speciality programming services, while it was silent with respect to the application of its access policy in the context of the distribution of video-on-demand services.

71. Astra, "Frequently asked questions on digital TV Broadcasting" (http://www.aia.lu/Down_Link?FAQ/DigitalTV/index.html).

72. FCC 1997.

73. In the United States, digital DBS service operators are considered as potential competitors to cable television, but they are not always considered as such in other OECD countries.

74. FCC 1997, p. 4.

75. In other countries, data on cable television and SMATV are not always grouped in the same way. For example, the ITU World Telecommunications Development Report combines SMATV and direct-to-home satellite.

76. FCC 1997, p. 20.

77. The emergence of digital terrestrial television services will make the multi-channel video programming distribution market more competitive, because terrestrial broadcasting is recognised as an immensely powerful medium in that almost all households can receive the signals. See Ross Kelso, "Opening up access to broadband media services", Royal Melbourne Institute of Technology, Australia, (http://www.dot.gov.au/programs/btce/forum/papers/kelso.htm#Acrobat).

78. According to one industry analyst, there would be a total of 13-15 million DBS households by the year 2000. Another observer projects that DBS operators will account for service to over 20% of all MVPD subscribers by the year 2000. See FCC 1997, p. 20.

79. Home satellite dish plus DBS services.

80. FCC 1997, p. 21, para. 40.

81. The coverage zone of the Eutelsat Hot Bird 1 at 13° east. In this context, DTH is the same as DBS. Eutelsat penetration estimates, 4th quarter 1995 (http://www.eutelsat.org/press/sat_tv1.html).

82. BIDS (Germany) (http://www.idate.fr/actu/bids/BIDS-Germany.html).

83. André Lange, "A Profusion of Packages for European Digital Television, European Audiovisual Observatory, July 1996 (http://www.obs.c-strasbourg.fr/profusio.htm).

84. CIAJ, "Current state of digital satellite broadcasting" (http://inetsrv.ciaj.or.jp/jmf/today/im000270.html).

85. "Tokyo accelerates plans for digital broadcasts", *Financial Times*, 11 March 1997.

86. CRTC, *op. cit.*

87. FCC 1997, p. 69, para. 128.

88. The average annual cost of US DBS is USD 424.31, while that of cable television is USD 280.99.

89. See FCC 1997, p. 20, para. 38.

90. Primestar's homepage on price competition, March 1997 (http://www.primestar-tci.com/Low/Shopping/1.3.html). According to DirecTV's homepage, suggested retail prices for equipment range from USD 399 for basic models up to USD 949 for deluxe systems (http://www.directv.com/sales/answer_cost.html#fee).

91. According to Peterson, "Direct Broadcast Satellite: A New Generation of Television in America", 27 November 1996 (http://www.dbsdish.com/dbs/a0.html), rebates and other promotions have lowered the net price of some models to under USD 200 when pre-paid programming subscriptions are purchased.

92. CRTC, *op. cit.*

93. CanalSatellite homepage (http://www.cplus.fr/html/canalsa/sacout.html).

94. Lange, *op.cit.*

95. FCC 1997; Peterson, *op. cit.*

96. In November 1984, United States Communications Inc. started digital DBS services using the Anik satellite, but the business plan failed in 1985.

97. Strictly speaking, Primestar and AlphaStar do not currently use the high-powered Ku-band frequencies allocated for DBS service as defined under the FCC's rules. Instead, they provide programming using medium-powered Ku-band frequencies allocated pursuant to the FCC's Fixed Satellite Service. See FCC 1997.

98. Section 304 of the 1996 Telecommunications Act amends the Communications Act of 1934 by adding Section 629 to it.

99. The FCC's position on this matter is pending, awaiting comments due 16 June 1997.

100. CRTC news release, 27 August 1996.

101. CRTC, "The Chronology of CRTC Policy regarding DTH" (http://www.crtc.gc.ca/ENG/INFO_SHT/G7AE.HTM).

102. CRTC, "What you should know", *op. cit*.

103. "Companies Ready To Enter Mexico's DTH Market", 20 November 1996. SkyREPORT http://www.mediabiz.com/skyreport/1120mx.htm).

104. "Still-Unofficial Sky Entertainment Approaches Debut", 2 August 1996. SkyREPORT (http://www.skyreport.com/82sky.htm).

105. The following description is based mainly on the following documents: "An Overview of Main Trends and Key Events (1995, 1996)", ISPO: *Information Society Trends*, Lange, *op. cit.* and IDATE, "The Broadband Infrastructure for Digital TV and Multimedia Services" project. (http://www.idate.fr/actu/bids).

106. In July 1996, TPS and CanalSatellite approached two other French public broadcasting channels (La Sept/Arte, and La Cinquième) about joining their packages.

107. Premiére is owned by Canal Plus (37.5%), Bertelsmann (37.5%) and Kirch (25%). There are plans for the Kirch-Gruppe and Bertelsmann to eventually hold 50% each of Premiere.

108. *Cable and Satellite Europe*, January 1997.

109. Philips and KPN will take 40% of Nethold Benelux shares, while Nethold will be taking a holding in Philips and KPN.

110. Astra press release, "Sogecable and Astra to Pioneer Digital Television in Spain", 16 October 1996.

111. BSkyB is considering the possibility of taking part in digital terrestrial television. It has agreed with Carlton Communications and the Granada Group to form a consortium, British Digital Broadcasting (BDB), for the launch of digital terrestrial television in 1998. BDB has also concluded a programming accord with the BBC, and seeks to win a license as well as approval from the UK Independent Television Commission as well as scrutiny of British competition (*Information Society Trends*, No. 64).

112. DTI Press Release, "Ian Taylor Welcomes Enthusiastic Response to Digital Television Opportunity," 31 January 1997.

113. *Information Society Trends*, No. 56 (28.6.96-24.7.96). Information was not available as to whether this service will be transmitted via digital DBS.