Mobile

Broadcast Television in Europe

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January 2008

Strategic Information Service | DigiTAG

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Introduction

Overview

This report covers the major western European markets and is based primarily on interviews with experts and key players in the industry including broadcasters, network operators, and regulators. Primary research was conducted from August through November of 2007. All efforts have been made to ensure that information is current as of November 2007. The EBU and DigiTAG do not necessarily endorse the opinions, analysis, or forward-looking statements contained in this report.

In the introductory section, the report explores pan-European influences on the mobile TV broadcast market including results of the World Radio-communication Conference 2007, the global standards available, the initiatives from the European Commission and the status in western European countries.

The main body of the report is composed of country level chapters which explore the issues of spectrum availability, status of enabling regulation, and positions of key players, particularly broadcasters. The general prospects for broadcast mobile television are evaluated and a tentative outlook is described. It must be stressed that any analysis concerning future trends has been made in a very uncertain environment in many markets, and that the early stage of development may lead to a substantially different market in the longer term.

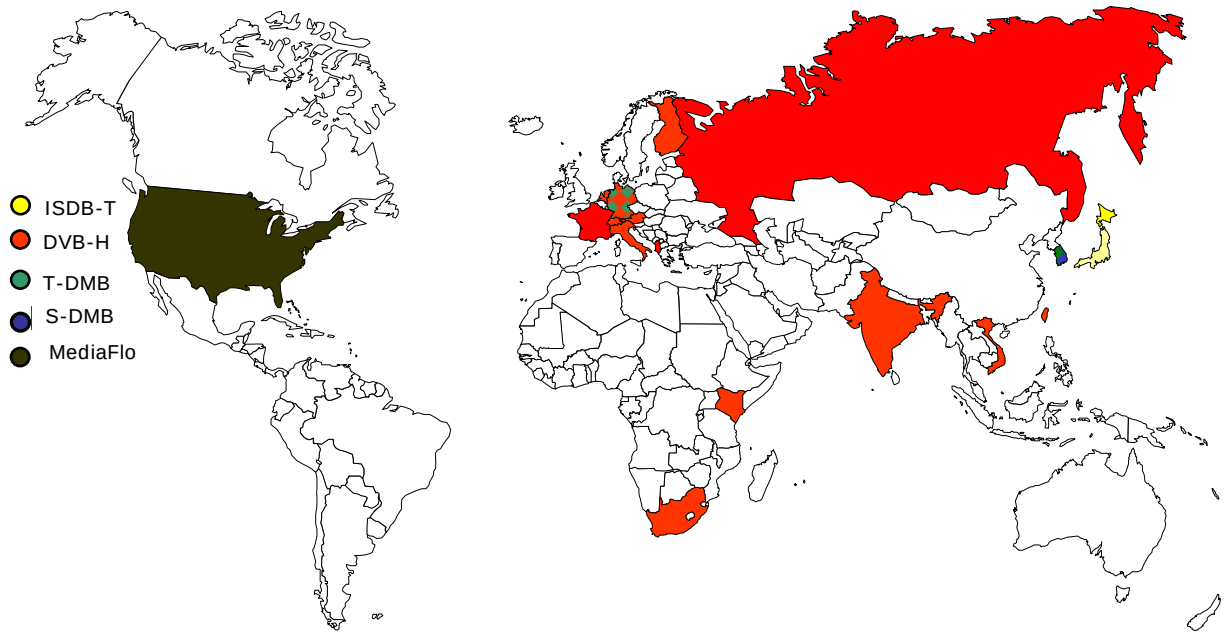
The focus of the report is broadcast mobile television rather than the currently widespread unicast solutions offered by most mobile phone operators. The distinction is crucial for broadcasters and broadcast network operators because the investment, production, and demand aspects of broadcast technologies are very different, as the report will show.

Global standards available

A number of different standards have been developed to provide television services to a handheld device. Mobile telecom operators can provide services using their UMTS networks with such technologies as High-Speed Downlink Packet Access (HSDPA), Multimedia Broadcast Multicast Service (MBMS) as well as TDtv and EDGE.However, these technologies are constrained by the capacity of the unicast network, although developments like HSDPA and MBMS will alleviate to some extent these constraints.

Several broadcast technologies are currently available to provide live television services. Digital Multimedia Broadcast (DMB) delivers mobile television services based on the Eureka-147 Digital Audio Broadcast (DAB) standard with additional error-correction. DAB-IP is one variant to DMB. Integrated Services Digital Broadcasting (ISDB-T), developed by Japan as its proprietary digital terrestrial television standard, provides some modes which are suitable for broadcasting for handheld reception. Two further technologies which have proven successful are MediaFLO in the United States, developed by Qualcomm, and Digital Video

Broadcasting on Handhelds (DVB-H), developed by the DVB Project.



There is a clear tendency of regionalization of technology standards for broadcast mobile television. In Europe, the European Commission is favouring DVB-H using primarily the economies-of-scale argument in the hopes of replicating the success of GSM and prompting widespread adoption. In the United States, regulators have not encouraged any particular standard and with the closure of Crown Castle's Modeo DVB-H project, MediaFLO has been left as the de facto US standard. In Asia, DMB variants are predominant except for Japan with its own national solution, ISDB-T. However, different standards are crossing borders in some cases. DVB-H has been launched in Vietnam, India, Nigeria, and The Philippines. MediaFLO has been working with BSkyB and other pay operators to establish a foothold in Europe. In the long run, it may be that more than one standard is taken up in a particular market depending on spectrum availability and other issues.

Spectrum issues and results of the WRC-07

The World Radiocommunication Conference 2007 (WRC-07) met in Geneva from 22 October until 16 November to discuss the worldwide use of radio frequencies and modify as necessary the Radio Regulations, the international framework governing the use of frequency spectrum and satellite orbits. The Conference brought together 164 national administrations from around the world, with countries divided into regions representing Europe, the Middle East and Africa (Region 1), the Americas (Region 2), and Russia and Asia Pacific (Region 3).

A key issue for broadcasters concerned the allocation of mobile telecom services in the terrestrial frequency bands between 470-862 MHz traditionally reserved for broadcasting. Some countries had requested that mobile services be given co-primary status alongside broadcasting in these bands.

Spectrum and Digital Systems

Band	Frequencies	Analogue systems	Digital systems
Band II	87.5-108 MHz	FM radio	(DRM+)
Band III	174-230 MHz	TV	DAB/DMB, DVB-T
Band IV/V	470-862 MHz	TV	DVB-T/H
Band L	1452-1492 MHz	-	DAB/DMB/(DVB-H?)

Source: EBU[1]

For countries in Europe, the question raised heated debate with a common position only possible after a marathon-long discussion session. The final agreement reached allows for mobile telecom services to be proposed as "primary services" in the frequency bands between 790-862 MHz only from 17 June 2015. This date corresponds to the end of the analogue/digital broadcast transition period for Region 1 and Iran as established in the Geneva 2006 (GE-06) Agreement.

However, not all countries agreed with this compromise. Because the introduction of mobile services in the frequencies between 790-862 MHz is generally delayed until June 2015, 65 countries decided in two footnotes (5.316 and 5.316A) to make these frequencies available for mobile services immediately.

In Europe, these countries include Bosnia and Herzegovina, Croatia, Denmark, Finland, France, Germany, Greece, Lithuania, FYR Macedonia, Montenegro, Norway, the Netherlands, Poland, Portugal, Serbia, Sweden and Switzerland and the United Kingdom. Three countries - Lithuania, Malta and Spain - allow for their early mobile service usage but only within a limited frequency range, from 830-862 MHz.

In both of these exceptions added to the Radio Regulations, it was noted that "*stations of the mobile services .... shall not cause harmful interference to, or claim protection from, stations of services operating in accordance with the Table...*" This means that broadcast services in neighbouring countries must be given protection against interference from mobile services. In the case of Poland and Lithuania, protection must also be guaranteed for the aeronautical mobile services of neighbouring countries (i.e. Russia).

It should be noted that within the mobile service allocation, international mobile telecommunication (IMT) services have been identified as one of the possible uses. IMT services includes both IMT 2000 (3G technologies, UMTS, CDMA 2000, WiMAX) as well as IMT advanced services (4G). At the WRC-07, national administrations decided to merge IMT 2000 and IMT advanced services into a single category.

While broadcasters had requested that their status as the unique primary service in the VHF and UHF frequency bands remain unchanged, they will now need to face the possibility that mobile services may be introduced in the upper parts of the UHF band.

Several reasons have guided this decision by national administrations. First, national

[1] All charts are based on EBU sources and EBU commissioned research

administrations have made the assumption that the switch of broadcasting from analogue to digital will make it possible to free-up frequencies for new services, including mobile services. Thus, it is necessary to allow such services to be given access to the bands. Second, national administrations may be coveting the potential revenue that may be generated by an auction for these frequencies. It is estimated that the auction of frequencies in the 698-806 MHz in the United States will bring the government up to $15 billion.

Finally, some national administrations wish to align themselves with the position of the European Commission which has called for the introduction of new rules to govern spectrum policy. In its proposed "Telecom Package" issued on 13 November, the Commission advocates the principle of "service neutrality" in which the type of service provided within a given frequency band is not established by policy but rather by the market. Allowing for mobile services in the UHF band provides some freeing up of constraints in the types of services that can be offered.

However, planning for the introduction of IMT (mobile) services will not be easy. In some countries, such as Spain, the bands that allow for the introduction of IMT services are currently used extensively by broadcasters for the provision of their DTT services. Making changes to the transmission network to move the current broadcast services will entail major costs, to which will be added the costs for the provision of the new IMT service transmission network.

The issue of interference will also need to be addressed. While the WRC-07 makes it clear that the allotments established in GE-06 must be respected, with services not causing more interference or requiring more protection than agreed, it will be important to ensure that broadcast services are not harmed by mobile services, particularly 'uplink' services. Some have suggested that the use of a harmonised frequency band for mobile services with guard bands on each end to protect broadcast services may be one solution. However, the allocation of such a harmonised band contradicts the Commission principle of "service neutrality" while the use of guard bands sterilizes spectrum bandwidth.

Ultimately, national administrations have provided themselves with the legal framework to provide more flexibility in the allocation of frequencies. It is possible that mobile services can be introduced in the broadcast bands, however, this will be very difficult prior to analogue switch-off and will require careful planning to avoid interference with broadcast services.

The role of the European Commission

At the end of November 2007, the Council of telecommunications ministers of the European Union affirmed Commissioner Reding's call for the adoption of DVB-H as the single European standard for mobile broadcast television on a non-compulsory basis. The Council generally supported the position put forcefully in March 2007:

> *"My assessment is that we are too slow and too uncoordinated to create the right conditions for a quick takeup of mobile TV on a large scale in Europe...I had asked*

industry in particular to address issues related to technology. The challenge is the following: providing technological solutions that are best suited to ensure the availability of mobile TV anytime and everywhere, including at home, and making technological choices that allow attractive commercial offers. European industry, supported also by EU-funded research, is largely behind the technologies being used today to launch mobile TV services in the world. I therefore expected from EMBC clear answers on how to best deal with this challenge. I find the recommendations in the EMBC report too consensual. What we really need now is to decide and draft a European strategy for a swift and large take-up of mobile TV in Europe.

I am convinced that the use of widely recognised open standards is of paramount importance to achieve economies of scale. Only with economies of scale will we have an efficient use of spectrum, affordable handsets and rapid consumer take-up. Therefore, I am prepared to give strong support to European standardised solutions, such as DVB-H, on the condition that they provide certainty about technology licensing terms and conditions. Without this certainty and predictability, it will be impossible to invest with confidence in new innovative technologies. Industry should therefore foster work in this direction." - Viviane Reding, Hannover, Germany, 16 March 2007

Since this statement was made it has come under attack by many industry experts. Many MEPs, especially from Germany, Britain and the Netherlands, have also expressed disagreement.

Many objected under the general rubric of "let the market decide", but specific arguments were made as well:

- In early stages of market development, competing standards often lead to greater innovation and encourage improvement in each technology as it vies against each other.
- Different standards often can be used in different frequency bands offering more flexibility of deployment depending on the national frequency situation in a particular country.
- Mandating DVB-H will not solve the problem of operators implementing different encryption systems.

At a more fundamental level, regulating a market that does not exist is always a tricky business. Sometimes similar markets can be used for guidance, however, the very nascent broadcast TV mobile resembles neither the GSM market nor the digital broadcast TV market.

The Commission wishes to encourage economies of scale to drive mobile TV. However, economies of scale need to be reached on a global scale in order for handset manufacturers to realize significant unit production savings. Driving competing technologies out of Europe

forces their proponents to accelerate their efforts in other markets, particularly Asia. This may lead to regional division of standards and a counterproductive result . Most importantly, the mobile TV market has not proliferated, not because of lack of standards, but rather because of unclear business models, limited spectrum, and questionable consumer demand.

In September, the German Federal Council (Bundesrat) decided there should be no mandatory standard for mobile TV and explicitly disagreed with the Commission's DVB-H policy. The Council went on to say that it could interfere with media pluralism and cultural diversity. Any moves to make the standard mandatory next year will likely face strong opposition.

Country summaries

Western European markets

Austria

Austria has decided to commit to the DVB-H standard and the regulator has initiated a call to tender for the network license. The key driver behind the launch of DVB-H services in Austria is the forthcoming Euro 2008 football tournament which will be jointly held by Austria and Switzerland in mid-2008.

A new broadcasting law was passed on the 1st August 2007 by the Austrian parliament which defined the DVB-H licensing process. The law also amends a number of existing broadcasting laws. For example, the public broadcaster ORF is permitted to make a number of “made-for-mobile” channels.

On the 14th September 2007, the regulator RTR launched a call for tender for the DVB-H network provider license. Potential bidders include the dominant broadcast network operator ORS, which is owned by the public broadcaster ORF, and mobile operators such as Mobilekom and One. The original deadline for bids was the 16th November. However, following calls for this deadline to be extended, the regulator has set a new date for receiving applications which is the 14th December 2007.

Coverage – fast roll-out and extensive population coverage will one of the key criteria evaluated by the regulator. The minimum network coverage should be 50 percent one year after the license is awarded. However, applicants will be expected to propose their own roll-out and coverage schedules and these proposals will be binding on the winning applicant.

Content aggregation - the network license holder will not be allowed to select the content on the multiplex. This will be done by content aggregators, in effect the mobile network operators (MNO), of which there are four in Austria. Each network license applicant will be required to include content packages created by the operators in the bid. A bidder could have content from all carriers or only two or three MNOs. It is possible that two bids could have exactly the same content.

With network licenses not likely to be granted until January 2008, the schedule for the launch

for services is likely to be very tight and there will need to be a great deal of goodwill between the various market players to resolve copyright and other conflicts in time for the start of the Euro 2008 tournament.

Belgium

The French-speaking community published its strategic plan for digital transition (PSTN) in July 2007. Currently the Community has available seven channels for TV broadcasting in the Bands IV and V. One is used for DTT, five for analogue transmissions and one is free. After switch-off all seven multiplexes (one SFN and six MFNs) will be devoted to television broadcast, but the amount of bandwidth eventually devoted to DVB-H has not been decided yet.

Meanwhile the channel currently free is to host a DVB-H multiplex from 2008, half of which has been licensed to the public broadcaster RTBF by the government and half is to be licensed to other providers through a call for tender. The licences will last nine years. In Band III the Community will have three T-DAB multiplexes, yet to be licensed.

Existing regulation states that the DVB-H call for tender should be aimed at network operators and, following a public consultation, the Community government wants to change the rule in order to licence channels instead. The changes should be made by a decree prior to the tender. The decree should also set the terms for the contractual relationship between RTBF and other multiplex licensees.

In the Flanders a two-year DVB-H trial started in 2006 after which a commercial DVB-H multiplex could be licensed. Public broadcaster VRT has taken an active role in developing mobile TV content, notably with re-purposed news bulletins and a fiction series edited for short episodes (or 'mobisodes') to be viewed on mobile. VRT is in a DVB-H trial partnership with the incumbent telecom operator Belgacom and its Proximus mobile division, the cable operator Telenet, Siemens, Scientific Atlanta and academic research centres. The two-year trial started in 2006. RTBF has announced in 2007 that it plans to start a pilot DVB-H bouquet of up to eight channels in the Brussels region, also in partnership with Proximus. Proximus launched a free 3G mobile TV service for its subscribers in 2005 and started charging in early 2007.

Denmark

There is interest in mobile TV in Denmark although the various players are very cautious about committing resources to develop such services.

At the present time, it is not clear how mobile TV will develop in Denmark. The lack of VHF Band III spectrum by Danmarks Radio means that it is unlikely that the company will be able to offer FTA mobile TV via T-DMB alongside its digital radio content in the short to medium term.

Although there is interest in DVB-H in Denmark, the commercial TV sector is small and hence there is no obvious big player that may have the resources to invest in a DVB-H

service. In any case, the frequencies are unlikely to become available until 2009. It is likely that Denmark will adopt the cautious approach of its Scandinavian neighbors and wait to see how the mobile TV market develops in other European countries and issues such as DVB-H spectrum harmonization and the future use of UHF band for mobile applications are resolved.

The Danish government has plans to auction L-band frequencies on a technology neutral basis and so these frequencies could be used for mobile TV. L-band is unlikely to be used for DVB-H due to the interferences issues associated with concatenating three 1.712 MHz DAB channels into a single contiguous 5 MHz DVB-H channel. However, it is not clear whether there is any interest in using this spectrum for T-DMB either. No decisions have been made on the date of the auction or the license conditions.

There are plans to launch a pilot DVB-H service in Denmark with participation from the Technical University of Denmark, Danmarks Radio, the telecoms operators with vendor support from Nokia and Motorola.

No decision has been made by Danmarks Radio about participating in any commercial mobile TV ventures, and the current financial issues at Danmarks Radio means that the company will be unlikely to be a dominant investor or partner in any mobile TV network. However, as it is the principle broadcaster in Denmark, it will inevitably be a major content provider.

Finland

Finland launched DVB-H pre-commercial service with free-to-air content in December 2006. The service has been hampered by a lack of appealing content.

The network provides around 25 percent population coverage in the three main cities of Helsinki, Oulu and Turku. Regulatory requirements call for coverage to be increased to 40 percent by the end of 2007. However, there are no further coverage requirements beyond this.

For the past year the platform has been operating with only limited content. A salient lesson to be learnt from Finland is that content rights is a major issue that needs to be addressed by DVB-H service providers. It is currently the biggest hurdle in Finland and impeding a full commercial launch of services. DVB-H in Finland will not progress until YLE's channels are on the platform.

The lack of a clear business model has also hurt the roll-out of DVB-H services as broadcasters have not been given sufficient incentive to make their services available on the platform. However, recent progress has been made towards finding a suitable business model based on the offer of pay services to viewers. These services can be distributed by a pay-operator who will serve as a content aggregator, sourcing content directly from broadcasters and other content producers, and will also purchase distribution capacity from the DVB-H network operator Digita.

All services are free-to-air at present and can only be received on two devices: the Nokia N77 and the Nokia N92. The cost of the N77 starts around €470 or is available for a monthly subscription rate of €22 per month from TeliaSonera. The Nokia N92 costs around €600.

The lack of content means that manufacturers are unwilling to offer DVB-H devices and mobile operators cannot market the service without content and devices. However, transmission company Digita has a 20-year license and it committed to the project.

France

France has set aside a full national multiplex for DVB-H with 16 television channels and radio services with up to 70-80 percent potential coverage prior to the November 2011 analogue switch-off.

Regulator CSA has launched a call for tender with a deadline of 15th January 2008 to award DVB-H licences to 13 television channels. The bids selected will be disclosed by April and licences awarded in June. All the major commercial broadcasters are expected to bid. Bidders are required to provide details on their plans for distribution, including the commercial model, and also whether broadcasts are free-to-air or encrypted. Public broadcasters will have three as yet unspecified channels. The broadcaster may use one each for France 2 and France 3, with the third split between France 5 and Arte

After the award of the licences, the licensees have two months to submit to the CSA an agreement to manage the multiplex, share transmission costs and award transmission contracts. Mobile operators could become shareholders in the multiplex company. If no agreement is reached by the licensees in the two-month window, licences will be invalidated

No agreement has been reached by channels and mobile operators on a business model. The major free-to-air broadcasters are ready to have their channels encrypted and distributed by mobile operators and over non-connected devices through the horizontal market. Canal+ envisages the direct distribution of an offer to consumers on non-connected devices, as well as a premium offer as part of the bouquet. A few smaller broadcasters want to be fully free-to-air.

Meanwhile, mobile operators want the full bouquet to be encrypted so that 1) they can subsidise handsets and 2) there is no risk, if as few as one or two channels were free-to-air, to have all channels follow suit, thus making it impossible to charge for the reception of DVB-H.

In any event a slow deployment is likely (CSA mandates 30 percent population ‘outdoor’ coverage within three years), as mobile operators will wait to face actual bandwidth constraints on the 3G networks which carry their existing mobile TV services.

The mandatory 30 percent coverage within 3 years is a minimum, and bidders are expected to present more aggressive deployment plans. All three mobile operators agree on the contrary on the need of a minimal critical mass of ca. 30 percent covered quickly to launch the service.

Germany

The main focus of attention in Germany at present is the launch of mobile TV via DVB-H and there is sufficient spectrum available in the UHF band to launch one multiplex with nationwide coverage. However, it is possible that there may also be a free-to-air T-DMB service launched within the next two years, in addition to the already existing T-DMB service.

The Bundesnetzagentur (national spectrum regulator) issued a call for tender for frequencies for the operation of a nationwide DVB-H network in May 2007, and there were a total of three bids.

On the 15th October, it was announced that the winner is T-Systems Media&Broadcast GmbH. The company is planning to have the network operational in the Hannover region in time for the CeBIT 2008 exhibition. It is expected that the remaining fifteen capitals of the federal states plus other major cities in Germany will be covered by the end of 2008.

In March 2007, the Landesmedienanstalten (LMA), or federal media regulators, issued a call for tender for the DVB-H platform operation and received two major bids: one from a consortium of mobile operators comprising T-Mobile, Vodafone Deutschland and O2 and the other from a joint venture known as Mobile 3.0 comprising Mobile Fernsehen Deutschland (MFD) and NEVA Media GmbH (financed by media companies Hubert Burda Media and Holtzbrinck Media. MFD is backed by Naspers/MIH, a major South African media and technology company.

On the 16th October, the LMA announced that its preferred bid was Mobile 3.0. Following a final decision by the media regulators, now not expected until January 2008, the Mobile 3.0 offer will need to be approved by the boards of each of the fourteen media regulators in Germany. Full commercial licenses for mobile TV services cannot be issued without a new national contract (e.g. between the federal states) which is under way. As a result, each individual regional state will issue “pilot” licenses to Mobile 3.0 which will vary from three to seven years depending on the region. This licensing process is not likely to be completed until mid 2008.

There is also interest in T-DMB mobile TV services in Germany. The first commercial T-DMB service in Europe was launched in Germany in May 2006 prior to the FIFA World Cup football tournament. Marketed under the brand name “Watcha” and operated by Mobiles Fernsehen Deutschland (MFD), the service uses L-band DAB network capacity leased from T-Systems Media&Broadcast and can be received in 16 major cities in Germany. The Watcha service offers 5 TV channels as well as all DAB radio stations available in Germany (see table page 49). The service is marketed by Debitel, Mobilecom and Simply Communications. MFD also markets the service directly via its own website. To date, the take-up of the service has been modest (around 10,000-15,000 subscribers). This is attributed mainly to the lack of marketing by mobile operators and a limited selection of mobile handsets.

Both the public and commercial broadcasters are planning to roll-out T-DMB mobile TV services from 2009 onwards. Mobile TV services are likely to be offered in conjunction with radio and other data services on the same multiplex rather than offered via a dedicated VHF T-DMB multiplex. Hence it is likely that these FTA services will compete with the DVB-H pay platform.

Greece

Mobile TV is at a very early stage in Greece. There is some interest although there have not been any technical or commercial trials yet.

The priority at present is to continue with the roll-out of digital TV services via DVB-T. The process has started and there is currently one multiplex operated by the public broadcaster ERT. It covers around 60 percent of the population. A second multiplex is due to be launched in 2007.

The main interest in mobile TV is being shown by the broadcasters, particularly ERT, but it is unlikely that mobile TV via DVB-H or any other standards will gain traction until the digital TV licensing process has progressed further. The official date for analogue TV switch-off is 2012.

Ireland

Regulator ComReg is prioritising, in terms of the allocation of frequencies, the launch of a national DVB-T platform over broadcast mobile television. DVB-T services were introduced on an experimental basis in Ireland only in 2006 and four fully fledged multiplexes are expected to launch in 2008. There are not enough frequencies available in Band III for a national TV bouquet before analogue switch-off.

Several mobile operators already distribute 3G-based TV bouquets in Ireland, and have substantial bandwidth available on their 3G networks to accommodate an increase in demand.

A DVB-H trial is under way since 2007 in Dublin and continues today. All market players appear to support DVB-H; MediaFLO has no backer yet.

Sufficient frequencies are already available for a broadcast mobile television multiplex covering major cities and ComReg will launch a consultation in early 2008, which could lead to the licensing of a multiplex – key players are the mobile operators and transmission companies. It appears that a licence would be issued to a multiplex operator, rather than on a channel-by-channel basis.

Much uncertainty remains over the business model for a broadcast mobile TV platform in Ireland, as in other European markets. Given the small size of the Irish market, mobile operators may wait and consider developments outside of Ireland before committing financial resources to a broadcast mobile TV platform.

Italy

Italy launched two DVB-H multiplexes in 2006. In the same year three DVB-H platforms went on air: 3 TV from 3 Italia; TIM TV from Telecom Italia; and Vodafone Sky TV from Vodafone. Content is encrypted (with Nagravision) and exclusively accessible to each operator's subscribers.

3 Italia owns and operates its own national DVB-H multiplex. Telecom Italia and Vodafone lease bandwidth from the other DVB-H multiplex, operated by commercial broadcaster Mediaset, which cannot retail its own DVB-H bouquet or sell mobile-only advertising airtime under its antitrust undertakings.

Mediaset's major free-to-air channels are available on TIM TV and 3 TV, while public service broadcaster Rai's services are available only on 3 TV. The satellite pay-TV operator Sky Italia supplies basic thematic channels to all three platforms. Mediaset and Telecom Italia Media supply TIM TV and 3 TV with domestic football games. Adult content is also available.

The number of DVB-H handset models available on the Italian market is low, with just two to three models each from Samsung and LG. Nokia, who initially took issue with the conditional access solutions adopted by the three operators, will launch compatible models in 2008, and Motorola is also expected to supply the handset market. In a mobile consumer market driven by a rapid handset replacement cycle, the small number of models available and their high prices are blamed for slow take up of DVB-H.

Without economies of scale being realised by manufacturers due to sufficiently strong global demand for DVB-H handsets, the price difference with other handsets could remain significant and a barrier to higher consumer take up.

Total DVB-H subscribers were about 800,000 in mid-2007: 3 Italia had over 700,000 TV subscribers in June 2007 thanks to a policy of heavily subsidising handsets and advertising on mainstream television; Telecom Italia and Vodafone had together less than 100,000 TV users, as they subsidise handsets only for their highest spending subscribers and are not publicising their services.

In late 2007, 3 Italia was shifting its publicity and advertising away from TV to web content access. 3 Italia also plans to use half of its multiplex for DTT from 2010. TIM was reviewing its approach and considering a shift in programming towards content re-purposed for mobile viewing.

Meanwhile, all three mobile operators with TV platforms are also actively deploying on-demand video services through their UMTS networks.

An alternative mobile TV platform using DAB/DMB could emerge in the medium term according to plans from broadcaster Rai and its transmission arm Raiway.

The Netherlands

The Netherlands switched-off analogue terrestrial broadcasting in December 2006.

The incumbent telecom operator KPN has a uniquely strong position in broadcast mobile TV: It controls the national terrestrial TV transmission network and the Digitenne DTT platform with four national multiplexes while having the largest customer base of all mobile telephony operators. According to its 2001 licence, Digitenne is free to use part of its frequencies for mobile broadcast.

The Dutch government has taken a technology-neutral stand leaving KPN free to chose its standard for mobile TV broadcast. KPN has chosen DVB-H. The KPN DVB-H bouquet was planned for launch in late 2007 but this was postponed to 'before the 2008 Olympics', reportedly because of the need to secure a wider supply of compatible handsets models. The bouquet will be available on a wholesale basis to third-party distributors.

Meanwhile, rival mobile telephony operators Vodafone and T-Mobile already retail mobile TV packages over 3G and KPN launched a trial 3G bouquet in September 2007. The commercial success or failure of the KPN bouquet will be an important indicator for a potential increase in the bandwidth devoted to DVB-H. If a failure, the emergence of rival platforms possibly using DAB/DMB is a possibility.

Norway

The focus in Norway is on the launch of digital terrestrial TV at the present time and it is likely that Norway will adopt a "wait-and-see" strategy with respect to the roll-out of mobile TV services via broadcast networks.

A major issue for Norway is the cost of rolling-out a dedicated DVB-H network. Norway is a sparsely populated and mountainous country with around 4.5 million inhabitants which means that it would be prohibitively expensive to build a nationwide network. A small population and high network costs means that it will be very difficult to create a viable business case in Norway. As a result, telecoms players such as Telenor are looking at the use of 3G/MBMS in conjunction with DVB-H.

Mobile TV in Norway could develop via a number of technologies. There is strong support for T-DMB from the public broadcaster while the telecoms industry favours the use of a combination of 3G, MBMS and DVB-H.

Portugal

Although mobile TV services are offered on 3G networks, there are no immediate plans to launch mobile TV services via broadcast networks in Portugal.

There have been several technical trials and demonstrations in the country. In 2006, commercial broadcaster TV1 carried out a DVB-H trial with Vodafone Portugal in the greater Lisbon area. More recently, Alcatel-Lucent and Vodafone Portugal demonstrated DVB-SH technology using S-band frequencies. Channels broadcast included the Euronews channel (which was broadcast in several languages) plus content from RTP Mobile, SIC Channel and TVI Channel. DVB-SH handsets were provided by Sagem Mobiles.

RTP operates a DAB network in Portugal and although digital radio has stalled in the country since its launch in 1999, there is interest in using this network for mobile TV services via T-DMB. However, it remains to be seen whether there is sufficient political support for T-DMB within RTP as DVB-H is perceived as the preferred standard for mobile TV.

Spain

Although DVB-H has been adopted as the de-facto standard for mobile TV, delays in passing new legislation by the Spanish parliament means that commercial services may not be launched until late 2008 or even 2009.

A technical plan will be published by the Ministry of Industry once the mobile TV legislation has been approved by the parliament. Then a call for tender for the network provider licenses will be issued. Finally, the regulatory conditions for content providers will be published. All these processes can be published without parliament approval.

A draft version of the technical plan has already been published which include the following proposals:

- Coverage: The government wants mobile TV to be rolled out in a 3 year period with deployment in several phases:
    - Phase 1: Cities with a population of more than 1 million (Madrid and Barcelona)
    - Phase 2: Towns and cities with a population of more than 250,000
    - Phase 3: All provincial capitals, autonomous cities and other autonomous community capitals of which there are 41 locations in Spain with a population between 225,000 and 30,000.

It is estimated that a DVB-H network covering Phases 1 and 2 would result in around 20-30 percent coverage of the Spanish population. However, some of the mobile network operators view DVB-H as a complement to their 3G networks and only wish to deploy DVB-H in the high density traffic areas rather than in the provincial capitals.

Spectrum for DVB-H will be limited to the major cities and provincial capitals until analogue TV is switched-off on the 3rd April 2010.

- Content providers will be expected to pay transmission costs to the network operator although public broadcaster RTVE is lobbying the government to mandate that two or three of its channels should have “must-carry” status which probably means that RTVE will not be obliged to pay transmission costs.
- The DVB-H network license will be awarded by a beauty contest rather than an auction process.

Sweden

Although all mobile operators in Sweden offer mobile TV services via their 3G networks, the

launch of mobile TV services via a dedicated mobile broadcast networks seems a distant prospect at the present time and there are several options regarding the most appropriate technology platform.

A major issue in Sweden is the cost of rolling out a DVB-H network and whether it is possible to generate a return on the investment. A solution being proposed by Nokia is to build a hybrid DVB-T/DVB-H network whereby one part of the multiplex is used for DVB-T and another part is used for DVB-H. This may be a plausible solution in the future, but such a proposal seems unworkable under the current broadcasting legislation as public broadcaster SVT is obliged by law to provide its programming to 99.8 percent of the Swedish population.

The interest in using UHF spectrum for mobile TV via DVB-H among the broadcasting industry seems to have diminished recently. The broadcasters and the network operator Teracom believe that the spectrum should be used for fixed TV broadcasting (either SDTV or HDTV) rather than using exclusively for mobile TV via DVB-H or any other technology.

An option being proposed by SVT and supported by the pubic radio broadcaster Swedish Radio is to use VHF Band III frequencies for mobile TV and to reserve the UHF spectrum for fixed TV broadcasting. This would entail the use of Eureka-147-based mobile TV technologies such as T-DMB or an IP-based alternative such as DAB-IP.

There is also strong interest in using the digital dividend spectrum for mobile applications, in particular, via MBMS. Ericsson, a major Swedish company, is a leading player in this market and there is support for the view that the government's industrial policy should support Swedish companies and Swedish technologies. However, the interest is probably for the long-term as no mobile vendors (with the exception of DVB-H hardware vendors) currently manufacture equipment for UHF frequencies.

It is likely that the government may adopt the same strategy it adopted with digital radio and decide to postpone a decision on mobile TV and the use of the digital dividend spectrum until it becomes clearer how the mobile TV is developing in other European countries and the issues regarding spectrum harmonization (particularly for mobile applications) across Europe have been resolved.

Switzerland

It is likely that there will be two mobile TV services in Switzerland: one a pay or subscription service controlled by the mobile industry and targeted at mobile phone devices and the other a free-to-air service controlled by broadcasters and targeted (initially at least) at non-phone devices.

A call for tender for a national mobile TV license using the first multiplex was launched by the Swiss Federal Office of Communications (ComCom) on the 5th June 2007. Two candidates submitted bids: Mobile TV Schweiz AG (with partners T-Systems Media & Broadcast GmbH and South Korea Telecom) and Swisscom Broadcast AG, a subsidiary of the incumbent telecommunications provider Swisscom.

The bids were evaluated on a beauty contest basis and the criteria used included coverage and rollout schedules, business and service plan, contribution to media diversity, compliance with license conditions, legal requirements and financial credibility. On the 28th September, it was announced that the winning bid was Swisscom Broadcast.

The license will be for ten years and Swisscom Broadcast will be required to comply with a number of license conditions:

- Network coverage: In its call for tender, the regulator stipulated that the network operator should provide at least 30 percent network coverage by the end of May 2008 (including Euro 2008 host cities Basel, Berne, Geneva and Zurich) and at least 50 percent by the end of 2012. However, Swisscom Broadcast proposed to provide 44 percent population coverage by the end of May 2008 and approximately 60 percent by the end of 2012
- Technical standards - although the call for tender did not specify that a specific technical standard should be used, the regulator favors DVB-H and Swisscom Broadcast proposed to adopt this standard
- Unlike many other countries, there are no “must-carry” obligations for broadcasters. However, Swisscom Broadcast is obliged to provide “all TV broadcasters and telecommunications providers with equal access to the platform under equitable and non-discriminatory conditions in accordance with article 51 of the Law on Radio and Television.”

With the Euro 2008 football tournament being held jointly by Austria and Switzerland in June 2008, the Swiss authorities have embarked on an ambitious plan to launch commercial DVB-H services prior to the tournament. Despite the political goodwill among market players, launching commercial DVB-H services in time for the Euro 2008 will be a challenge.

United Kingdom

Mobile TV services are available over 3G from four of the UK’s five mobile network operators, with channel package pricing ranging from £3 to £10 a month, although there has been limited reporting of the success of these services to date.

Broadcast mobile TV services were launched by BT Movio in October 2006, operating using DAB-IP technology in VHF Band III spectrum. However, the service has not managed to attract significant customer numbers or sufficient interest from the mobile operators, and it is due to close at the start of 2008. All of the four front-running technology contenders, DAB, DVB-H, MediaFLO and TDtv have been tested in trials in the UK.

Ofcom, the UK regulator, is currently pursuing a technology neutral approach to spectrum licensing, and hence no spectrum will be set aside specifically for mobile TV. Furthermore, the European Commission’s attempt to centralise mobile TV broadcasting standards around DVB-H conflicts with Ofcom’s position of technology neutrality, and currently any of the

principal technologies could be used in the UK. Spectrum allocation will be through auctions, with L-Band spectrum due to be auctioned in H1 2008 and UHF spectrum from the digital dividend now likely to be auctioned in early 2009. Before 2012, there are only limited options for a mobile TV network in the UK, with Channel 36 in the UHF band and the L-Band the main contenders, while TDD and VHF spectrum remain outside possibilities

The prospects for broadcast mobile TV in the UK remain uncertain, as none of the main players in the UK has yet committed to running a platform, and competition for spectrum from other technologies such as WiMAX means there is no guarantee that spectrum will be available. Evidence of consumer demand for paid services has yet to be demonstrated, with the BT Movio service failing to garner sufficient interest. However, Sky is having some success with its premium packaged content.

Most industry players believe that broadcast mobile TV services are likely to be launched in the UK in the next few years, with the most likely scenario seen as a single platform operator using a content aggregation model and offering wholesale services to mobile operators.

Non-European markets

South Korea

There are two competing mobile TV services in South Korea: a free-to-air T-DMB service operated by the broadcasters and a competing S-DMB pay-service operated and marketed by the main mobile operator SK Telecom. Although South Korea is often cited as a success story for mobile TV, none of the Korean broadcast services seem to be profitable and handset sales appear to be driven by applications other than broadcast services.

There are six T-DMB broadcasters in South Korea: three incumbent terrestrial broadcasters (KBS, MBC and SBS) and three new service providers (YTN DMB, U1 Media and KMMB). They offer a total of seven TV channels on six multiplexes. Each multiplex typically carries one video channel broadcasting at a data rate of between 512- 544 kbps per channel. The licenses have been granted for a whole multiplex and broadcasters are able to offer any mix of service – TV, radio or data services

There is strong competition between T-DMB and S-DMB in South Korea. After SK Telecom launched its S-DMB service via TU Media in May 2005, LG Telecom and KTF (the second and third largest mobile operators) started marketing T-DMB services with the help of broadcasters such as KBS and SBS.

A surprisingly large proportion of T-DMB devices – approximately 40 percent – are car navigation devices, equalling the number of T-DMB mobile phone devices sold. In contrast, the majority of S-DMB devices - around or 96 percent - are mobile TV phones with only a small proportion being car navigation devices.

In early 2007, devices permitting unidirectional services based on TPEG, Broadcast Web Sites (BWS) and Slide Show (SLD) became available and several broadcasters have started offering these services. Consumers are obliged to buy a TPEG device and pay a one-off fee

(approximately $100) to a broadcaster which provides them with a lifetime access to the services. Although the TPEG data signal is not encrypted, consumers must decide which service provider they prefer when they purchase a terminal, as for example, a KBS TPEG terminal cannot access MBC TPEG services and vice versa. TTI services via TPEG are widely regarded as a killer application in South Korea and are boosting the sales of T-DMB car navigation devices.

China

The Chinese market is very complex due mainly to the number of competing mobile TV standards, several of which are backed by different regulatory bodies. As a result, it is difficult to predict how the market will develop. However, the Chinese authorities are keen to showcase mobile TV technology to the world during the Olympic Games in 2008 and this could well be a major catalyst for mobile TV in the country.

There are a number of mobile TV standards, both domestic and international, being proposed for the Chinese market.

- CMMB – or China Mobile Multimedia Broadcasting is the new commercial name for the main national Chinese mobile TV standard. Also known by its technical acronym STiMi (Satellite and Terrestrial Interactive Multimedia Infrastructure), it was developed by the Academy of Broadcast Sciences and operates at VHF and UHF frequencies for terrestrial broadcasting and S-band for satellite broadcasting.
- DMB-TH – or Digital Multimedia Broadcasting Terrestrial/Handheld is a handheld version of DMB-T, which is one of the standards used in China's new fixed digital TV standard.
- T-MMB – or Terrestrial Mobile Multimedia Broadcasting is being developed by Nufrontsoft (a Beijing software company), the Communications University of China and Southeast University. This is based on the Eureka-147 DAB standard.
- T-DMB – is also allowed in conjunction with DAB for audio but only for FTA services. However, retailers are not yet allowed to sell T-DMB mobile phones.

CMMB has already been approved as a national standard but it remains to be seen which of the others will achieve the same status. At present, a key issue for the Chinese government is whether these standards will be available commercially in time for the 2008 Olympic Games. At IBC 2007, SARFT officials insisted that CMMB was on schedule and claimed that the first CMMB chipset had been developed by a Chinese company called Innofidei. SARFT expects to have pre-commercial mobile TV services based on CMMB in six Chinese cities by the end of 2007 and to launch two satellites in Spring 2008. CMMB based mobile TV services will be available in 60 cities before the Olympics according to SARFT.

United States

In the United States Qualcomm has developed a proprietary broadcasting standard,

MediaFLO[2] that operates exclusively in the 700 MHz frequency spectrum and the company has nationwide rights to use this frequency band. Qualcomm expects to spend $800 million to build out its entire nationwide network.

The company is expected to have less than half a million subscribers by the end of 2007 through its deal with Verizon. The service is known as VCast and offers 8 channels in 32 major markets in the US. Subscription rates range from $13 to $15 per month. Qualcomm is reaching out to other operators and secured a launch on AT&T's network, however, this has been postponed into early 2008.

In the US, the market is divided between MediaFLO and services like MobiTV, a TV service over existing mobile networks. Competition on exiting networks is also coming from a company called Alltel which launched its Mywaves service in July 2007, offering a wide variety of pre-recorded niche content charging about $4 per month. The company claims over one million subscribers.

The DVB-H venture Modeo, a subsidiary of network operator Crown Castle, was shut down in summer 2007. Modeo failed to find partners willing to back the project and distribute the service.

[2] Forward Link Only

European markets

Austria

Summary: Austria has decided to commit to the DVB-H standard and the regulator has initiated a call to tender for the network license. The key driver behind the launch of DVB-H services in Austria is the forthcoming Euro 2008 football tournament which will be jointly held by Austria and Switzerland in mid-2008.

Spectrum and regulation

According to the Geneva 2006 Plan, Austria will have a total of seven DVB-T coverages in UHF Bands IV and V. Two of these have already been licensed for digital TV services and services began in October 2006. A third multiplex (Mux-C) has been allocated for nationwide DVB-H services and a fourth (Mux-D) will be used for local or regional digital TV services.

The frequencies for the remaining three DVB-T coverages are still being used for analogue TV in Austria and neighboring countries and it is unlikely that these transmissions will be switched-off for a long time. Analogue switch-off is expected to be completed in Austria in 2010.

Austria will also have three 1.5 MHz coverages in VHF Band III plus one DVB-T block.

A new broadcasting law was passed on the 1st August 2007 by the Austrian parliament which defined the DVB-H licensing process. The law also amends a number of existing broadcasting laws. For example, the public broadcaster ORF is permitted to make a number of “made-for-mobile” channels.

On the 14th September 2007, the regulator RTR launched a call for tender for the DVB-H network provider license. Potential bidders include the dominant broadcast network operator ORS which is owned by the public broadcaster ORF, and mobile operators such as Mobilekom and One.

The call for tender will be evaluated according to a set of criteria, some of which are as follows:

- Coverage – fast roll-out and extensive population coverage will one of the key criteria evaluated by the regulator. The minimum network coverage should be 50 percent one year after the license is awarded. However, applicants will be expected to propose their own roll-out and coverage schedules and these proposals will be binding on the winning applicant
- Building networks in the four main cities (which are also the four Euro 2008 host cities in Austria) of Vienna, Innsbruck, Klagenfurt and Salzburg will fulfill the 50 percent network coverage requirement.

- The tender for the network operation will be decided by a beauty contest and there will be no restriction on bidders, i.e. a bidder could be an existing broadcast network operator such as ORS, or it could be a telecoms operator such as an MNO, or even another entity who would sub-contract the network operation and maintenance functions to an established network operator.
- A DVB-H network could be built by co-locating transmitters at the sites of MNOs although some sites from the national broadcast regulator ORS would probably also be required. ORS has provided transparent cost information for the use of their sites to all prospective bidders
- Content aggregation - the network license holder will not be allowed to select the content on the multiplex. This will be done by content aggregators, in effect the MNOs of which there are four in Austria. Each network license applicant will be required to include content packages created by the MNOs in the bid. A bidder could have content from all MNOs or only two or three MNOs. It is possible that two bids could have exactly the same content.
- The regulator will periodically monitor the channel line-up of the winning applicant and will have the power to force the content aggregator (via the network license holder) to change the content if required.
- The network license provider is obliged to offer the basic package to all MNOs whose own content is not on the multiplex. MVNOs will receive the DVB-H service via their respective MNOs and not directly via the network operator.
- Must-carry rules – The network operator will be obliged to carry the two existing channels from the public broadcaster ORF in its basic package plus two “made-for-mobile’ channels. However, there are no obligations on ORF to produce the latter two channels. In addition, the network provider must carry the ATV commercial channel in its basic package
- Value chain criteria – the regulator does not stipulate who should pay the transmission costs (i.e. content provider, network operator or MNOs), whether the content should be FTA or encrypted (or issue rules on encryption) or even whether the service should be free to the end customer or a pay service. It will be up to each applicant to decide on the exact value chain of the business and this will be evaluated by the regulator
- Non-connected devices – the regulator has stipulated that it wished to see proposals on how to introduce non-connected devices (i.e. non-mobile phones) into the market place

The original deadline for bids was the 16th November. However, following calls for this deadline to be extended, the regulator has set 14th December 2007 as the new date for

receiving applications.

Key players

The key players in the Austrian mobile TV market are the main broadcast network operator ORS and the four MNOs.

Technology and services

A mobile TV market study was carried out in early 2007 by the regulator RTR which showed that virtually all players supported the DVB-H standard.

Although Austria has broadcast DAB transmissions on a trial basis for many years, there is little interest in DAB from the public broadcaster ORF. As a result, there is no interest in using any mobile TV technology based on the Eureka-147 DAB standard, despite the availability of spectrum.

Outlook

With network licenses not likely to be granted until January 2008, the schedule for the launch for services is likely to be very tight and there will need to be a great deal of goodwill between the various market players to resolve copyright and other conflicts in time for the start of the Euro 2008 tournament.

Belgium

Summary: With television households highly dependent on cable for reception, Belgium has not needed to roll-out extensive DVB-T services prior to analogue switch-off. This has meant that frequencies are available for DVB-H services and such services could be launched in 2008.

Regulatory environment

Like the Netherlands, Belgium experienced an early development of cable television from the 1960s thanks to demand for channels from neighbouring countries. From the 1980s, cable provided the distribution system for domestic commercial television. As a result, Belgium has one of the highest cable penetration rates in the world and less than 3 percent of households rely exclusively on terrestrial transmissions to access TV.

Telecommunications regulations are overseen by the Institut belge des services postaux et des telecommunications. The IBSPT is responsible for frequency management and represents the national government at the international level. However, licensing and broadcasting regulation is overseen by the three linguistic communities of Flemish, French and German speakers, each of which has its own broadcasting regulator, respectively the Vlaamse Regulator voor de Media, the Conseil supérieur de l'audiovisuel and the Medienrates der Deutschsprachigen Gemeinschaft Belgiens.

The two main communities of Flemish and French speakers operate overlapping frequencies in the bilingual Brussels area. The two public broadcasters VRT and RTBF are the only analogue terrestrial television operators in the country (private channels are exclusively on multichannel platforms) and they have been transmitting one DVB-T multiplex each since, respectively, 2003 and 2002.

In 2007, both main communities have setup switch-off deadlines. The analogue transmissions overseen by the Flemish-speaking community will stop at the end of 2008. The French-speaking community will switch-off analogue broadcasts in November 2011, at the same time as neighbouring France. The fact that RTBF has a sizeable over-the-air analogue audience in France was a key factor in determining how the process would move forward. The French community has also ruled that the post-switch-off broadcasting standard will be MPEG-4.

The French-speaking community published its strategic plan for digital transition (PSTN) in July 2007. Currently the Community has available seven channels for TV broadcasting in the Bands IV and V. One is used for DTT, five for analogue transmissions and one is free. After switch-off all seven multiplexes (one SFN and six MFNs) will be devoted to television broadcast, but the amount of bandwidth eventually devoted to DVB-H has not been decided yet.

Meanwhile the channel currently free is to host a DVB-H multiplex from 2008, half of which

has been licensed to RTBF by the government and half is to be licensed to other providers through a call for tender. The licences will last nine years. In Band III the Community will have three T-DAB multiplexes, yet to be licensed.

Existing regulation states that the DVB-H call for tender should be aimed at network operators and, following a public consultation, the Community government wants to change the rule in order to licence channels instead. The changes should be made by a decree prior to the tender. The decree should also set the terms for the contractual relationship between RTBF and other multiplex licensees.

In the Flanders, a two-year DVB-H trial started in 2006 after which a commercial DVB-H multiplex could be licensed.

Key players and platforms

Major broadcasters

	Ownership	Main FTA channels	Pay-TV
RTBF	Public	La Une, La Deux	-
VRT	Public	Eén, Canvas, Ketnet	-
SBS Broadcasting	Pro Sieben Sat.1	VT4, Vijftv	-
RTL Group	Bertelsmann	RTL Tvi	-
AB Groupe	TF1 34%, Management 66%	AB3, AB4	-
Vlaamse Media Maatschappij	De Persgroep, Roulata	VTM, Canaal Twee	-
Be.TV	Applications Câble Multimedia 68%, SOCOFE SA 17%, Deficom 15%	-	Premium and basic packages on cable
Telnet	Liberty Global	-	Premium and basic packages on cable
Belgacom	Belgacom	-	Domestic football and others on DSL TV

Mobile telephony operators

	Ownership	Networks
Proximus	Belgacom	GSM, 3G
Mobistar	France Télécom 50.2%	GSM, 3G
Base	KPN	GSM, 3G

The dominant broadcasting organisations in Belgium are still the two public service corporations of VRT broadcasting in Flemish and RTBF in French. Each controls its own transmission network, has created its own DTT bouquet, and is in charge of DVB-H deployment.

VRT has taken an active role in developing mobile TV content, notably with re-purposed news bulletins and a fiction series edited for short episodes (or 'mobisodes') to be viewed on mobile. VRT is in a DVB-H trial partnership with the incumbent telecom operator Belgacom and its Proximus mobile division, the cable operator Telenet, Siemens, Scientific Atlanta and academic research centres. The two-year trial started in 2006. RTBF has announced in 2007

that it plans to start a pilot DVB-H bouquet of up to eight channels in the Brussels region, also in partnership with Proximus. Proximus launched a free 3G mobile TV service for its subscribers in 2005 and started charging in early 2007.

Denmark

Summary: The focus in Denmark is on the launch of digital terrestrial TV at present and it is likely that Denmark will adopt a "wait-and-see" position before committing to deploy any mobile TV broadcast networks.

Spectrum and regulation

The Geneva 2006 Agreement provides Denmark with a total of seven DVB-T coverages in UHF Bands IV and V. One is already used for DTT services which were launched in 2006.

In June 2007, the government provided some indications on how the spectrum in UHF Bands IV and V will be allocated:

- The existing DTT operator will be granted a second DVB-T multiplex which may be used for DVB-H services if desired.
- Four of the remaining DVB-T multiplexes will be auctioned to a "gatekeeper" whilst the seventh will be reserved for "innovation and research" purposes. The gatekeeper is expected to be appointed in March 2008. The four multiplexes will become available after ASO on 31st October 2009. One of these four multiplexes could be used for DVB-H.

It is feasible to provide nationwide DVB-H coverage but the government has announced that there will not be an universal coverage mandate as with DVB-T. The commercial DVB-H gatekeeper will be obliged to reserve 15 percent of the capacity to the public broadcaster Danmarks Radio. No official decision has been taken on how and when the spectrum will be allocated.

Denmark was granted a new multiplex in VHF Band III in the Ge-06 Agreement. However, it is likely that it will be used for digital radio (to allow regional broadcasters to transition to digital) rather than mobile TV via DAB. There is also one DVB-T block which could be used for DAB radio or mobile TV. At present, this is designated as an "innovation and research" multiplex and will probably not be allocated for several years. It could also be used for mobile telecom applications.

The Danish government has plans to auction L-band frequencies on a technology neutral basis and so these frequencies could be used for mobile TV.

L-band is unlikely to be used for DVB-H due to the interferences issues associated with concatenating three 1.712 MHz DAB channels into a single contiguous 5 MHz DVB-H channel. However, it is not clear whether there is any interest in using this spectrum for T-DMB either. No decisions have been made on the date of the auction or the license conditions.

Technology and services

The public radio and TV broadcaster, Danmarks Radio, has made a small T-DMB pilot test using its DAB network in order to verify that the technology would work on its network. However, there are no plans to launch commercial services, mainly due to the lack of VHF spectrum.

There are plans to launch a pilot DVB-H service in Denmark with participation from the Technical University of Denmark, Danmarks Radio and the telecom operators, with vendor support from Nokia and Motorola.

No decision has been made by Danmarks Radio about participating in any commercial mobile TV ventures, and the current financial crisis at Danmarks Radio means that the company will be unlikely to be a dominant investor or partner in any mobile TV network. However, as it is the dominant broadcaster in Denmark, it will inevitably be a major content provider.

Outlook

There is interest in mobile TV in Denmark although the various players are very cautious about committing resources to develop such services.

At the present time, it is not clear how mobile TV will develop in Denmark. The lack of VHF Band III spectrum by Danmarks Radio means that it is unlikely that the company will be able to offer FTA mobile TV via T-DMB alongside its digital radio content in the short to medium term.

Although there is interest in DVB-H in Denmark, the commercial TV sector is small and hence there is no obvious big player that may have the resources to invest in a DVB-H service. In any case, the frequencies are unlikely to become available until 2009.

It is likely that Denmark will adopt the cautious approach of its Scandinavian neighbors and wait to see how the mobile TV market develops in other European countries and how issues such as DVB-H spectrum harmonization and the future use of UHF band for mobile applications are resolved.

Finland

Summary: Despite launching pre-commercial DVB-H services with free-to-air services in December 2006. This service has been hampered by a lack of appealing content.

Spectrum and regulation

There are four DTT multiplexes in Finland, all operated by Digita. The first three multiplexes are operated under a single license and the fourth under a separate license.

Digita is the only company in Finland able to provide nationwide coverage and was originally owned by the public broadcaster YLE. It now owned by the French-based broadcast service operator TDF.

In March 2006, Digita was awarded a license for the operation of DVB-H network by the Finnish government. Other bidders for the license included Elisa Corp., TeliaSonera Finland Plc and Telemast Nordic Oy.

Finland also has additional spectrum to permit a further 4 networks to be built (two in UHF Bands IV/V and two in VHF Band III) although it is not known what applications will use these frequencies. Possibilities could include HDTV, pay-DVB-T, DVB-H or non-broadcast services.

The DVB-H platform has been operating as a pre-commercial service since December 2006 with limited free-to-air content available. While Digita is responsible for the network operation, it is not responsible for the content aggregation. A separate license for the content aggregation does not exist in Finland, and it is not yet clear who will take on this role. However, several pay-TV operators, including PlusTV and Canal Digital, have expressed an interest in serving as the content aggregator for the DVB-H platform.

The network provides around 25 percent population coverage in the three main cities of Helsinki, Oulu and Turku. Regulatory requirements call for overage to be increased to 40 percent by the end of 2007. However, there are no further coverage requirements beyond this.

All existing DTT broadcasters have an automatic right to be on the DVB-H platform. All other content providers (for example, mobile operators) need a license. Licenses are granted by the Finnish Communications Regulatory Authority (FICORA) which operates a very “light-touch” regulatory environment. Once a license has been granted, the content providers negotiate terms with the platform operator Digita. However, Digita must offer equal, fair and open terms to all content providers.

Technology and services

The network has been designed to provide indoor signal penetration and 20 transmitters are required to cover Helsinki (compared to 2 transmitters for DVB-T). It is expected that repeaters will be installed in subways and tunnels in Helsinki in 2008.

Although the network can carry up to 22-33 channels (depending on audio-visual quality), there are only five channels on the network at present. These are:

- Voice-tv from SBS Finland Oy (available since December 2006)
- MTV3 MTV Media (available since May 2007)
- Channel 4 from Nelonen (available since May 2007)
- Elisa-tv – a made-for-mobile content provided by mobile operator Elisa which includes occasional one-off broadcasts of selected sporting events. This is a trial rather than a commercial service.
- Voice radio (a visual radio channel)

All services are free-to-air at present and can be received on two devices: the Nokia N77 and the Nokia N92. The cost of the N77 starts around €470 or is available for a monthly subscription rate of €22 per month from TeliaSonera. The Nokia N92 costs around €600.

Despite being on-air for almost twelve months, very little business progress has been made. This is unlikely to change until a number of key issues are resolved.

- Lack of content - there are a total of 25 TV channels on Finland's four DTT networks but only two or three of these are available on the DVB-H platform. In particular, there are no programmes from the public broadcaster YLE and at present no indications of when any of the broadcaster's five channels will be available on the network.

  The main reason behind the lack of content is the failure to resolve copyright issues. It has become apparent that broadcasters will be required to pay extra copyright payments to the copyright authorities in order to be allowed to simulcast DTT content on another platform such as DVB-H. Broadcasters such as YLE are negotiating terms with the rights owners but this is a very slow process, particularly as YLE does not believe that it should pay any extra copyright charges. This is a major issue for YLE as it is financed solely by a license fee and therefore may be obliged to fund extra copyright payments from its existing budget.

  This is a major issue for YLE as it is financed solely by a license fee and therefore may be obliged to fund extra copyright payments from its existing budget. YLE recently completed an expensive switch to all-digital broadcasting and its resources are clearly limited, particularly if it needs to allocate funds to cover extra copyright costs.

  However, the government has called on YLE to make its services available on the DVB-H platform as soon as is possible.

- Lack of a clear business model – broadcasters have not been given sufficient

incentive to make their services available on the DVB-H platform and it is unclear if content from public service broadcasters should be made available free-to-air or encrypted. However, recent progress has been made towards finding a suitable business model based on the offer of pay services to viewers. These services can be distributed by a pay-operator who will serve as a content aggregator, sourcing content directly from broadcasters and other content producers, and will also purchase distribution capacity from the DVB-H network operator Digita.

- Clarity on the role of content aggregator - With hindsight, it may have been more prudent for regulators to issue two separate DVB-H licenses - one for the operation of the DVB-H network and one for the aggregation of content. While the DVB-H network operation license has been allocated to Digita, it is not yet clear who will take on the role of content aggregator. For the service to succeed, it will be necessary for a major media company experienced in marketing TV services to consumers to take on this role.

Because the above issues have hindered the full development of DVB-H services, manufacturers have had limited incentive to launch DVB-H devices in the market. This has thus limited the choice and availability of DVB-H handsets and delayed an eventual drop in handset prices. There is also no marketing by mobile operators who cannot market DVB-H subscription services without sufficient content available.

Outlook

A salient lesson to be learnt from Finland is that content rights is a major issue that needs to be addressed by DVB-H service providers. It is currently the biggest hurdle in Finland and impeding a full commercial launch of services.

The lack of a clear business model has also hurt the roll-out of DVB-H services as broadcasters have not been given sufficient incentive to make their services available on the platform. Yet, DVB-H in Finland will not progress until YLE's channels are on the platform.

The lack of content means that manufacturers are unwilling to offer DVB-H devices and mobile operators cannot market the service without content and devices. However, Digita has a 20-year license and time to develop a suitable business plan.

However, recent progress has been made towards finding a suitable business model based on the offer of pay services to viewers. These services can be distributed by a pay-operator who will serve as a content aggregator, sourcing content directly from broadcasters and other content producers, and will also purchase distribution capacity from the DVB-H network operator Digita.

France

Summary:

- *France has set aside a full national multiplex for DVB-H with 16 television channels and radio services with up to 70 percent potential coverage prior to the November 2011 analogue switch-off*
- *Regulator CSA has launched a call for tender with a deadline of 15th January 2008 to award DVB-H licences to 13 television channels. The bids selected will be disclosed by April and licences awarded in May. It is expected that all the major commercial broadcasters will bid and simulcast licences will be won by TF1, M6, Canal+, Lagardère, NRJ and BFM. Radio licences will be awarded in a second stage for a total bandwidth of 350Kbit/sec*
- *Bidders are required to provide details on their plans for distribution, including the commercial model (pay-TV or advertising), and also whether broadcasts are free-to-air or encrypted. These details will feature in the terms of their licence. Upon request, the CSA can change these licence terms*
- *The Government has pre-empted three feeds for public broadcasters but has yet to decide their attribution – it is expected one each for France 2 and France 3, with the third feed split between France 5 and Arte*
- *After the award of the licences, the licensees have two months to submit to the CSA an agreement to manage the multiplex, share transmission costs and award transmission contracts. Mobile operators could become shareholders in the multiplex company. If no agreement is reached by the licensees in the two-month window, licences will be invalidated*
- *No agreement has been reached by channels and mobile operators on a business model. Large FTA broadcasters are ready to have their channels encrypted and distributed by mobile operators, but smaller ones want to be fully FTA. Canal+ wants to distribute directly to consumers*
- *Mobile operators want the full bouquet to be encrypted and exclusively distributed by them – they need exclusive distribution to justify subsidising DVB-H handsets and the costs of transmission*
- *France's largest mobile operator, France Télécom's Orange, has not clarified whether it will participate in a joint DVB-H platform, and has raised the prospect of supporting the development of handsets receiving the DVB-T bouquet – although this could imply a significant investment in boosting DVB-T technical reach as current indoor reception is quite limited*
- *There is a risk of the regulatory process collapsing without agreement, but the*

Government's strong support for mobile TV roll-out will help ensure a compromise is found. A slow deployment can be expected (CSA mandates 30% population 'outdoor' coverage within three years), as mobile operators will wait to face actual bandwidth constraints on the 3G networks which carry their existing mobile TV services

Regulatory environment

Overview

France is expected to see the launch of a DVB-H multiplex with 16 television channels covering about 15 percent of the population by the end of 2008. But there is considerable uncertainty over the business model of the platform, and if the main players fail to agree on this model, the project would be postponed. However the French government has taken a proactive view of mobile TV deployment, and, if needed, could put pressure on the main players to reach an agreement.

Television licensing in France is under the authority of the *Conseil Supérieur de l'Audiovisuel* (CSA). The CSA has a duty to licence operators for the bandwidth released for TV and radio broadcasting usage by the government. All major television broadcasters, the three mobile operators and the main transmission companies created a Forum TV Mobile in 2004 under the auspices of the Ministry for Industry.

In France, television is exclusively broadcast in the UHF Bands IV and V in Channels 21 to 65 with up to 15 simultaneous feeds available in any one location. Current usage is as follows:

- The six national analogue channels offer 90-99 percent population coverage
- 24 local TV stations broadcasting in analogue – only one per area
- The five DVB-T MFN multiplexes launched in March 2005 will have population coverage of 85 percent at end-2007, due to rise to 89 percent in 2008
- One DVB-T multiplex, dedicated to HDTV, with channels expected to start transmission in 2008. The CSA is in the process of licensing two channels for the multiplex (TF1 and M6) and will licence a further channel in the coming months. The government has pre-empted one channel for public service television France 2. A further multiplex offering HD services, with limited coverage is also expected to be launched.
- One multiplex dedicated to DVB-H, whose bandwidth is expected to be licensed by summer 2008, with potential population coverage of below 70 percent. The MFN multiplex uses channels between 21 and 55 and is to be deployed in 73 cities
- A further DVB-T multiplex, however of limited coverage (exact figure not available), used for local digital television, notably in Paris

The UHF Band III and the L Band are due to be used for digital radio in the T-DMB standard – usage of these frequencies for television services is ruled out. The CSA is consulting with

industry and calls for tender could be issued in 2008.

Mobile TV licensing

The regulatory framework specific to mobile broadcast TV was established by the 5th March 2007 Law n° 309 on 'the television of the future' (sic), modifying the 1986 Broadcasting Law (n° 1067). The Law established that 'mobile personal television' (*télévision mobile personnelle (TMP)*) is a 'service category', like DVB-T or HDTV on DTT, for which the CSA can make specific calls for tender. The law stipulates that the mobile TV platform must include radio and 'interactive' services.

For public television the government is free to pre-empt bandwidth. It did so in November 2007, for three feeds. It has not been announced which existing channels will be allocated the bandwidth.

The CSA is free to decide on bandwidth allocation per channel and thus the total number of services. However, it had to set aside an unspecified share of the bandwidth for radio and data services (see below). In November 2007, the CSA issued a call for tender setting the terms for 13 DVB-H licences – taking the bouquet's total to 16 TV channels including the three feeds reserved for public channels. The deadline for lodging bids is 15th January 2008.

For candidates who request to simulcast their DVB-T service on the DVB-H platform or with a difference of less than 33 percent, the CSA will issue a mobile TV licence that is considered to be an 'extension' of their DVB-T licence.

In accordance with the law amended in 2007, the CSA will select the bids based on the following criteria:

- Programming most suited to mobile TV, notably news
- Commitments on production and broadcast of fiction, animation and documentary programmes ('oeuvres audiovisuelles' in the French legal sense) as well as, surprisingly, films. Candidates will have to meet the elaborate domestic production obligations and programming quota system and the CSA will pay attention to any commitment going beyond the legal requirements
- Candidates must commit to reach a minimum outdoor coverage of 30 percent of the population three years after launch and 60 percent after six years, as well as make specific commitments for indoor coverage
- Distribution plans, including with respect to conditional access, plans for bouquets and retail distribution
- Capacity to meet a wide public demand and support the growth in demand for mobile TV
- "Pluralism", and specifically, no single operator will be allowed to own more than three mobile TV licences

The CSA will issue a list of selected candidates, possibly in May 2008. Then a specific licence (*cahier des charges*) will be drafted and signed by each candidate selected, after which the licence would be issued, most likely in June 2008.

After that step, the most difficult and critical part of the licensing process will start. Licensees will have two months to come to an agreement – which will of necessity be based on consensus - on the creation of a company to operate the multiplex and on the commercial aspects of transmission, including the sharing of costs and the process to award transmission contracts[3]. Mobile operators who make a significant financial contribution to channels' transmission costs can be offered an equity stake in the multiplex company. Within the multiplex company, decisions on coverage extension are to be taken by majority vote, with votes weighted by the pro rata contribution to transmission costs. Once agreed, the multiplex arrangement must be cleared by the CSA. After two months, in the absence of an agreement, all the licences will be invalidated. The same process was followed for DVB-T, but the much smaller number of operators per multiplex and the clarity of the business model – broadcasters pay for transmission – ensured a successful outcome.

At the last stage of the licensing process, distributors of pay bouquets of DVB-H channels are required to declare themselves to the CSA. Distributors are required to carry FTA channels that request carriage, under reasonable and non-discriminatory terms. FTA channels can refuse to be distributed only if the bouquet is not suitable to their public service mission, their editorial positioning or if the distributor wants to carry only parts of the channel broadcasts. These rules regard only FTA channels with a DVB-T licence; if there were to be DVB-H licences issued to FTA channels without DVB-T distribution (and this is unlikely), they would not benefit from the rules.

Analogue switch-off and digital dividend

Law n° 309 set 30th November 2011 as the national analogue switch-off date. The law also allowed for immediate switch-off of local transmitters in instances where it was necessary for the deployment of the national DVB-T platform in specific regions; this provision has been used only once so far. The law states that analogue switch-off can start as early as March 2008. The prime minister is to produce a national switch-off plan in the first half of 2008, under which the CSA will decide, at least nine months in advance, the schedule for each transmitter and each television channel. In preparing the post switch-off frequency plan, the CSA has to take into account results from the 2006 Regional Radiocommunications Conference.

In the Geneva 2006 Agreement, France was awarded eight national, full coverage multiplexes (with over 95 percent of the population under technical reach) in the UHF Bands IV and V between channels 21 and 65 (with a few local exceptions where transmitters will use higher channels). The VHF Band III is available for one DVB-T and five T-DAB

[3] DVB-T contracts are awarded for each transmission site, but for DVB-H TDF believes they would have to be closed on a regional basis to accommodate the denser nature of such a network

multiplexes. The DVB-T multiplex is configured to permit its transformation in four T-DAB multiplexes in the future.

In the RRC negotiations, France was attentive to securing frequencies especially suitable to mobile TV broadcast (like DVB-H). All zones will thus be covered by at least two channels using frequencies below 750MHz (minimizing the risk of interference with mobile telephony in the GSM 900 MHz band) and 97 percent of the population by three channels.

One option would be to re-structure the DVB-H multiplex after switch-off in order to concentrate its frequencies in a sub-band of UHF in order to either increase coverage (notably indoor) and/or reduce handsets' energy consumption.

The usage of frequencies freed by the switch-off has yet to be assigned. According to Law n° 309, the prime minister will decide their allocation to government ministries (including the military), telecom regulator Arcep or broadcast regulator CSA. The law stipulates that the majority of the released frequencies must remain dedicated to audiovisual services. The Prime-Minister is to consult a Parliamentary Commission on the digital dividend.There is an ongoing political battle between the audiovisual industry and the CSA, on one side, and the telecoms industry and Arcep on the other side, because the former wants the digital dividend to be used for broadcasting, while the latter is seeking a competitive tender for at least a portion of the freed frequencies.

The law established a non-profit body (Groupement d'intérêt public), France Télé numérique (FTN), in charge of overseeing the national digital switch-over process, including publicity and public information. FTN will also manage a government fund to subsidise the purchase of DTV reception equipment low-income households and the elderly.

Technical specifications

On 24th September 2007, the Government issued a 'technical' decree mandating DVB-H for terrestrial mobile TV broadcasting in the UHF Bands IV and V, and DVB-SH for hybrid satellite and terrestrial broadcasting in the S Band. The Government's ruling is based on the fact that DVB-H is an open standard chosen by the European Commission. The same decree mandated simulcrypt for conditional access and the MPEG-4 compression standard – the latter is already mandatory for encrypted and HDTV broadcasts on the DVB-T platform.

In its November 2007 call for DVB-H tender, the CSA has chosen the QPSK 2/3 mode because of its higher coverage potential and the fact that the resulting total bandwidth is 7.37Mbit/sec. This choice is in line with the recommendations from the Forum Mobile as well as network operator TDF.

The average bandwidth per video channel (including its audio and data feeds) will be 360Kbit/sec, before gains of about 20 percent from statistical multiplexing. On the hypothesis of up to six commercial distributors of the package, each having its own encryption system, the CSA is to devolve 150Kbit/sec for Entitlement Control Messages (ECMs) and Entitlement Management Messages (EMMs). A further 550Mbit/sec is set aside for two electronic service

guides, under the assumption of the coexistence of two conditional access profiles, one based on OMA/Bcast (for usage in mobile phones with SIM cards) and one on IPDC-OSF or a similar technology to permit the distribution of the service to terminals without a return path (an option favoured by pay-TV operator Canal+). About 350Kbit/sec, as much as is allocated for a TV service, will be devoted to the radio bouquet. The CSA has not decided how much capacity will be used for each radio service, but will do so and proceed with licensing the bandwidth only after the separate award of Band III and L Band digital radio licences. Finally, 120Kbit/sec of bandwidth is set aside for data services and will be awarded at a later stage, possibly to commercial distributors of the bouquet looking for a differentiation of their service.

Strategy of key players

Broadcasters

Major broadcasters

	Ownership	Free TV on DVB-T platform	Pay TV
France Télévisions	Public	France 2, France 3, France 4, France 5	-
Arte	Public	Arte	-
Groupe TF1	Bouygues 43%	TF1, TMC, NT1 (34%)	*Main channels*: Eurosport, LCI, TF6 (50%)
Groupe M6	RTL Group 49%	M6, W9	*Main channels*: Paris Première, TF6 (50%)
Canal+ Group	Vivendi	i-Télé	Canal+ and CanalSat bouquets on satellite, DVB-T and DSL

France Télévisions

FTV is the main public television company in France, operating three national FTA channels with analogue and digital distribution - France 2, France 3 and France 5, plus France 4 (on digital platforms) and France Ô (only on cable, satellite and DSL). The group is financed by both the TV licence fee and advertising airtime sales. The Franco-German cultural channel Arte, with its own analogue and DVB-T network, is a separate company. France Télévisions Interactive (FTVI) is the FTV division in charge of internet and new media development.

Development at FTV is curtailed by its slow revenue growth, notably because of refusal by the government to raise the licence fee rate, declining audiences that are eroding advertising sales, and stricter limitations on advertising airtime than on private channels. This has led FTV to pursue a new media strategy on a commercial basis. For instance, FTV and Orange concluded in July 2007 an exclusive content agreement under which FTV will supply all its programmes[4] for a catch-up TV service due to launch on DSL TV in January 2008. The agreement also covers mobile television, but the launch date has yet to be announced. It seems the main reason behind FTV's acceptance of the deal was that Orange offered to pay royalties for the service – in sharp contrast with similar services from Channel 4 or the BBC

[4] The news programmes are non-exclusive and available to other distributors on the rationale that they, alone, constitute public service content. Neuf Cegetel, Iliad and the Afors association of ISPs have denounced the agreement as anti-competitive and contrary to FTV's public service remit and made a complaint to the Conseil de la Concurrence in October. A government intervention to break the exclusivity clause is also reportedly considered.

in the UK which are supplied free to distributors.

This revenue-seeking approach underlies FTV's view of mobile TV. The group has no major objection to encryption basically because it wants mobile transmissions to be financed by operators. FTV sees little alternative to subscription as the main revenue source for supporting mobile TV transmission because advertising would never be sufficient. However, if its channels are to be included in encrypted bouquets, FTV will ask for a licence fee, perhaps optimistically, "to share the value created" by the platform. Currently, FTV supplies channels to 3G TV platforms operated by Orange and SFR and to the CanalSat Mobile bouquet. FTV is sceptical about Canal+ ambitions to become a distributor of mobile TV. FTV believes it would create an extra, unnecessary layer, and that the mobile operators are the most obvious candidates to distribute the bouquets.

Mostly for administrative and regulatory reasons, FTV prefers to proceed with distribution of existing channels rather than creating dedicated mobile services. However it may re-purpose channels for mobile.

Regarding mobile TV rights in programming contracts, the FTV position is that it considers all existing contracts as including mobile TV unless they specifically exclude it – a position also taken by all other major broadcasters. Exceptions include the French Open tennis tournament for which Orange has a separate 3G TV licence.

Earlier in 2007, FTV has said it would like the government to pre-empt four DVB-H channels for its own use, but in November the government requested three channels. It remains to be seen if all three will go to FTV or whether one will be attributed to Arte.

TF1

The leading commercial broadcaster in France, Groupe TF1 owns the eponymous channel and majority control in TMC, the most viewed digital channel, available FTA on all platforms. It also controls some of the largest themed channels, including Eurosport, LCI (news) and TV Breizh (entertainment). It also owns a 34 percent stake in AB Groupe, which controls popular channels RTL 9 and NT1. TF1 also owns 9.9 percent of Canal+ France. Groupe TF1's main shareholder is the Bouygues group with 42.9 percent of equity, owner of the third largest mobile operation in France.

In its contribution to the CSA 2007 consultation on mobile television, TF1 argued for distribution of popular programmes, especially news and sports, rather than content made for mobile TV. TF1 favours a bouquet including a mixture of existing general interest channels, such as TF1 itself, and re-formatted themed services such as the mobile version of LCI.

Regarding the business model for simulcasting existing FTA channels on mobile TV, TF1 believes that the regulator should issue flexible licences allowing changes over time, for instance from encrypted to FTA. TF1 reckoned that it does not expect mobile distribution to generate an increase in advertising revenue. TF1 has not indicated what model it favours for

its own flagship channel. However, historically TF1 has often encrypted its FTA service to support the take up of selected platforms, notably with TPS on digital satellite and currently for the HD version of TF1 on CanalSat. Also, it is expected that TF1 would ultimately align its model with the plans of Bouygues which supports a fully encrypted platform.

In its contribution to the CSA consultation TF1 said it would expect penetration of 8-10 percent of mobile subscribers for pay mobile TV five years after launch. It argues in favour of 30 percent coverage for the DVB-H multiplex after three years (i.e. at the time of analogue switch-off).

M6

M6 is the number two commercial television company in France, and is 49 percent-owned by the Luxembourg-based RTL Group. Besides its flagship channel M6, the company owns W9, one of the most viewed digital channels. It also controls pay channels Paris Première and Téva and a 50 percent stake (alongside TF1) in TF6 and Série Club. M6 owns a 5.1 percent stake in Canal+ France.

Since the 1990s, M6 has taken a proactive view of diversification. Advertising on the M6 channel now generates less than half of group turnover. Other activities include home shopping, internet retail sites and the M6 Mobile retail brand, in a joint-venture with Orange.

M6 believes that mobile television has a large development potential in France. It supports a mixed model of dual bouquets featuring a pay and a free component, including the existing top FTA channels.

Canal+

The Canal+ Group is the leading pay television company in France and the sole premium TV operator through the Canal+ bouquet. The latter has analogue and digital terrestrial distribution. The group also owns CanalSat, a themed channel bouquet. Canal+ Group's domestic operating arm is Canal+ France, 65 percent-owned by the Vivendi conglomerate.

The main divergence between Canal+ and other major would-be mobile TV players about DVB-H regards distribution. Canal+ says it wants to extend to mobile TV the direct billing relationships it enjoys on other platforms. The group believes in a model where a pay-bouquet is distributed by a third party, such as CanalSat, and accessible through a range of devices, including cell phones and stand-alone pocket TV sets. This seems to be at odds with a model where the mobile operator subsidises handsets in return for a longer term contract for a bundle of services including television.

Currently, Canal+ distributes two bouquets of mobile TV channels and on-demand content, Canal+ Mobile and CanalSat Mobile, over the SFR and Bouygues 3G networks. The line up of channels and programmes is tailored for each of the two operators.

In 2005-06, Canal+ ran a DVB-H trial in Paris in partnership with mobile operator SFR (also controled by Vivendi), the transmission company Towercast and Nokia. The pilot platform lasted nine months with 500 users drawn from the SFR and Canal+ subscriber bases who

were supplied with Nokia handsets and had access to a 17-channel bouquet. According to Nokia usage monitoring, average viewing was 20 minutes per day, in the evening (20.00-22.00), with smaller peaks in the morning (9.00-10.00) and at lunch (13.00-14.00). According to a survey of users, 50 percent said they watched the service mostly at home, 14 percent in public transports (though broadcasts were not accessible in the Métro) and 12 percent at work; 73 percent were satisfied and 68 percent would be ready to subscribe to a similar bouquet at €7 per month.

DTT new entrants

The Bolloré conglomerate, and the radio groups NRJ and NextradioTV, entered the television market by obtaining FTA licences for the DVB-T platform, on which they launched channels in 2005, respectively Direct 8, NRJ 12 and BMF. Lagardère, a long-time operator of themed channels, owns two FTA DTT services. All four companies are on record as planning to bid for DVB-H licences to simulcast their existing DVB-T channels.

Bolloré, NRJ and NextRadio would like their DVB-H channels to be FTA and unencrypted. NextradioTV, which has taken the most pro-active position in favour of unencrypted broadcasts, plans to simulcast in DVB-H its existing BFM channel and would pay fully for transmission costs.

Transmission company - TDF

After the November 2007 announcement of its acquisition of Germany's Media & Broadcast from Deutsche Telekom, TDF is by far the largest broadcast transmission company in Europe. Formerly called Télédiffusion de France, TDF used to be a subsidiary of France Télécom. It is now owned by private equity funds - Texas Pacific Group (42%), Axa Private Equity (18%), Charterhouse Capital Partners (14%) – and also state-owned Caisse des Dépôts et Consignations (24%).

In France, TDF was designated as a dominant operator by regulator Arcep in 2006. TDF owns all analogue TV transmission sites, and also the vast majority of the DVB-T sites.[5] Its DVB-T market share is estimated at 70 percent and that for analogue transmissions is close to 100 percent. TDF already operates a DVB-H multiplex in Finland, through its Digita subsidiary, and in Germany Media & Broadcast has the national licence for DVB-H transmission with a multiplex expected to launch in 2008. In France, TDF has been one of the most active proponents of mobile television deployment in the past few years.

If an agreement with the DVB-H channel licence holders and mobile operators is reached before summer 2008, TDF believes it can deliver an indoor technical reach of ten million individuals (16 percent population coverage) by the end of the year. In 2007, TDF started to identify sites where it would implement gap fillers. The ideal sites must be at a higher level from the ground than mobile cellular relays to minimise the cost of the network.

[5] Under Arcep regulation TDF ha to make a wholesale offer for access to its broadcast site to its competitors. The latter use mostly these sites to transmit as establishing new sites implies re-tuning aerials.

As a result of its unique position in the French market, TDF is the main source of estimates on the cost of DVB-H deployment. The following estimates were supplied in October 2007.

TDF estimates for transmission costs

Outdoor coverage	Indoor coverage*	Cost/channel/year
30% of population	Good	€4m
	Deep	€6m
50% of population	Good	€6m
	Deep	€8m
*Good indoor is reception at up to six meters from the window and includes the ground flour. Deep indoor is reception in all rooms, including those without a window and the ground floor.		

TDF expects good reception even in vehicles travelling at up to speeds of 120km/h, but more 'problematic' at higher speeds such as French TGV trains. TDF sees coverage of the main motorways as a low priority since viewing by the driver is excluded and usage would be primarily for family travel during holiday periods.

In its pitch for DVB-H, TDF supports the view of a fully encrypted bouquet distributed by mobile operators. With a price at or below €5 per month, penetration would reach one fourth of all 3G subscribers within ten years.

Mobile operators

Mobile operators

	Ownership	Networks
France Télécom/Orange	State 27%	GSM, UMTS
SFR	Vivendi 56% Vodafone 44%	GSM, UMTS
Bouygues Télécom	Bouygues 90%	GSM, UMTS

France Télécom/Orange

France Télécom is the incumbent fixed line telephony operator in France, and 27 percent of FT is still publicly owned. It uses the Orange brand for its mobile, IPTV and broadband services. The Orange mobile subscriber base, with 22.5 million subscribers in September 2007, is the largest in the country. It launched a TV DSL service in 2004 that is expected to have close to one million subscribers by end-2007. Orange has a strong commitment to television services on DSL and on mobile, but it remains uncommitted to DVB-H.

In 2005 FT created a 'Content' division with the aim of acquiring licences for programmes, films, music and games. As part of its remit, the division purchased rights for both DSL TV and mobile TV distribution. For instance, FT owns the exclusive mobile TV rights for the football Ligue 1, the French Open tennis championship and the Tour de France cycling race. Also, in July 2007, FT signed an agreement with FTV for exclusive distribution of a 'catch-up' TV service on both DSL TV and mobile TV. The service is due to launch in January 2008 and FT is to pay royalties to FTV for the material. In September 2007, FT launched Orange Sports TV, a sports channel exclusively available to its subscribers via DSL or 3G. There has been speculation in the French press that FT could bid for a DVB-H licence for Orange

Sports TV.

The Orange mobile TV platform over 3G is branded Orange World and features 61 live channels (including all the main general interest services) plus video-on-demand material. According to FT, it had 637,000 'active users' in Q3 2007 up from 505,000 a year earlier. The great majority of these customers were pay-as-you-go users. There are only 100,000 subscribers for unlimited services paying €10-12 per month, depending on the package of services to which they subscribe. The latter group is believed to have a much higher level of usage than the average of 32 minutes per month.

FT has taken a high-profile sceptical view on DVB-H, stating in July 2007 that it favoured upgrading the DVB-T transmission network to allow better indoor coverage and reception on mobile handsets. Company executives have demonstrated that prototype handsets can pick up the DVB-T signal at some key indoor locations.

This position is disputed by TDF, which says that the DVB-T network ensures good reception on rooftops but not indoor, limited to about 10 percent of the population. TDF claims that raising this to 30 percent would involve 10 times the costs of building a DVB-H network. DVB-T reception is said to need a much larger amount of power than DVB-H reception. DVB-T would also require a stronger antennae in the handset than for DVB-H. TDF also argues that DVB-H and DVB-T are divergent systems for divergent types of content: DVB-T is evolving towards high definition with entertainment content aimed at the 'lean-back', living room viewer, while DVB-H is aimed at viewers on the move, using interactivity and seeking short programmes.

At this point it is still hard to judge what FT will do. FT could refuse to join the DVB-H platform and support DVB-T reception on mobiles. However, FT would have limited benefits since DVB-T broadcasts are free to air.

SFR

Under its full name the Société Française du Radiotéléphone, SFR is France's number two mobile operator, 56 percent-owned by the Vivendi conglomerate and 44 percent by the UK's Vodafone. The company had 18 million subscribers in June 2007.

The SFR mobile TV offer is accessible under the Vodafone Live ! brand. SFR draws it content from Canal+, a sister company within the Vivendi Group, but also acquires distribution licences from third-party channels and content suppliers. Since August 2007, the offering has switched from a PAYG model to a subscription, based on a model with unlimited access. The basic bouquet is the Pass TV Mobile and includes 20 channels (only France 2 and France 3 are in the bouquet) alongside à la carte content, including high profile series like Prison Break. If taken alone, Pass TV costs €6 per month. Subscribers can also choose between three options:

- Pass Canal+ includes live broadcasts from the channel (but not the premium sports and films) plus 500 à la carte programmes, including adult content, for €8 per month

(incl. Pass TV Mobile)

- CanalSat Mobile, also from Canal+, features 50 live channels (including TF1 and M6), and unlimited access to the Vodafone Live ! video on demand library, for €10 per month (including Pass TV Mobile)
- The last bouquet features the CanalSat Mobile above plus the self-descriptive service SeXstation for €15 per month

SFR disclosed 'over' 200,000 subscribers to its mobile TV service – that is users paying at least €6 per month for a package – in October 2007. This represents an increase of 70,000 compared with June. According to industry sources, average usage is about one hour per month.

SFR is cautious about DVB-H prospects. The company believes that all television channels must accept encryption and exclusive availability through mobile operators if these companies are to invest in the network and assume transmission costs. But even in this configuration, SFR believes there is a risk for mobile operators who would invest in their reception base (through handset subsidies) and who could see some channels revert to FTA broadcast after a few years. SFR is sensitive to the risk of media and politicians mounting campaigns against mobile fee structures (as seen recently in France against roaming and hot line charges) – a distinct prospect if FTA channels are exclusively accessible through subscription. In SFR's view, one of the most interesting outcomes would be a mixed 3G and DVB-H bouquet. However SFR does not rule out a failure of the current process and emergence of alternative technologies, notably 3G antennae on DSL routers feeding TV to mobile phones and hybrid satellite and terrestrial mobile TV networks.

Bouygues Télécom

Bouygues Télécom is the smallest of the three French mobile operators with 8.7 million subscribers in 2006. 89.5 percent of the operator belongs to the Bouygues conglomerate, also the controlling shareholder of TF1. Bouygues, like its two rivals, was granted a 3G licence in 2000, but has been much slower to deploy its network and therefore is regarded as the keenest for DVB-H deployment since this would relieve it from using its rivals' networks for TV services. Indeed, in its contribution to the 2007 CSA consultation, Bouygues took the most pro-active view of DVB-H (compared to FT and SFR), notably arguing for a 50 percent population coverage by the time of analogue switch-off – that is within three years following the probable launch of DVB-H.

Outlook

Despite the progress of the regulatory process to licence DVB-H, there remains some uncertainty on the deployment of DVB-H in France. This is the result, of one central deficiency of the regulatory process - the bandwidth is to be licensed to channels - in line with France's long history of micro managing programming. This not only involves the

regulator second guessing what type of channels are best suited to succeed on a market that is still nascent, but also establishes a constraint on the licensees to find an agreement by consensus on the common management of the multiplex and, consequently, on the business model for the platform as a whole. A single licensee for the whole multiplex, free to choose the channels it wants to broadcast in partnership with distributors, would have been preferable for launching a credible commercial offer.

Currently, the calendar provides that by 15th January 2007, the list of candidates for the 13 DVB-H frequencies to be awarded by the CSA will be known. They are likely to include all broadcasters currently with a DVB-T channel, with the largest (TF1, Canal+, M6) perhaps each bidding for two or three licences. By April, the CSA will publish its selection, which, will certainly include simulcasts of TF1, M6, NRJ, BFM, LCI and Canal+, plus a Lagardère channel. In the following two months, the licensees will individually negotiate with the CSA the terms of their 'cahier des charges' and, by June, licences will be formally issued.

At that juncture, agreement will need to be reached and either a consensus between the broadcasters and mobile operators on the business model will have emerged or not. In the former case, the discussions to set up the multiplex operating company and the distribution and transmission arrangements will be rapidly concluded and the outcome will be endorsed by the CSA.

The main obstacle to a compromise appears to be the DVB-T new entrants and their plans for unencrypted broadcasts, which are unacceptable to the mobile operators, most likely to finance DVB-H. The availability of a free bouquet would undermine the sales potential of the pay bouquet and thus the rationale for handset subsidies. Moreover, the competitive pressure of the new entrants could push the major channels to abandon encryption. A secondary disagreement could emerge should the main FTA channels plan to make their service available unencrypted on stand alone devices[6] since mobile operators think this would devalue their own offering.

In the case of persistent disagreement, the licensees will have only two months to find an agreement before automatically losing their licences. With such a scenario, it is likely that the government will step in to force a compromise. The government has already spent some political capital in pushing for mobile TV and President Sarkozy has shown in the past his willingness to work with industry players. The channels will also be tempted to compromise because, as remarked by a regulator, "they will hold licences for a scarce resource [spectrum] and will be better advised to think twice before declining it", especially since the conditions for a new call for tender could be very different.

A most likely scenario would be for some sort of compromise to emerge on a slow – therefore cheaper – coverage deployment schedule. Broadcasters will spend little, and get little extra viewing for it. The mobile operators are under no immediate risk of bandwidth

[6] In this configuration a one-off charge could be levelled from consumers when they acquire the device to finance the transmission network

shortage in 3G (the latest estimates say that, at current growth pace of traffic, it should not happen until 2010) and therefore will take a progressive view of DVB-H, that will depend much on the availability, choice and cost of handsets. A significant commercial push is not expected before spring 2009.

Germany

Summary: The main focus of attention in Germany at present is the launch of mobile TV via DVB-H and there is sufficient spectrum available in the UHF band to launch one multiplex with nationwide coverage. However, it is possible that there may be also a free-to-air T-DMB service launched within the next two years, in addition to the already existing T-DMB service.

Spectrum and regulation

According to the Geneva 2006 Agreement, there are seven nationwide DVB-T frequency layers available in the UHF band. In an ongoing national process, these resources are re-planned in such a way that nine DVB-T frequency blocks can potentially be made available for digital broadcasting in Bands IV/V (470 – 862 MHz), some of them with limited coverage (see table below). Three of these blocks are already used for terrestrial digital TV services nationwide, three other multiplexes are in use in densely populated areas and the seventh block has been assigned for nationwide commercial DVB-H. The ninth block will not be available before 2012 (military usage).

UHF Bands IV/V spectrum plans in Germany

Multiplex	Coverage
3 multiplexes for public broadcasters	National
2 multiplexes for commercial broadcasters	National
1 DVB-H multiplex	National
1 multiplex for commercial broadcasters	Limited to towns with more than 100,000 inhabitants
1 multiplex for commercial broadcasters	Limited to towns with more than 500,000 inhabitants
1 multiplex available from 2012 (use undecided)	National

In addition, a total of three 1.5 MHz DAB blocks and one 7 MHz DVB-T block were assigned by the Geneva 2006 Agreement in Band III. There is a strong tendency that the nationwide DVB-T layer will also be used for DAB and T-DMB which in effect means that there will be a total of seven 1.5 MHz DAB channels available for DAB and T-DMB. In this scenario, DVB-T multiplexes currently operating in Band III are planned for migration to Bands IV/V.

The process of switching off analogue TV is progressing well in Germany. All commercial analogue TV services have already been switched off and it is expected that the remaining public broadcaster signals will be switched off by the end of 2008.

The Bundesnetzagentur (national spectrum regulator) issued a call for tender for frequencies for the operation of a nationwide DVB-H network in May 2007, and there were a total of three bids.

On the 15th October, it was announced that T-Systems Media&Broadcast GmbH received the license. The company is planning to have the network operational in the Hannover region in time for the CeBIT 2008 exhibition. It is expected that the remaining fifteen capitals of the federal states plus other major cities in Germany will be covered by the end of 2008.

In March 2007, the Landesmedienanstalten (LMA; federal media regulators) each started a call for tender for the DVB-H platform operation. They received two major bids: one from a consortium of mobile operators comprising T-Mobile, Vodafone Deutschland and O2 and the other from a joint venture known as Mobile 3.0 comprising Mobiles Fernsehen Deutschland (MFD) and NEVA Media GmbH (financed by media companies Hubert Burda Media and Holtzbrinck Media. MFD is backed by Naspers/MIH, a major South African media and technology company.

On the 16th October, the LMA announced that its preferred bid was Mobile 3.0. However, before being officially granted the license, Mobile 3.0 had to provide the regulators with the definitive content line-up, including both national and regional content. It addition, the company was also required to provide details of four radio channels which it proposes to include in its offer. Mobile 3.0 was due to submit its final offer on the 9th November 2007.

However, due to problems in agreeing contracts with content providers and MNOs, the company requested and was granted a second extension to the deadline. According to the regulators, Mobile 3.0 will not be granted any further extensions and the licensing process will be stopped if the company cannot show it has signed the required contracts by the new deadline.

Following a final decision by the media regulators, now not expected until January 2008, the Mobile 3.0 offer will need to be approved by the boards of each of the fourteen media regulators in Germany. Full commercial licenses for mobile TV services cannot be issued without a new national contract (e.g. between the federal states) which is under way. As a result, each individual regional state will issue “pilot” licenses to Mobile 3.0 which will vary from three to seven years depending on the region. This licensing process is not likely to be completed until mid 2008.

A new regulatory body known as ZAK will also be set up to deal with national media licensing for mobile TV, radio and other media. ZAK will comprise of 14 directors from the various media regulators.

The full reasons for the selection of the Media 3.0 bid have not yet been made public. However, it is thought that the main reasons for its selection were as follows

- Mobile 3.0 offered a more diverse range of content was thus favoured by the broadcasters
- Mobile 3.0 may have offered a better network coverage than the competing bid from the MNOs.

  The regulator only specified a few minimum requirements and a slightly unclear schedule for the deployment of the DVB-H network. Instead, it invited bidders to propose their own plans which will be binding on the winning bidder.

Although full conditions of the Mobile 3.0 license have not yet been made public, it is

believed that Mobile 3.0 will be required to adhere to the following rules and regulations:

- It is expected that there will be sixteen channels on the multiplex. Capacity will be reserved for three public channels and four commercial channels. The public channels are likely to be ARD1 Das Erste, ARD regional and ZDF with two commercial channels from ProSiebensat and two from RTL

  Accessing the DVB-H network is inevitably a key issue for broadcasters. They were lobbying media regulators to issue licenses directly to the broadcasters as is the case with DTT today. However, the platform operator will decide on channel line-up subject to the "must-carry" rules described above

- Mobile 3.0 must allow non-connected devices (i.e. non-phone devices such as PMPs, laptops with USB-type DVB-H receivers, etc) to have access to the content. However, these devices will be required to have a SIM card in order to descramble the commercial channels.

Key players

The award of the platform license to Mobile 3.0 is a major relief for German broadcasters and content providers as they feared that the MNOs would exercise complete control over content choice on the platform if they had been allocated the platform license.

Mobile 3.0 intends to operate as a neutral platform provider procuring content and supplying this content on a wholesale basis to its appointed service providers. However, Mobile 3.0 is an additional player in the value chain – another player who needs to make a profit from the business – which may put pressure on the business model and could even undermine the viability of the business.

Clearly, the company must now formulate a viable business case with a number of key players such as the network provider T-Systems Media&Broadcast GmbH (recently acquired by TDF) and broadcasters/content providers on one hand and MNO service providers on the other.

Technology and services

There is also interest in T-DMB mobile TV services in Germany. The first commercial T-DMB service in Europe was launched in Germany in May 2006 prior to the FIFA World Cup football tournament.

Marketed under the brand name "Watcha" and operated by Mobiles Fernsehen Deutschland (MFD), the service uses L-band DAB network capacity leased from T-Systems Media&Broadcast and can be received in 16 major cities in Germany.

The Watcha service offers 5 TV channels as well as all DAB radio stations available in Germany (see table below). The service is marketed by Debitel, Mobilecom and Simply Communications. MFD also markets the service directly via its own website.

To date, the take-up of the service has been modest (around 10,000-15,000 subscribers). This is attributed mainly to the lack of marketing by mobile operators and a limited selection of mobile handsets (Samsung SGH-P900 and LG V9000). Prices for the service range from €5 to €8.95 per month.

Debitel has announced plans to stop the Watcha service by June 2008. MFD is expected to keep the service alive with new market partners.

Programming on Watcha mobile TV service (as of December 2007)

Channel	Broadcast bit rate
ProSiebenSat.1 Mobile (Soaps, Talk, Shows, News)	192 kbps
ZDF (Sports, Films, Shows, News)	192 kbps
ARD	192 kbps
N24 (24 hour news)	192 kbps
MTV Music (Non-stop commercial-free music videos)	192 kbps
bigFM2see (Visual radio station)	96 kbps
Electronic Programme Guide	16 kbps
EMM CAS	16 kbps
50 DAB radio stations	80-192 kbps

MFD currently acts as a platform operator, content aggregator and wholesale service provider. The public channels, ARD and ZDF, are broadcast unencrypted without any charge for the broadcasters. However, MFD pays the commercial channels to be on the platform. As a wholesale provider, MFD's business model relies on its service providers marketing the service.

Following the RRC-06 conference and the resolution of key issues such as the audio codec, there are plans to re-launch digital radio in Germany in 2008/09.

At present, the regulatory authorities are involved in a spectrum re-planning exercise which is expected to be completed by the end of 2007. The availability of this spectrum will also depend on the shut down of analogue TV services which are expected to be completed by the end of 2008.

The re-launch plan involves primarily the launch of two national multiplexes, although there are also plans to launch a third regional multiplex in early 2009 in some parts of the country. The primary focus will be to use the capacity for digital radio and associated data services, although some broadcasters have expressed an interest in offering 1-2 TV channels via T-DMB on a regional basis.

However, both the public and commercial broadcasters are planning to roll-out T-DMB mobile TV services from 2009 onwards. Mobile TV services are likely to be offered in conjunction with radio and other data services on the same multiplex rather than offered via a dedicated VHF T-DMB multiplex. Hence it is likely that these FTA services will compete with the DVB-H pay platform.

Outlook

Although progress has been made on the licensing front, there are numerous challenges to be overcome on the business front before a commercial launch happens. The complex nature of the DVB-H value chain coupled with the federal nature of media regulation in Germany means that will not be an easy process.

Mobile 3.0's repeated requests for deadline extensions is proof of this and there are already doubts about whether the service will be launched in time for Euro 2008 and the Olympics – two events which could provide an early subscriber boost to the service.

The wholesale business model adopted by Mobile 3.0 relies totally on its service provider customers to market the service. It is the MNOs that control access to the end-users via their mobile networks. As a result, they wield significant market power and the success of the DVB-H service will depend on how enthusiastically they support and market the service.

The inability of MFD's Watcha TV service to gain traction in Germany (due to the lack of commitment and marketing by its main service provider Debitel) illustrates this weakness. Clearly, Mobile 3.0 should try to negotiate safeguards (incentives/penalties) with its service providers if it is to avoid this problem, although this will not be easy.

A danger for Mobile 3.0 is that if the DVB-H service does not flourish quickly (in Germany or abroad), then the mobile operators will either lose interest in mobile TV or focus their mobile TV efforts on other technologies such as 3.5G and MBMS. In this respect, DVB-H in Germany has a limited window of opportunity to be successful.

Greece

Summary: Mobile TV is at a very early stage in Greece. There is some interest although there have not been any technical or commercial trials yet.

Spectrum and regulation

According to the Geneva 2006 Agreement, Greece will have seven DVB-T coverages although it will be some time before the Greek authorities start to focus on allocating any of this spectrum for mobile TV services.

The priority at present is to continue with the roll-out of digital TV services via DVB-T. The process has started and there is currently one multiplex operated by the public broadcaster ERT. It covers around 60 percent of the population. A second multiplex is due to be launched in 2007.

Key players

The main interest in mobile TV is being shown by the broadcasters, particularly public broadcaster ERT.

Technology and services

The Greek authorities are keeping their options open with regards to mobile TV technology although the preferred standard at present is DVB-H.

There are no mobile TV services via 3G in Greece.

Outlook

It is unlikely that mobile TV via DVB-H or any other standards will gain traction until the digital TV licensing process has progressed further. The official date for analogue TV switch-off in Greece is 2012.

Ireland

Summary:

- *Regulator ComReg is prioritising, in terms of the allocation of frequencies, the launch of a national digital terrestrial television (DTT) platform over broadcast mobile television*
- *DTT was introduced on an experimental basis in Ireland only in 2006 and four fully fledged multiplexes are expected to launch in 2008*
- *No date has yet been set for analogue switch-off, which should take place from 2012.*
- *There are not enough frequencies available in Band III for a national TV bouquet under DAB-IP before analogue switch-off*
- *A DVB-H trial is under way in 2007 in Dublin and continues today*
- *All market players appear to support DVB-H; MediaFLO has no backer yet*
- *Sufficient frequencies are already available for a broadcast mobile television multiplex covering major cities and ComReg will launch a consultation in early 2008, which could lead to the licensing of a multiplex – key players are the mobile operators and transmission companies*
- *It appears that a licence would be issued to a multiplex operator, rather than on a channel-by-channel basis*
- *Several mobile operators already distribute 3G-based TV bouquets in Ireland, and have substantial bandwidth available on their 3G networks to accommodate an increase in demand*
- *Much uncertainty remains over the business model for a broadcast mobile TV platform in Ireland*
- *Given the small size of Ireland's market, mobile operators may wait and consider developments outside of Ireland before committing financial resources to a broadcast mobile TV platform*

Spectrum and regulation

Overview

Despite having frequencies available, Ireland is at a very early stage of the regulatory process to launch broadcast mobile TV. This is principally the result of the delayed (from 2001) launch of the DTT platform, now anticipated for 2008, with four multiplexes being licensed. Although prioritising DTT, the Commission for Communications Regulation (ComReg) is supportive of mobile TV broadcasts and will hold a consultation in spring 2008.

Two mobile telephony operators currently offer mobile TV services to Irish subscribers over 3G networks, but ComReg believes the supply of bandwidth on these networks could become a constraint in due course.

In terms of spectrum availability, Ireland's position on the western edge of Europe and its relatively low population density, means that spectrum congestion is relatively light. RTÉ One and RTÉ Two are on VHF band III in some areas, and the more recently established stations (TV3 and TG4) have been only broadcast on UHF Bands IV and V. Besides the four multiplexes planned for DTT, there appears to be enough room for DVB-H coverage of the main cities through a fifth multiplex. The Geneva 2006 Agreement allocates Ireland with eight DVB-T frequencies in the UHF Bands IV and V, plus one DVB-T multiplex in VHF Band III, at 43 sites around the country.

Regulator's outlook

ComReg publishes spectrum management strategy documents on a two to three year basis. The current document "ComReg Spectrum Management Strategy Statement 2005-2007" covers the period 2005-2007, and the 2008-2010 document has been put to consultation; a process which is scheduled to conclude at the end of November 2007. ComReg reports to the Department of Communications, Energy and Natural Resources, which makes the overall policy decisions on spectrum management.

Two scenarios are outlined in the 2005-2007 document. The high growth scenario, 'Wireless Boom', places significant demands on spectrum, and is based on the two assumptions outlined below:

> "*Ubiquitous availability of digital multi-channel TV by cable/MMDS and satellite enables analogue transmissions to cease. Digital terrestrial transmission primarily focuses on mobile TV and other content, and on supporting broadband access in rural areas*"
>
> "*Mobile digital TV and delivery of audio visual content to mobile phones is commonplace, using the DVB-H standard*"

Alternatively, the 'Steady Growth' scenario has a low impact on demand for spectrum, and is based on the following two assumptions:

> "*Mobile data remains a niche market, 3G coverage restricted to main urban areas, no immediate demand for more spectrum*"
>
> "*Mobiles are still predominantly used for voice and messaging services, with limited demand for data, so there is no immediate requirement for any spectrum beyond the current 2G and 3G allocations*"

Both scenarios are being seriously considered. They inform ComReg's 'Wireless Vision for 2010':

"*Digital TV is now in the majority of homes, many of which have multiple television sets and rely on a mix of platforms for reception. Regional trials of mobile TV have been successful and there is now pressure from broadcasters and mobile operators to expedite analogue switch off to free up spectrum for national mobile TV multiplexes. DAB in Band III is offering a range of new, specialist radio channels and L-band is being used to deliver mobile multimedia content to the latest generation of multi-mode phones. Portable and mobile content TV and other audio/visual material receivable on hand-held devices is a big growth market and there is pressure for access to UHF TV channels to deliver services to hand-held DVB-enabled mobile phones*."

Digital terrestrial television deployment

On 9 November 2007, ComReg published its response to the consultation issued on 31 August 2007 on DTT licensing. This document states that digital TV services are widely available to Irish consumers – through cable, MMDS and satellite and increasingly via the Internet – but that "the introduction of DTT services will provide Irish consumers with as broad a range of viewing options as is available in other European countries".

ComReg anticipates issuing a 12-year licence for a DTT multiplex to RTÉ, the public television and radio broadcaster, and three such licences to the Broadcasting Commission of Ireland (BCI). ComReg expects to issue the licences in spring 2008. The BCI regulates private broadcasting in the Republic and will organise a call for tender to operate the multiplexes.

A DTT trial from sites at Three Rock and Clermont Carn commenced in August 2006. The trial includes one high definition channel. Commercial launch is expected in mid-2008, when the licensed operators take over from the trial.

No date has yet been set for the analogue switch-off in Ireland. Industry players expect that the process could take place before the end of 2012. Once the DTT licensing process is over in 2008, ComReg will establish an industry-wide body to consider and support the switch-off process, which could lead to an official date being set.

Mobile TV

In its November 2007 statement on the licensing framework for DTT, ComReg says it "expects to licence spectrum in 2008 that could potentially be used to facilitate mobile TV" although it "may not necessarily be national in extent". There will be a consultation in Q1 2008 on the licence conditions for mobile TV. It is expected that ComReg will propose to licence a multiplex to a single network operator. The multiplex would cover major cities. In ComReg's Mobile TV briefing note issued in 2006, the regulator had set out the approach to licensing broadcast mobile TV services by highlighting that only limited spectrum would be available before analogue switch-off.

With respect to commercial mobile TV services, ComReg stated that such services are available as data services delivered over 3G networks and the advantage was that 3G

infrastructure was in place and handsets already available. However, “it is ultimately limited in terms of network capacity, since individual data streams must be sent across the network to individual users.”

ComReg summarises the principal market and commercial issues in its note. It points to the need to redesign content to suit small mobile screens and for shorter segments (‘mobisodes’). It suggests that broadcasters could either roll out their own networks or conclude partnerships with mobile operators or package and sell their content to mobile operators who would then distribute this to customers.

In its Regional DVB consultation, ComReg also stated that it wants to regulate in a technology neutral manner and does not intend to prescribe a standard (DVB-H, DMB, MediaFLO). However, in ComReg’s Mobile TV briefing note, it stated that “DVB-H is currently considered the strongest contender in the standards battle”, noting that such services had been tested and launched commercially in a number of countries. There appears to be no interest by any industry player for other standards like MediaFLO.

Key players

Broadcasters

Ireland’s broadcasting landscape is dominated by public corporations. Radio Telefís Éireann (RTÉ) produces two national channels - , RTÉ One and RTÉ Two - broadcasting almost exclusively in English. A separate, independent body produces the TG4 channel with daily programmes in Gaelic and also in English. TV3, the only commercial channel, is owned since 2006 by the private equity firm Doughty Hanson.

Thanks to terrestrial overlap (and illegal ‘deflectors’), cable television and satellite, British channels have traditionally been widely available in the Republic of Ireland, commanding significant share of local audiences.

Britain’s Sky Television retails its pay-TV packages in Ireland and carries the four Irish domestic channels in its bouquet. It supplies content to the Vodafone UMTS TV platform (see below) and it would be the most likely contender to supply pay and premium material to a DVB-H service. The main Irish-based pay-television broadcaster is Setanta Sport, which also operates in the UK. Setanta Ireland is distributed on basic cable and Sky TV.

Transmission companies

The main terrestrial transmission company in Ireland is RTÉ NL, a subsidiary of the public broadcaster. ComReg has designated RTÉ NL as having “market power” and it is required to provide competitors with access to its sites. RTÉ, TV3 and TG4 contract their transmission to RTÉ NL. Arqiva is the main potential competitor, as it already supplies radio communication services in Ireland, and is O2’s partner for the DVB-H trial under way in Dublin (see below).

RTÉ NL installed a DAB transmitter during H1 2006, providing coverage to Dublin and parts of Kildare and Meath. It trialled DAB-IP technology, including the application of mobile TV. In May 2006, BT installed its DAB-IP technology (used for its BT Movio mobile TV service) in

the RTÉ network and tested the service. A public demonstration took place on a LUAS tram on 9 June 2006. However RTÉ believes there are not enough frequencies available in VHF Band III for a viable bouquet of TV channels to be launched before switch-off.

O2 Ireland, in partnership with Arqiva, has been the most active in trialling DVB-H technology in Ireland, following their joint trial in Oxford (UK) in 2005. O2 was granted a licence for a trial by ComReg in September 2006[7] and O2 held a showcase of the technology during the Ryder Cup held in Kildare that month. In October 2006, O2 announced its intention to run the first consumer trial of mobile TV in Ireland under ComReg's 'test and trial' scheme.

Following a technology trial at the end of 2006, the consumer trial went live in March 2007 when 350 O2 subscribers in the Greater Dublin area were provided with modified Nokia N92 phones. The triallists, a broad cross-section of the customer base, were able to access 13 digital channels[8] including two interactive services. The trial was to last until the end of August 2007, but transmissions were still continuing in November 2007. O2 is due to file a report detailing the results of the trial with the Department of Communications, Marine and Natural Resources and ComReg before the end of 2007.

Mobile telephony operators

There are four mobile operators in Ireland: O2 Ireland, Vodafone Ireland, Three Ireland and Meteor. The first three are subsidiaries of the eponymous British operators and the latter is a subdivision of the Irish incumbent Eircom.[9] All four operators have 3G licences and O2, Vodafone and Meteor have 2G licences as well.

Mobile TV platforms

The services described below are based on 3G technology and are streamed video channels which are either simulcast live TV or repackaged content specifically intended for the mobile platform (re-purposed). Neither O2 Ireland nor Meteor is currently offering TV (or indeed any form of video) at this time. (O2 is running the DVB-H trial.)

Vodafone offers 'Mobile TV' through its Vodafone live! 3G service to both pre-pay and pay-monthly customers. The service is not available to customers equipped with 2.5G handsets. There are currently 16 pre-pay 3G handsets and 17 pay-monthly handsets available. The 'Mobile TV' offering is retailed on a weekly subscription basis that excludes the metered cost of the data service. Four themed channel bundles are available priced at €1.99 per week while the 'Value Pack' provides access to all channels for €4.99 per week. All 24 channels come from the Sky Television platform, but do not include domestic Irish services. A majority of the channels are re-purposed for mobile viewing.

Three has taken a different approach as its nine channels are retailed on a pay-as-you-go

[7] Three Ireland was also issued a licence for a trial, but eventually declined to conduct one after coming to an agreement with O2 to access results from its pilot.
[8] The 13 channels were: RTÉ1, RTÉ2, TV3, TG4, Sky News Sky Sports News, Sky Sports 1, Setanta Sports, Discovery, Cartoon Network, Sky Travel, Interactive Music, Interactive Games.
[9] Ultimate owners of O2 are Spain's Telefónica and of Three, Hong Kong's Hutchinson Whampoa.

basis for 50 cents per 24 hours. Nine channels are available, including domestic channels from RTÉ and Setanta. Five of the channels are re-purposed for mobile viewing.

Outlook

Although Ireland has the spectrum available for a (quasi) national DVB-H multiplex to commercially launch any time, ComReg is prioritising DTT. Furthermore, the uncertainties over the business model may delay an actual launch, possibly indefinitely. The consultation on mobile television to be held in early 2008 by ComReg should at least allow for a clearer expression of the views of the mobile telephony operators and the transmission companies, which appear to be the principal interested parties.

The view favoured by the incumbent transmission company RTÉ NL is that of a national multiplex operator who would wholesale a bouquet to all the mobile telephony operators. But this would leave limited room for differentiation among them, and mobile operators would likely enter into such a scheme only if the upfront cost for them was low or nil. On the other hand, it would not make much economic sense for RTÉ NL to build a DVB-H network without some minimum revenue guarantee from mobile operators.

A further consideration is the small size of Ireland. In such a small market for mobile telephony, and in particular handsets, mobile operators may wait and see on economies of scale materialising elsewhere before rolling out a DVB-H offering in Ireland. Meanwhile, mobile operators still have a relatively large amount of bandwidth available on their 3G networks to accommodate the growth of their existing 3G mobile TV services.

Italy

Summary:

- *A liberal regulatory regime allowing for frequency trading and lax enforcement of frequency usage regulations enabled the launch of two DVB-H multiplexes in 2006. In the same year three DVB-H platforms were launched: 3 TV from 3 Italia; TIM TV from Telecom Italia; and Vodafone Sky TV from Vodafone. Content is encrypted (with Nagravision) and exclusively accessible to each operator's subscribers*
- *3 Italia owns and operates its own national DVB-H multiplex. Telecom Italia and Vodafone lease bandwidth from the other DVB-H multiplex, operated by commercial broadcaster Mediaset, which cannot retail its own DVB-H bouquet or sell mobile-only advertising airtime under its antitrust undertakings*
- *Mediaset's major free-to-air channels are available on TIM TV and 3 TV, while Rai's are available only on 3 TV. The satellite pay-TV operator Sky Italia supplies basic thematic channels to all three platforms. Mediaset and Telecom Italia Media supply TIM TV and 3 TV with domestic football games. Adult content is also available*
- *The number of DVB-H handset models available on the Italian market is low, with just two to three models each from Samsung and LG. Nokia, which initially took issue with the conditional access solutions adopted by the three operators, will launch compatible models in 2008, as will Motorola. In a mobile consumer market driven by a rapid handset replacement cycle, the small number of models available and their high prices are blamed for slow take up of DVB-H.*
- *Without economies of scale being realised by manufacturers due to sufficiently strong global demand for DVB-H handsets, the price difference with other handsets could remain significant and a barrier to higher consumer take up*
- *Total DVB-H subscribers were about 800,000 in mid-2007: 3 Italia had over 700,000 TV subscribers in June 2007 thanks to a policy of heavily subsidising handsets and advertising on mainstream television; Telecom Italia and Vodafone had a combined total of less than 100,000 TV users, as they subsidise handsets only for their highest spending subscribers and are not publicising their services*
- *In late 2007 3 Italia was shifting its publicity and advertising away from TV to web content access. 3 Italia also plans to use half of its multiplex for DTT from 2010. TIM was reviewing its approach and considering a shift in programming towards content re-purposed for mobile viewing*
- *Meanwhile, all three mobile operators with TV platforms are also actively deploying on-demand video services through their UMTS networks*

- *An alternative mobile TV platform using DAB/DMB could emerge in the medium term according to plans from public broadcaster Rai and its transmission arm Raiway*

Regulatory environment

Overview

Italy has one of the most liberal frequency regimes in the world. After a 1976 Constitutional Court ruling on local television and the subsequent failure of Parliament to enact a new licensing process, frequencies were used without authorisation by private operators across the country. The process was later legalised, although the government never managed to implement a plan of frequency allocation – to this date frequency usage is the result of this 1970s 'land grab'. By the admission of one regulator, broadcasters regard themselves as "owners" of the frequencies, regardless of the text of the law, and the government will find it difficult to fully assume control over the airwaves.

Currently, according to estimates from the broadcasting and telecommunications regulator, the "Autorità per le garanzie nelle comunicazioni" (Agcom), there are 22,000 local frequencies in use for television broadcasts by a total of 600 channels. The frequencies used for television broadcast (analogue and digital) are as follows:

- In VHF Band I, Channels A/13 and B/14, the former being allocated to the military but used in some areas by private broadcasters. The usage of VHFI is residual, mostly for Raiuno in analogue
- In VHF Band II only Channel C/15, used by very few transmitters
- In VHF Band III there are seven channels, D/16, E/17, F/18, G/19, H/20, H1/11 and H2/12, plus legally dubious Channel H3 used in some areas by local broadcasters using frequencies just above the band's official limit.[10] Channel H2/12 is licensed to Rai for DAB, but nevertheless used in some areas by private operators
- UHF Band IV has 17 channels (21 to 37) used for TV
- UHF Band V has officially 21 TV channels (38 to 68) but there are broadcasters stretching the Band up to Channel 72 despite the fact that Channels 69, 70 and 71 are legally set aside for the military and traffic air control – but in practice not actually used. Current talks between the relevant administrative bodies and the Ministry of Communications could lead to the official release of the three channels for television

Digital terrestrial television (DTT)

The Decree-Law No. 5 of 20th January 2001, as amended by enacting Law No. 66 of 20 March 2001, allowed existing analogue terrestrial broadcasters to request licences to launch experimental digital broadcasts, including DVB-H broadcasts. The law also legalised the

[10] The seven channels 13 to 20 in Bands I and III have security gaps. In most of Europe there are no such gaps (as is the case between Channels H, H1 and H2) and Italy plans to re-allocate the bandwidth after switch-off without the gaps. In a few Italian regions, some local broadcasters use the so-called European channels, as do most bordering countries.

market for frequencies, provided they were acquired by existing operators, and used for DTT. By using spare frequencies and upgrading existing analogue networks to digital, the national and some regional broadcasters have managed to create DTT multiplexes, all of which are multiple frequency networks (MFNs). Channels for which an experimental digital licence had been delivered by July 2005, including the two would-be DVB-H multiplexes, were given licences to continue transmission until analogue switch-off.[11]

The 2001 law established two licence categories for network (multiplex) operators and content suppliers (traditional TV channels). There is a national ownership cap of 20 percent of all channels (either analogue channels or digital multiplexes) per network operator. Also, a single content provider cannot own more than 20 percent of the total number of national programming channels (excluding simulcasts and channels broadcasting more than 20 hours per week). A DTT subsidy programme operated until 2006 and was re-launched in September 2007 as a tax break of a value of up to €200 to be used by the end of the year to acquire integrated digital TV sets.

Analogue switch-off and digital dividend

Analogue television broadcast switch-off was initially set to 2006 in the 2001 law, a deadline now postponed. The draft Gentiloni broadcasting bill currently under consideration by the Italian Parliament mentions the date of 30th November 2012 for switch-off.[12] Small-scale regional switch-offs that took place in Sardinia in 2007 and are planned for the Val d'Aoste in 2008 are viewed as pilots for the frequency reshuffle that should eventually occur in all regions. National multiplexes should be re-structured from multiple frequency networks (MFNs) to single frequency networks (SFNs).

In 2003, Agcom prepared a national and local digital frequency plan (PNAF), to apply after switch-off, that would have re-organised the spectrum for the first time since the 1970s. This 2003 plan was shelved. In 2007, Agcom started compiling a national registry ('cadastre') of frequencies and their current users[13] and intends to produce a new PNAF in 2008. This PNAF is not expected to be a complete site-by-site plan, but will identify areas of reception and leave regional governments in charge of the actual site planning.

There is considerable uncertainty regarding the attribution of the frequencies to be freed in the future by switch-off. In the Gentiloni bill, there are no provisions for the allocation of the digital dividend, but a cap of 20 percent on the national transmission capacity for any single content supplier; Mediaset would like high definition simulcasts to be excluded from the 20 percent ceiling. The bill makes no specific provision for mobile broadcasts. The experience of over 30 years of frequency management in Italy suggests that frequencies may remain in

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[11] *In July 2006 the European Commission sent a formal request to the Italian government to review its DTT legal framework in order to abolish 'unjustified advantages to existing analogue operators' that infringe EU directives. In July 2007 the request was renewed with a threat to take Italy to the European Court of Justice. The Gentiloni bill has a provision abolishing the rule restricting the right to acquire frequencies to existing broadcasters.*

[12] DDL 1825 or *disegno di legge* Gentiloni (referring to Communications Minister Paolo Gentiloni).

[13] The commonly quoted figure is that of 24.000 local frequencies in use in Italy.

the hands of broadcasters, whether this is sanctioned by the law or not. Enactment of the Gentiloni bill by Parliament is not certain given the government's tiny majority.

At the 2006 Regional Radiocommunication Conference, Italy agreed to clear a number of frequencies currently used by its broadcasters, for use by neighbouring countries. Actual frequency-per-frequency negotiations with the bordering countries have not started yet. The most affected part of Italy is that bordering the Tyrrhenian sea where many transmitters use frequencies now dedicated to France and likely to be used in Corsica. Accordingly, only a total of 16-17 SFN multiplexes could be deployed there according to industry estimates, compared with up to 25 on the Adriatic coast. The usual estimate is that about 30 separate feeds (analogue channels and digital multiplexes) are broadcasting in most areas, the majority of which are local, and are expecting to transform their analogue frequency in a full digital multiplex – as Mediaset (and Rai by consequence) have indicated they want to do with their own analogue frequencies. In fact, the RRC 06 conclusions add to the justification for a full review of frequency usage (including possible international litigation). Meanwhile prospects appear remote for Italy engaging in any pan-European harmonization of frequency spectrum.

Aside from the current VHF and UHF frequencies used by Italian broadcasters for analogue and digital transmissions, there is little bandwidth left that would allow new services to be launched. The single exception resides with Band L where Agcom is considering licensing bandwidth and which could conceivably be used for DAB transmissions. The experimental regional DAB platforms due to launch by end 2007, under the auspices of Raiway (see below), will inform an upcoming regulatory framework to be issued by Agcom in 2008.

DVB-H

It appears that the DVB-H standard was chosen by Italy's two multiplex operators without giving much consideration to the alternatives. Agcom recognised the standard in its June 2008 'delibera' after it was chosen by the operators and the same pragmatic approach is being used for DMB. Currently, there is little sign of interest for MediaFLO.

The main regulatory text affecting DVB-H is the June 2006 proceeding of Agcom (Delibera 191/06) amending a 2001 proceeding (435/01). Content providers for mobile networks must have an authorization and existing content providers, including those with an authorization for cable and satellite broadcasting, can be carried on mobile networks after a declaration to the Ministry of communications. The channels carried on the mobile TV platform are not taken into account when calculating the 20 percent cap noted above. The text also states that DTT network operator licences also permit broadcasts to mobile terminals.

There was no thorough licensing process for DVB-H in Italy, but the launch of the two DVB-H multiplexes was the subject of some regulatory oversight.

In November 2005, H3G announced the acquisition of Canale 7, a quasi-national analogue network and its national DTT licence, from its owners Profit Group. After consulting with

Agcom, the antitrust regulator, the Autorità Garante della Concorrenza e del Mercato (AGCM) decided in April 2006 to clear the deal without investigation.

Mediaset's acquisition of the national analogue network of Europa TV (and its national DTT licence), announced in December 2005, was approved by AGCM in April 2006 under the following conditions:

- The network must be exclusively dedicated to DVB-H broadcasts for mobile terminals
- Mediaset must confine itself to the role of network operator, and specifically must not sell advertising on the platform
- Bandwidth must be wholesaled to third parties on non-discriminatory terms

These two AGCM rulings are regarded as crucial by operators because they provide some legal basis for their usage of the frequencies and it is expected that they would use the rulings in any future dispute arising from frequency re-allocation.

Encryption

The encryption technology Nagravision, from Switzerland's Kudelski Group, was chosen in 2004 by Mediaset for its then up-coming pay DTT football service. NDS, Kudelski's main rival, is owned by News Corporation, which controls Mediaset's chief pay-TV competitor Sky Italia.

The Nagra Mobile version of Nagravision is embedded in both SIM cards and handsets and as such it is seen as much more secure by Mediaset than standards locating decrypting algorithms exclusively in the SIM card; Italy has a history of widespread pay-TV piracy in the 1990s and early 2000s. As the supplier of bandwidth, Mediaset allowed its clients to choose the encryption technology, but insisted on "high security" for its content and pressured them to accept Nagravision. Considerations of economies of scale in handset manufacturing led all three mobile operators to accept Nagra Mobile. This ruled out Nokia as an initial supplier of handsets with only Samsung and LG left (plus new entrant Brionvega that has failed to make a measurable impact on the market). Nokia will launch DVB-H handsets in Italy in 2008. Motorola is also expected to enter the market by the end of that year.

Key players and platforms

Broadcasters

Major broadcasters

	Ownership	Free TV	Pay TV	DVB-T mux	DVB-H mux
Rai - Radiotelevisione Italiana	Government	Raiuno Raidue Raitre Themed channels	RaiSat (satellite)	2	-
Mediaset	Fininvest (Berlusconi family)	Canale 5 Italia 1 Rete 4 Boing	Mediaset Premium (DTT), up coming themed bouquet (DTT)	2	1
Sky Italia	News Corporation	-	Sky (satellite, DSL)	-	-
La 7	Telecom Italia	La Sette MTV Italia	La 7 Cartapiù (DSL)	2	-

Mediaset

Mediaset is the largest Italian commercial broadcaster, and a 36 percent stake is owned by the Fininvest conglomerate, controlled by former prime minister and current opposition leader Silvio Berlusconi and his family. Mediaset owns three national general interest channels available on analogue and digital terrestrial TV: Canale 5, Italia 1 and Rete 4. It also operates a DTT pay-per-view platform featuring domestic first division football games. Mediaset is expected to launch a pay-TV bouquet in early 2008 on DTT.

In 2005 Mediaset acquired Europa TV, a national television network that was broadcasting the Sportitalia channel in analogue and had a licence to switch to DTT. The network was already using Mediaset as its transmission company. At the onset, Mediaset stated its plans to use the network for DVB-H transmission, but Agcom required undertakings to clear the purchase of Europa TV (see above).

Mediaset invested €250 million in buying the network and upgrading it to DVB-H – the capital expenditure is amortised over ten years at €25 million per year.

Mediaset leases capacity to TIM and Vodafone for about €45 million per year in total revenues[14] against €10-15 million in operating costs. TIM and Vodafone are renting each close to 40 percent of the capacity with the remaining 20 percent still unused. The channels that are available on both TIM and Vodafone mobile TV bouquets are simulcast in each bouquet. In 2007 Mediaset claimed 75 percent outdoor coverage and 40 percent indoor. The latter figure reflects the scaled back plans to deploy gap fillers, supplied by Telecom Italia, 4,000 initially (required to raise indoor coverage to 70 percent) to 1,000. In the agreement with Mediaset, TIM widens the multiplex coverage by using its own mobile transmission network to install gap fillers – mobile telephony having a much denser network of

[14] These figures come from oral statements from Mediaset. In its published earnings statements the company does not breakdown its DVB-H network operator business.

transmitters than traditional terrestrial television. The costs of these gap fillers are deducted from the €45 million TIM pays annually to Mediaset to rent the multiplex capacity. Nevertheless, the guidance figures released by Mediaset indicate that wholesale revenues appear to cover costs and amortizations.

As a content supplier, Mediaset licences its three general interest channels for DVB-H to platform operators for an undisclosed amount. Canale 5 and Italia 1 are fully simulcast on TIM TV, but these are merged in a single 'best of' Mediaset feed on 3 TV. Mediaset also licences the domestic Serie A and the European Champion's League football games to DVB-H distributors under a 50/50 revenue sharing arrangement with a minimum €18 million guaranteed for Mediaset. TIM buys the two football championships (through TI Media), and 3 TV buys Serie A also Boing (a children's channel) from Mediaset.

Mediaset's stated longer-term strategy is to make its three general interest channels available free-to-air on DVB-H. The current encryption approach is viewed as a transitory measure to support viewer penetration.

Mediaset fully owns its own transmission company called Elettronica Industriale. Elettronica Industriale operates the Mediaset channels in analogue and its three DTT multiplexes. As an in-house transmission arm, Elettronica Industriale has no strategy of its own and there is no indication that Mediaset is considering selling the company.

Rai

The public broadcaster Radiotelevisione Italiana (RAI), has three national general interest channels - Raiuno, Raidue and Raitre – which together have the highest audience share in Italy, ahead of Mediaset. (Rai is also the No. 1 radio operator in the country). Rai's three main channels are available terrestrially in digital and analogue. Separately Rai produces a range of digital-only channels for terrestrial, satellite and IPTV distribution. Rai maintains the popularity of its content with viewers despite being plagued by management instability and political interference. It faces much stricter limitations on advertising airtime than private broadcasters, and the revenues from the TV set licence fee account for close to half the group's turnover.

In 2005, Rai declined to create its own DVB-H multiplex due to bureaucratic delays and funding constraints.

Rai licenses its two main channels to 3 TV. The current fees collected by Rai are low and cover the costs of re-formatting those channels for mobile distribution – that is cutting off and replacing programming for which Rai does not have the pay-TV broadcast licence. Although Rai agreed to have its content distributed on pay-TV and in encrypted format, it favours the free-to-air model for its mobile TV strategy. The FTA content would be re-purposed for mobiles, as Rai does not consider there to be much potential audience for its traditional channels on mobile TV. Rai is also reluctant to have its audiences controlled by a telecoms operator.

The Rai transmission subsidiary is Raiway, who owns Italy's most extensive transmission network. Raiway is the main proponent in Italy of DAB and its sister-standards DAB+ and DMB and could conceivably in the future create a DAB-based alternative to the DVB-H platforms.

Since 1995, Raiway operates Italy's only DAB multiplex (with 1.5Mhz of bandwidth) under a government licence, using one of the four blocs of the VHF Band III Channel H2/12.15 But the technology was never marketed to Italian consumers and the reception base is believed to be almost inexistent.

In the course of 2006 and 2007, Raiway re-deployed its network, switched to DAB+ and increased (outdoor) coverage from 27 to 34 percent of the population, aiming to reach 50 percent by end-2007. It is creating regional platforms in partnership with private radio stations. The bouquets will include two or three 'visual radio' services[16] and one video feed. This offer could increase in the future if more bandwidth was to be allocated to DAB, for instance Channel A/13, currently attributed to but not used by the military and used without authorization in many areas by private broadcasters. Another option to obtain extra bandwidth for DAB would be to licence the four bits of intermediary frequencies between channels D/16 to H/20, a scenario considered unrealistic as any release of spectrum would trigger demands from other interested parties.

Rai is apparently aiming to create an operational digital radio platform, where Raiway would be the contractor for the private stations. This would be presented as a model for analogue TV switch-off where the main stumbling block is the question of how to buy out local analogue operators. The Rai DAB platform would also allow to showcase cheap €150 receivers with a TV screen to publicise the technology's potential.

Telecom Italia Media

Telecom Italia (TI) Media owns two national analogue TV networks, La Sette and MTV Italia, and two national DTT multiplexes. Despite some incremental improvement in recent years, La Sette and MTV together command only 3-4 percent national audience share. Telecom Italia Media is a quoted company and 69 percent owned by Telecom Italia. There has been regular speculation in Italy about possible TI plans to sell TI Media.

Telecom Italia Media has a DTT pay-per-view service competing with that of Mediaset. The main offering consists of domestic Serie A football games; TI, like Mediaset, has broadcast deals in place with a range of clubs, but these are smaller, less popular ones than the ones broadcast by Mediaset. However, an agreement between TI and Mediaset allows each platform to retail the games from its competitor. Thus TI Media is in position to supply the TIM TV mobile platform with all domestic football games and a selection of European ones.

[15] In some areas of the country Channel 12 is used by private television stations.
[16] Featuring still images

Sky Italia

The satellite platform Sky Italia was created in July 2003 by News Corporation after it acquired Telepiù and bought out Telecom Italia from their then jointly-owned bouquet Stream TV. Sky had 4.24 million subscribers in September 2007, up 2.3 million over the merger total. Sky retails its bouquet through ADSL TV to Fastweb subscribers and wholesales its premium channels to Telecom Italia and Wind, also for DSL distribution. Under the anti-trust undertakings made to the European Commission in 2003, News Corp cannot operate terrestrial channels until 2012, preventing the company from acquiring a terrestrial broadcaster and entering the DTT or DVB-H markets.

Sky is supplying channels to all three mobile TV platforms. But the services are 'basic' pay channels, the premium material on mobile TV is supplied by Mediaset to 3 TV and by Telecom Italia Media to TIM. The terms under which Sky is licensing its channels to DVB-H operators are not known.

Mobile telephony operators/mobile TV platforms

Mobile telephony operators

	Ownership	Networks	DVB-H bouquet
Telecom Italia/TIM	Telecom Italia	GSM, UMTS	TIM TV, with rented bandwidth on the Mediaset multiplex
Vodafone	Vodafone	GSM, UMTS	Vodafone Sky TV, with rented bandwidth on the Mediaset multiplex
Wind	Orascom	GSM, UMTS	None
3 Italia	Hutchinson Whampoa	UMTS	3 TV, on own multiplex

3 Italia/La 3 TV

3 Italia launched in 2003 and competes with market leader TIM, and challengers Vodafone and Wind. The latter three operators have both 2G and 3G networks, but 3 uses exclusively 3G. In June 2007, 3 was number four in the Italian mobile telephony market with 7.7 million subscribers. From launch, 3 has been constrained to compete mainly on voice call prices and DVB-H represents an opportunity to differentiate its service[17]. Thus, in sharp to contrast to Vodafone and TIM, 3 has been heavily promoting its mobile TV service.

3 Italia acquired the home shopping channel Canale 7 in April 2006 from Profit Group, and its network. Under the deal, 3 commissioned Profit Group to expand the network's coverage, for a total cost to 3 of €220 million. In May 2006, just in time for the football World Cup, the 3 DVB-H bouquet was the first commercial launch in Europe. 3 proposes a mixture of 'big' channels from Rai and Mediaset with niche services re-formatted for mobile distribution. It also produces its own promotional channel La 3 Live. Only about half of the multiplex bandwidth is used for the bouquet that includes about eight simultaneous feeds at any given moment.

[17] Further constraining 3 was the fact that about 90% of Italian mobile telephony subscriptions are pre-paid – in sharp contrast with other European markets where the 40-60% of subscriptions are post-paid contracts.

In June 2007, 3 had 719,000 subscribers on the DVB-H service, up from 400,000 in March. 3 has been heavily promoting DVB-H capable handsets, typically available at no cost for 30-month contracts with a minimum expenditure of €20 per month, or at €99 without any spending minimum (and a blocked SIM card). Moreover access to the TV content, including the premium football games, is available at no extra cost for a limited promotional period of 6-9 months to all buyers of a DVB-H handset. It is unclear if those who bought the phones in 2006 have seen their free content subscription extended after their initial promotional trial. Access is also free, that is included in the subscription fee, to all premium voice postpaid customers. 3 also retails a stand-alone DVB-H receiver without the telephony function for €349.

3 TV bouquet

Channel	Supplier	Description
La 3 Live	3 Italia	Programme guide and trailers
La 3 Sport	4 Italia	Domestic football, up to four simultaneous games
Sky Sport Mobile	Sky Italia	Dedicated sports channel
Sky TG 24	Sky Italia	Simulcast (news)
Sky Cinema Mobile	Sky Italia	Films, magazines, clips
Rai Uno	Rai	Simulcast
Rai Due	Rai	Simulcast
Canale 5, Italia 1, Rete 4	Mediaset	Best of Mediaset channels
Boing	Mediaset	Kids
Playboy	Playboy Enterprises	Adult
Penthouse	General Media	Adult

The official rate card for prepaid subscribers to the 3 TV service includes unlimited viewing of the basic package at €4 per day, €9 per week, €19 per month and €29 for three months. Up to now, viewing of premium content has been also included as a promotion in the above offer. 3 also offers two 'adult' channels, Penthouse and Playboy, not included in the promotions, at €4 per day, €9 per week, €19 per month and €29 for three months. These adult channels are believed by industry sources to generate the bulk of pay-per-use TV sales at 3.

According to audience data released by 3 Italia in October 2006, the majority of viewing on the platform was generated by the themed channels with 71percent, compared with 29 percent for the general interest services from Rai and Mediaset. Sports was the most popular genre of programming with a total of 28 percent for La 3 Sport and Sky Sport. As to the locations where viewing takes place, according to a survey of its users also published in late 2006, 3 said 13 percent of them watched exclusively at home, 62 percent 'mostly' out of it and 24 percent in both situations. Within those viewing their mobile TV out of home, a third watch it at work and over half while travelling.

It is unclear how successful the DVB-H project is from 3's point of view in the absence of dedicated profit and loss accounting. Since mid-2007, 3 Italia's advertising places much more emphasis on mobile Internet access, as opposed to live TV through DVB-H. Somewhat

confirming this shift in October 2007 the company said that, from 2010, it will use hierarchical modulation[18] to split its multiplex in two parts, one devoted to DVB-H and one to DTT.

Telecom Italia/TIM TV

The incumbent fixed line telephone company, Telecom Italia, also owns TIM, the country's largest mobile operator with 34.3 million subscribers in mid-2007, and Telecom Italia Media, which operates two national analogue channels (La Sette and MTV Italia) and two DTT multiplexes. Since October 2007, the largest shareholder in Telecom Italia is the Telco holding, with 24 percent, and in turn the Telco's largest shareholder is Spain's Telefónica, with 42 percent. It is unclear what impact Telefónica's shareholding may have on TI's mobile TV strategy.

TIM 'soft-launched' its own TV Mobile platform in May 2006 in time for the football World Cup and 3 Italia's own launch, using rented capacity from the Mediaset DVB-H multiplex. TI rents 40 percent of the multiplex's capacity. In the agreement with Mediaset, TIM widens the multiplex coverage by using its own mobile transmission network to install 'gap fillers'. Industrial sources estimate the cost of each gap filler (including installation) at €30,000. At the onset of the project, TI cited the figure of 4,000 gap fillers, but the actual installed number in November 2007 was 1,000 according to Mediaset, and it is unclear if the deployment of gap fillers will continue.

At the onset TI (like Vodafone) took a defensive view of DVB-H. The offering and pricing was set to retain the small minority of higher ARPU subscribers who would have churned to 3 Italia to gain access to its TV offer. TI is only subsidising handsets for its top end subscribers – that is those spending at least €60 per month in telephony and data. In October 2007 the only handset available was priced at €449 for subscribers with a lower ARPU and €199 for those spending more than €60 per month. A cheaper €149 handset from Italian new entrant manufacturer Brionvega was not available and it is assumed in the industry that Brionvega's entrance in the handset market on the coat tails of DVB-H has been a failure. TI estimates that 3 Italia's strategy for raising mobile TV penetration is extremely costly as the handsets retailed for €99 have an implicit subsidy of €200. In line with 3 Italia and Vodafone, TI's bouquets are heavily promoted with the first year of subscription, including premium football, in effect free.

TI has not disclosed sales figures but industry estimates put at below 50,000 the number of its DVB-H subscribers in October 2007. TI however reckons that 60 percent of its TV subscribers are below 34 years of age and that about 90 percent have the TV service as part of a bundle and pay no extra separate fee for it. Without giving details, TI recognises that the DVB-H project is heavily loss-making, mostly because of the minimum guaranteed licence fees paid to Mediaset. TI says it has no data on DVB-H usage but believes it must be in line with that of usage of TV delivered by UMTS, which is below five minutes per day.

[18] hierarchical modulation may carry a higher risk of interferences of adjacent channels.

Amongst the factors cited by TI as slowing adoption is the small range and high price of handsets. “Barriers to entry in terms of price and functionalities trade-offs must be low, TV must be embedded in the telephone, like the camera”, according to TI. The complexity of the sale process is also blamed, and specifically the fact that TV can not be activated straight away when the handset is acquired but a few hours after an activation request (this because of the intricacies of the conditional access system). TI also recognises that TV’s lower coverage than GSM and 3G networks has generated some dissatisfaction with users who cannot understand why they can make calls but not pick up the TV signal in a given location.

According to Mediaset, owners of mobile TV handsets on DVB-H say they watch it:

- Exclusively at home, 6%
- Mostly at home, 7%
- Both at home and away from home, 28%
- Mostly away from home, 33%
- Exclusively away from home, 26%

Overall 40 percent of usage occurs in mobile situations, such as work commutes. The data, from 2007, is broadly consistent with that released by 3 in 2006 (see above).

TIM TV bouquet

Channel	Supplier	Description
Canale 5	Mediaset	General interest
Italia 1	Mediaset	General interest
La 7	Telecom Italia Media	General interest
MTV Italia	Telecom Italia Media	Music
Sky TG 24	Sky Italia	News
Sky Sport 24	Sky Italia	Sports
Sky Meteo 24	Sky Italia	Weather
SI Live 24	Sportitalia (Ben Ammar/TF1)	Sports
Premium Calcio	Telecom Italia Media	Live domestic football

The original TI approach was to create a bouquet including major FTA channels plus a football premium component. The bouquet has room for about eight simultaneous feeds. The premium channels for football broadcast exclusively during games and use a higher bit rate which means that Sunday afternoons, when up to four games can be played simultaneously, most other channels are taken off the air.

However after 15 months of operation, the company is changing its view. In November 2007, TI strategists interviewed for this report saw the future of mobile TV as a delivery system for dedicated content, notably user-generated, featuring interactivity, and not as a way to access the same channels that are available in the living room. In fact TI has moved to the view taken by 3 Italia from launch. However, TI is not at the point of re-structuring its mobile TV bouquet yet. The company believes that any re-launch should include a partnership with one

or more content providers that would share risks and promotional efforts. For instance, TI would expect such partners to publicise DVB-H reception and educate the public on programmes that have mobile distribution. In the future, TI believes that mobile TV will offer a mixture of programmes using DVB-H, notably those with the largest live audience and the need for higher resolution like football games, and 3G.

Vodafone/ Vodafone Sky TV

The Italian unit of the UK-based Vodafone group is number two on the local mobile telephony market with 21.8 million subscribers in June 2007.

The Vodafone DVB-H service was launched just prior to Christmas 2006 under the Vodafone Sky TV brand. Sky Italia supplies the bulk of channels. The composition of the bouquet is very different from that of TIM TV: Vodafone focuses on mobile-only content, as opposed to giving mobile access to the existing top TV channels and content. Thus Vodafone has declined to carry Rai or Mediaset services and has also decided against broadcasting domestic football games, as opposed to its two rivals.

Vodafone Sky TV is positioned up-market. In October 2007 Vodafone retailed a single model of handset (the LG KU 950) at €49 for subscribers spending at least €25 per month on domestic calls (SMS excluded) for at least 24 months, or €599 without any spending commitment.

Vodafone Sky TV bouquet

Channel	Supplier	Description
Sky TG 24	Sky Italia	News
Sky Sport 24	Sky Italia	Sports
Fox One	Sky Italia	Entertainment
Sky Show	Sky Italia	Entertainment
FX Mobile	Sky Italia	Entertainment
SI Live 24	Sportitalia (Ben Ammar/TF1)	Sports
Cine Shots	N/a	Trailers
Disney Channel Mobile	Disney	Kids
DeeJay TV	L'Espresso	Music

The Vodafone Sky TV service has very little exposure on the websites and at Vodafone shops where the UMTS-based video-on-demand service Vodafone Live TV benefits from much more prominent publicity. The TV package costs €9.9 per month or €1.9 per day and promotions for acquirers of the LG handset include only one month of free subscription.

Vodafone subscribers using the LG handset can also access Vodafone Live TV, featuring a Vodafone portal and a piece of software allowing to download material from the wider internet. However the two services are not part of an integrated offering.

Outlook

Italy has emerged in 2006 as Europe's DVB-H pioneer market thanks to a liberal frequency usage regime and specific business considerations at broadcaster Mediaset and mobile operator 3 Italia. Mediaset saw the strategic opportunity to widen its terrestrial footprint and

simultaneously deny space to possible competitors. 3 Italia decided to invest in a TV service to make its consumer offering more distinctive. In turn TIM and Vodafone, renting capacity from Mediaset, launched their own services to prevent the risk of churn.

Eighteen months after DVB-H's commercial launch, on balance, the results are mixed.

From the broadcasters' point of view, as content providers, DVB-H is a one-way bet. For premium content suppliers Mediaset and Telecom Italia Media, DVB-H has allowed them to establish modest new revenue lines at practically no risk and no extra investment. The same is true for Sky Italia, however, by supplying only basic channels, the company's revenues from this operation are unlikely to be significant.

For free-to-air television content providers, DVB-H generates negligible revenues without any dedicated investment. Free-to-air broadcasters can rely on telephony operators for investment and development of a reception base that could possibly become increasingly valuable to FTA TV if it grew to reach a sizeable share of the population. The very dominance of the large broadcasters in the audience ratings makes it likely that they would keep some bargaining power, even in front of distributors with millions of customers, as it has been the case in the pay-TV industry. For the medium term, the benefits of mobile distribution appear to be much more in branding and strengthening the relationship with the audience rather than in the size of the new revenue flows. DVB-H remains only one aspect of the mobile distribution strategy broadcasters have to put in place, alongside podcasts delivered through the Internet, 3G, etc.

As a network operator, Mediaset is certainly the DVB-H player benefiting most from the new technology's deployment. Besides the strategic upside of wide control over Italian frequencies, Mediaset has created a credible and profitable business model that could repay its start-up investment cost.

Outcomes are more problematic for 3 Italia. In its current form, the mobile television offering has not achieved commercial success and the company is shifting its marketing away from TV. For TIM and Vodafone the (undisclosed) commercial investment was much more limited and, even with the benefit of hindsight, they have arguably taken a reasonable bet on the new technology to protect themselves against 3.

Could Italian consumer demand for DVB-H pick up in the medium term?

Handsets are the main drivers of the mobile consumer telephony market. As much as 40 percent of European mobile TV subscribers get a new handset each year, partly as a way to make a status or fashion statement, partly to benefit from the latest functions (like photo cameras and, increasingly, GPS). To gain acceptance from consumers, these latest features must generally not come with a higher handset weight. Thanks to the higher competition between mobile telephony providers, new features are also usually available at practically no extra cost.

In Italy the range of DVB-H handsets available is extremely low and they weigh more than

similar, DVB-H-less handsets. Moreover their battery life is shorter. Therefore it is not a surprise to see that even at 3 Italia, where DVB-H handsets are subsidised heavily and carry a price tag similar to that of handsets without TV, consumers seem to prefer those without broadcast television services.

With both Vodafone and TIM following a defensive strategy to minimise costs with DVB-H, it appears unlikely that the customer volumes generated by 3 alone will entice handset manufacturers to widen their offering. Nokia alone sells more than 100 million handsets per year in Europe and will make a shift to inclusion of a new technology only when it sees demand materializing on a global scale – as it appears to currently be the case with GPS. The eventual pick up of consumer demand in Italy for DVB-H handsets can only result from a wider offering and lower prices. This could come from higher global demand for DVB-H handsets, of which there is no clear indication as yet.

The future of DVB-H in Italy lies somewhere between two scenarios. In the pessimistic scenario, the reception base starts eroding as consumers who bought 3 subsidised handsets renew their hardware and choose other models without DVB-H. 3 goes ahead with plans and devotes bandwidth to DTT. Eventually the service is discontinued as it becomes evidently more profitable for 3 to wholesale bandwidth to DVB-T channels than use it for DVB-H broadcasts. Mobile TV is pursued by operators on other platforms, like HSDPA-enhanced 3G and, possibly, DMB or WiMax. For regulatory reasons, Mediaset can not use its multiplex for DVB-T, in this lower case scenario the broadcaster keeps its muliplex in operation at least until analogue switch-off.

In the best scenario for DVB-H, consumer penetration starts picking up from 2009 as new manufacturers (like Nokia and Motorola) enter the market and growing international demand leads to a decrease in the DVB-H handset price premium. The platforms are revamped with more dedicated content and integrated in a wider video offering including on-demand material from 3G and downloads from fixed line broadband (the video iPod model). Under this scenario, a mass market could emerge, but not before the first half of the next decade.

The Netherlands

Summary:

- *The Netherlands switched-off analogue terrestrial broadcasting in December 2006*
- *The incumbent telecom operator KPN has a uniquely strong position in broadcast mobile TV: It controls the national terrestrial TV transmission network and the Digitenne DTT platform with four national multiplexes while having the largest customer base of all mobile telephony operators*
- *According to its 2001 licence Digitenne is free to use part of its frequencies for mobile broadcast*
- *The Dutch government has taken a technology-neutral stand leaving KPN free to chose its standard for mobile TV broadcast. KPN has chosen DVB-H*
- *The KPN DVB-H bouquet was planned for launch in late 2007 but this was postponed to 'before the 2008 Olympics', reportedly because of the need to secure a wider supply of compatible handsets models*
- *The bouquet will be available on a wholesale basis to third-party distributors*
- *Rival mobile telephony operators Vodafone and T-Mobile already retail mobile TV packages over 3G and KPN launched a trial 3G bouquet in September 2007*
- *The commercial success or failure of the KPN bouquet will be an important indicator for a potential increase in the bandwidth devoted to DVB-H. If a failure, the emergence of rival platforms possibly using DAB/DMB is a possibility*

Regulatory environment

Overview

Cable television has existed in The Netherlands since the 1960s and has developed due to strong demand for channels from neighbouring countries as well as demand for private Dutch-language channels which didn't have terrestrial distribution. Since the late 1980s satellite TV has also been available. As a result the share of households which depended on terrestrial broadcasts alone was below 5 percent by 2000. This factor helped The Netherlands become the first country in Europe to switch-off analogue transmissions on 11th December 2006.

Digital terrestrial television multiplexes are licensed to the public broadcaster and to the Digitenne platform, owned by the telecom incumbent KPN. KPN plans to use some of its capacity to launch a DVB-H bouquet by the summer of 2008. The Ministry for Economic Affairs licences frequencies and the telecommunications and broadcast industries are overseen by OPTA – the *Onafhankelijke Post en Telecommunicatie Autoriteit*.

The Ministry and OPTA agreed the radio frequencies available for digital services in the

country at the RRC-06 conference in Geneva. Digital broadcasters can use frequencies in 174-230 MHz and 470-862 MHz bands. This includes one DVB-T layer and three T-DAB layers in the 174-230 MHz band and six DVB-T layers in 470-862 MHz band. In addition a further section is available providing 80 percent national coverage. Much of the spectrum was not available in 2006 and required agreements with neighbouring countries to facilitate its use.

Auctions for L-Band and Band III frequencies for DAB-based broadcasts are expected to be held in 2008. The government also plans to auction spectrum in the 2.6GHz band for mobile and WiMAX services in 2008. Discussions are underway between the Ministry of Economic affairs and the Ministry of Defence about freeing some UHF frequencies which are currently devoted to military use.

Digital terrestrial television licensing

Digitenne won the licence for terrestrial digital television in 2001 in a government tender for which it was the only candidate. The company was licensed four national multiplexes. The public broadcasting organisation NOS was licensed a fifth multiplex. The licences run for 15 years from 2002. In 2008 one more national multiplex is expected to be licensed by the Ministry through a call for tender. The new multiplex will use frequencies freed by the 2006 switch-off. Most of the frequencies freed have, however, already been attributed to DTT in order to complete the national coverage of the five multiplexes. VHF Band III frequencies are expected to be licensed in 2008 for use with the DAB family of standards.

KPN has already stated that its broadcast mobile TV platform will use DVB-H. The company is free to use any standard it judges fit as the government has taken a 'technology-neutral' stance. There is no indication that KPN has given consideration to alternative standards.

Key players

Broadcasters

Major broadcasters

	Ownership	Main FTA channels	Pay-TV
NOS	Public	Nederland1, Nederland2, Nederland 3	-
RTL Nederland	Bertelsmann	RTL4, RTL5, RTL7, RTL8	-
SBS Broadcasting	Pro Sieben Sat.1	SBS6, Net 5, Veronica	-
Versatel	Tele2	-	Tele2 Voetbal
UPC	Liberty Global	-	Film1, Sport1
KPN	Capital Research and Management 15%, Capital Group Int. 5%	-	Digitenne
Canal Digitaal Satelliet	Airbridge, Providence	-	Canal Digitaal

The Dutch broadcasting landscape is very competitive thanks to the historically high penetration of cable that has ensured early market access to commercial channels. The national public broadcasting organisation NOS produces three national channels and is primarily financed through the TV licence fee. The main two commercial players are RTL

Nederland and SBS Broadcasting with, respectively, four and three national channels. The vast majority of pay television subscribers over cable, DTT or satellite access only basic bouquets of free-to-air channels. Premium and pay-for channels have limited penetration.

Of the existing broadcasters, RTL Nederland has taken the most pro-active policy towards mobile TV with the announcement in 2006 of the launch of RTL Mobiel, offering customised content for mobile viewing, such as five or ten minute clips of broadcast programming. However, in late 2007 the channel is not yet available on the 3G bouquets.

Telecom operators and mobile TV platforms

Mobile network operators

	Ownership	Networks
KPN Mobiel	KPN	GSM, 3G
Telfort	KPN	GSM, 3G
Orange	Deutsche Telekom	GSM, 3G
T-Mobile	Deutsche Telekom	GSM, 3G
Vodafone	Vodafone	GSM, 3G

KPN

The incumbent telecom operator KPN is the key digital terrestrial television player in The Netherlands because it controls the Digitenne DTT platform and the terrestrial transmission company. It will launch a DVB-H bouquet in 2008. KPN is the number one mobile telephony company in The Netherlands through its KPN Mobiel and Telfort brands. The latter was acquired from Britain's O2 in 2003.

KPN bought the terrestrial transmission company Nozema in 2006 and re-named it KPN Broadcast Services. Nozema was a 40 percent shareholder in Digitenne with KPN holding 40 percent with KPN now controlling 80 percent of the DTT platform which remains a separate corporation. To meet regulatory competition undertakings, KPN sold 24 transmission sites to France's TDF in January 2007.

The launch of the DVB-H platform was delayed from an earlier target of end-2007 because of the issue of handset availability. Digitenne is considering the launch of VoD over HSDPA 3G to complement the DVB-H bouquet. KPN has stated that it will wholesale the DVB-H bouquet to third parties – as it already does with Digitenne.

In September 2007, KPN started testing a mobile TV service over 3G. Available to customers with a UMTS handset and a subscription to KPN's Surf&Mail data package, the service features eleven channels including Nederland 1, 2 and 3, RTL 4, RTL 7/Z, SBS6, TMF, Eurosport, CNN, Cartoon Network and the Discovery Channel. KPN is offering the service free to existing data subscribers until the end of the year as a way of analysing viewing patterns. Users need to sign up for access to the service and will be asked to participate in a questionnaire. At launch the service was only available to owners of three Nokia handsets models.

Vodafone

Vodafone launched its Dutch 3G mobile TV bouquet in 2005 on an à la carte basis and introduced subscription packages in May 2006 prior to the Football World Cup. In 2006, it reported average usage of 3 minutes per day for active users of the service. Since May 2007, customers have been able to subscribe for a flat fee of €7.50 per month. At that time Vodafone also expanded its themed channel offering by adding the major national channels of Nederland 1, 2 and 3, RTL 4 and SBS6. Customers can activate and de-activate the TV subscription on a monthly basis. Customers with no subscription can watch a large part of the programmes on demand for €0.5 per period of ten minutes.

T-Mobile

Deutsche Telekom acquired in 2007 the Dutch unit of France Télécom, including fixed line and mobile operations under the Orange brand. Orange launched its own mobile TV bouquet in May 2007 with a selection of major Dutch channels. Orange World TV offers a selection from the public broadcasters, RTL (RTL News), SBS and Tien (Voetbalvrouwen). Users can also access international channels such as BBC World, Euronews, the Cartoon Network and FashionTV. The service also includes a video-on-demand function for downloading video clips. The live TV service requires a UMTS data subscription. The TV service costs €7.50 per month for domestic channels, while an extra charge is added for premium channels such as the Cartoon Network or Playboy. There is no mobile TV service available to subscribers of packages under the T-Mobile brand.

Outlook

The details of the launch of a DVB-H bouquet by KPN in 2008 remain uncertain. Most notably, it is unclear if a full multiplex will be used or if DVB-H will share a stream with DVB-T using hierarchical modulation. However, the information which has been disclosed so far tends to indicate that the project will be the largest test ground for the technology since the Italian launch in 2006. KPN is the market leader in mobile telephony in The Netherlands and will take a pro-active stance, in contrast with Telecom Italia's TIM defensive approach. Unlike in France, KPN is fully in control of the platform and thus in a position to create the offering it regards as the most suited to its subscriber base. Finally, coming two years after the Italian launch, KPN will have a wider range of handsets to offer to consumers.

The KPN platform has the potential to be the most thorough test of actual consumer demand for mobile television. Industry players will be especially attentive to the commercial strategy of KPN, specifically to what extent it will subsidise DVB-H handsets and to what categories of subscribers the subsidies will extend. Whether the bouquet is included in a bundle of services or will be charged for separately will reveal the KPN assessment of the Dutch public's willingness to pay for mobile TV. Also of interest will be the selection of channels and the balance between simulcast of existing services and re-purposed channels, designed specifically for mobile viewing. The extent to which the new platform will integrate on-demand and 3G-based services will be key to differentiating the service against re-sellers of

the package.

If the KPN platform emerges as a reasonably successful venture with consumers, more frequencies could be devoted to DVB-H by the Dutch government or by the companies who will license the frequencies which are released next year. However if the project proves to be a commercial failure, possible alternative options, notably DMB, could find backers in the broadcasting industry.

Norway

Summary: The focus in Norway is on the launch of digital terrestrial TV at the present time and it is likely that Norway will adopt a "wait-and-see" strategy with respect to the roll-out of mobile TV services via broadcast networks.

Spectrum and regulation

Digital TV services via DVB-T commenced on the 1st September 2007 in Norway using MPEG-4 technology. The date for analogue switch-off has been set for 2010 and there is an aggressive ASO policy with the simulcast period set for one year only in some regions. The DVB-T multiplexes will also carry radio services which will use the MPEG-4 AAC+ audio codec.

The Norwegian government awarded five DVB-T network licenses in UHF Bands IV and V in June 2006 to a consortium known as NTV which is jointly owned by the public broadcaster NRK, the main commercial broadcaster TV2 and Telenor, the incumbent telecoms operator.

The primary interest within the NTV consortium is to use these multiplexes for fixed TV broadcasting (and probably HDTV services in the future) so as to better compete with cable and satellite television services.

NTV has a regulatory obligation to build three multiplexes but it has decided to roll-out all five multiplexes. The consortium has already started to roll-out the first three of these multiplexes.

There are currently no plans to use any of the five multiplexes for DVB-H. The regulations stipulate that these multiplexes must provide extensive population coverage which means it is would be prohibitively expensive to build a DVB-H network outside the four main cities in Norway (which account for 50 percent of the population).

There are two further multiplexes in UHF Band V which will be available after 2009 although they do not have nationwide coverage. These channels are in the bands above Channel 60. These could be used in the future for DVB-H, mobile applications or other completely different applications.

The Ministry of Culture is investigating how the digital dividend should be used in Norway. It is due to make a recommendation by March 2008. All issues regarding how the spectrum should be licensed (for example, beauty contest or auction, etc.) are being investigated by the Ministry.

The European Commission is expected to publish a communication before the end of 2007 which will provide recommendations on how the digital dividend spectrum should be used across Europe. The Ministry of Culture is keen to review the Commission's recommendations before making any decisions on how to allocate further spectrum.

The digital dividend also includes spectrum in VHF Band III. Norway has been allocated

three 1.5 MHz blocks plus one 7 MHz DVB-T block in this band.

Two of these multiplexes are currently being used for DAB digital radio. It is very likely that the remaining multiplex will also be used for DAB. However, it is unclear at the present time whether the DVB-T multiplex will be used for DAB and T-DMB or for other applications.

Key players

The broadcast landscape in Norway is dominated by the public broadcaster and the commercial sector is relatively small. The key player is thus NRK and the main commercial broadcaster TV2.

In the telecoms sector, the incumbent operator Telenor is the main telecoms operator and also provides broadcast network services via its Telenor broadcast division and its wholly owned subsidiary Norkring.

Technology and services

A major issue for Norway is the cost of rolling-out a dedicated DVB-H network. Norway is a sparsely populated and mountainous country with around 4.5 million inhabitants which means that it would be prohibitively expensive to build a nationwide network. A small population and high network costs means that it will be very difficult to create a viable business case in Norway. As a result, telecoms players such as Telenor are looking at the use of 3G/MBMS in conjunction with DVB-H.

NRK is fully committed to DAB digital radio and has even tentatively set an analogue radio switch-off date. It is also interested in using its DAB network to launch T-DMB mobile TV services. The company is cooperating with the commercial TV sector and may launch a trial service in 2008.

As there is ample VHF Band III spectrum for both radio and mobile TV services in Norway, it could make commercial sense to build a single network covering in excess of 98.8 percent coverage.

However, NRK must finance the launch of T-DMB services by itself and the Norwegian government is unlikely to provide any additional financial resources. Hence it remains to be seen whether NRK will have sufficient finance to launch these services.

NRK would have a stronger business case if it could partner with the commercial broadcasters. However, the TV advertising market is small in Norway and there are doubts about whether commercial broadcasters would be able to generate any revenues on a T-DMB platform.

Another issue is the availability of handsets. T-DMB handsets are only available from Korean manufacturers such as Samsung and LG. In Norway, and in Scandinavia as a whole, the mobile phone market is dominated by Nokia and Sony Ericsson and Korean handsets account for less than 10 percent of the total market. Hence it remains to be seen whether consumers would be prepared to change handsets in order to access one new service.

In future, the introduction of multi-standard phones (DVB-H/T-DMB) may help to resolve this issue.

There may also be an opportunity to develop a mobile TV market for non-connected devices such as PMPs, car navigation devices, laptops, USB devices, etc. This may be more than a niche market. Experience in South Korea shows that the non-connected device market accounts for a substantial part of the total number of T-DMB devices sold to date.

Outlook

Mobile TV in Norway could develop via a number of technologies. There is strong support for T-DMB from the public broadcaster whilst the telecoms industry favours the use of a combination of 3G, MBMS and DVB-H.

A FTA service offering the most popular or core channels (the five main channels in Norway account for 80 percent of viewing) could undermine a pay-TV service even if that service offered more channels.

However, as with its Scandinavian neighbours, Norway is likely to wait and see how mobile TV develops in other European countries before making any decisions at home particularly as it is likely that there will be other technology options available during the next five years.

Portugal

Summary: Although mobile TV services are offered on 3G networks, there are no immediate plans to launch mobile TV services via broadcast networks in Portugal.

Spectrum and regulation

According to the Geneva 2006 Agreement, Portugal has sufficient spectrum in both VHF Band III for T-DMB and in UHF Bands IV and V for DVB-H or other technologies.

There will be a total of seven DVB-T multiplexes in Portugal: two with national coverage and five with regional coverage.

The main priority in Portugal at present is to launch digital TV services, which is still at the first stage of the tendering process following many years of delay.

The government intends to award licenses for two multiplexes: one for FTA services and other for pay-services. The government may announce a decision on the winning bid by the end of 2007. However, due to the many bids received, it more likely that a final decision will not be made until mid-2008.

Key players

The key players in Portugal are the public broadcaster RTP and mobile operators such as TMN.

Technology and services

There have been several technical trials and demonstrations in the country. In 2006, commercial broadcaster TV1 carried out a DVB-H trial with Vodafone Portugal in the greater Lisbon area.

More recently, Alcatel-Lucent and Vodafone Portugal demonstrated DVB-SH technology using S-band frequencies. Channels broadcast included the Euronews channel (which was broadcast in several languages) plus content from RTP Mobile, SIC Channel and TVI Channel. DVB-SH handsets were provided by Sagem Mobiles.

RTP operates a DAB network in Portugal and although digital radio has stalled in the country since its launch in 1999, there is interest in using this network for mobile TV services via T-DMB. However, it remains to be seen whether there is sufficient political support for T-DMB within RTP as DVB-H is perceived as the preferred standard for mobile TV.

RTP launched a 24/7 3G TV service in July 2006. The company claims that the service is proving popular but that the mobile operators are not actively marketing it.

Altogether around 25 channels are offered for a subscription price of €7.5 per month for unlimited access or 90c per day. Operators have also started to split the 25 channels into a number of thematic packages (for example, news, sport, soaps, etc.) and the prices for these packages start at €4.40 per month.

Outlook

As with other smaller European countries, Portugal is unlikely to rush into deploying mobile TV infrastructure for some time and is likely to monitor developments in the main European economies before making any firm decisions with respect to technology and regulation.

Spain

Summary: Although DVB-H has been adopted as the de-facto standard for mobile TV in Spain, delays in passing new legislation by the Spanish parliament means that commercial services may not be launched until late 2008 or even 2009.

Spectrum and regulation

There are seven DVB-T multiplexes operational in Spain at present. According to the Geneva 2006 Agreement, it is expected that there will be sufficient spectrum for a total of up to thirteen DVB-T multiplexes following analogue TV switch-off which is scheduled for the 3rd April 2010.

Eight of these will be national multiplexes (two for RTVE and six for commercial broadcasters), two will be regional multiplexes, one a DVB-H multiplex and one or possibly two will be local multiplexes.

In several autonomous communities there may be a third multiplex for community cross border transmissions.

There is also spectrum available in VHF Band III, part of which is currently used for digital radio services via DAB. According to the Geneva 2006 plan, the total amount of spectrum allocated to Spain amounts to six 1.5 MHz DAB blocks plus one 7 MHz DVB-T block.

In April 2007, the government via the Ministry of Industry, Tourism and Commerce opened a public consultation on the subject of mobile TV in Spain. There was an unanimous support for DVB-H to the exclusion of all other technologies and the government decided to initiate the legislative process to permit commercial mobile TV services to be launched in Spain.

Originally, mobile TV legislation was to be included as part of the “Ley Generale del Audio-visual.” However, this law only exists in draft format and is not expected to be submitted to the Spanish parliament until after March 2008. An ad-hoc law for Terrestrial and Satellite Mobile TV and Satellite Radio was also drafted.

As a result, the legislation to permit mobile TV via broadcast networks was added as an annex to another law known as the “Ley de Medidas de Impulso de la Sociedad de la Información” or LISI. It was thought that this law would proceed quicker through the Spanish parliament than an ad-hoc law “Ley General del Audio-visual.” However, in the meantime, many other unrelated issues have been added to the LISI with the result that the annex on mobile TV regulation has been excluded and can thus be re-introduced into Parliament once agreement has been reached on the manner for its re-introduction.

The general election scheduled for March 2008 will cause a further delay since all parliamentary activities will cease at the end of the year. This means that the adoption of the mobile TV legislation will be delayed by at least six months, or more probably, 12 months.

As in most other European countries, DVB-T broadcasters are awarded a frequency license

for a particular multiplex. However, the new mobile TV legislation will separate content and frequency licensing. This means that the DVB-H frequency license will be awarded to a network operator and broadcasters (and other content providers) will need to apply for the convenient content authorization from the government. Once granted broadcasters will then need to negotiate with the network operator in order be allocated into the capacity on the DVB-H network.

A technical plan as well as the regulatory conditions for content providers will be published by the Ministry of Industry once the mobile TV legislation has been approved by the parliament. A call for tender for the network provider licenses will then be issued. All these documents can be published without needing parliamentary approval.

A draft version of the technical plan has already been published and includes the following proposals:

- Coverage: The government wants mobile TV to be rolled out within a 3 year period with deployment in several phases:
    - Phase 1: Cities with a population of more than 1 million (Madrid and Barcelona)
    - Phase 2: Towns and cities with a population of more than 250,000
    - Phase 3: All provincial capitals, autonomous cities and other autonomous community capitals of which there are 41 locations in Spain with a population between 225,000 and 30,000.

It is estimated that a DVB-H network covering Phases 1 and 2 will result in around 20-30 percent coverage of the Spanish population. However, some of the mobile network operators view DVB-H as a complement to their 3G networks and only wish to deploy DVB-H in the high density traffic areas rather than in the provincial capitals.

Spectrum for DVB-H will be limited to the major cities and provincial capitals until analogue TV is switched off on the 3 April 2010.

- Content providers will be expected to pay transmission costs to the network operator although RTVE is lobbying the government to mandate that two or three of its channels should have “must-carry” status which probably means that RTVE will not be obliged to pay transmission costs.
- The DVB-H network license will be awarded by a beauty contest rather than an auction process.

Key players

As in other countries, a critical aspect of the DVB-H business in Spain will be the role of the network provider and the nature of the business model. Clearly, the government will play a key role in establishing some regulatory conditions and ultimately selecting the winning

applicant based on a set of pre-determined criteria.

The main contenders are Abertis Telecom, the leading broadcast network operator in Spain, rival regional operator Axion (majority owned by TDF) and the mobile network operators (Telefonica Movilstar, Orange and Vodafone) either together as a consortium or individually in a partnership with a broadcast network operator.

The major issue for the broadcasters is ensuring fair access to the DVB-H network. The commercial broadcasters association UTECA is lobbying for seven channels to be reserved for broadcasters (one for RTVE and six for commercial broadcasters). Another major issue is copyright costs as broadcasters will have to pay additional fees for simulcasting DVB-T content on the DVB-H network.

Most players expect a DVB-H service in Spain to be a pay-service. If so, consumers will expect a high quality of service and will therefore expect to receive the programming in exactly the same environments as mobile phone voice calls. However, providing indoor penetration will be difficult in Spain due to interference issues (with DVB-T channels on adjacent frequencies) and will inevitably have a major impact on the cost of the DVB-H network.

Due to the interference issues, it is possible that the service could be marketed as a portable outdoor service which could mean that it may be a free-to-air service. However, this will depend on who is providing the network service: a broadcaster or an MNO.

Technology and services

During the past two years, there have been numerous mobile TV trials in Spain and there was an extensive demonstration of mobile broadcast technologies at the 3GSM conference in Barcelona (see table below).

Although Spain has launched digital radio services via the Eureka-147 DAB standard, there is no interest in using T-DMB or DAB-IP even though Spain has an abundance of spectrum in VHF Band III.

Mobile broadcast technologies demonstrated at 3GSM in February 2007

Technology	Partners	Content	Technical details
DVB-H	Nokia, Abertis Telecom, 3GSM Association	11 channels (2 encrypted)	RF freq: Ch 22 (482 MHz) Platform: Nokia 3.1
DVB-H	Siemens, Abertis Telecom, 3 GSM Association	8 channels 3 interactive TV	RF freq: Ch 42 (642 MHz) Platform IPDC-CBMS
DVB-H	Thomson, Abertis Telecom, 3GSM Association	6 channels	RF freq: Ch 28 (530 MHz) Platform IPDC-CBMS
DVB-H	SIDSA, Abertis Telecom, 3G Association	11 channels (1 encrypted)	RF freq: Ch 30 (546 MHz) Platform IPDC-CBMS
MediaFLO	Qualcomm, Abertis Telecom	20 channels (local and international)	RF freq: Ch 50 Platform: MediaFLO
DVB-SH	Alcatel Lucent, Abertis Telecom, 3GSM Association	3-7 channels	RF freq: 3 slots of 5 MHz 2172.5 -2177.5 – 2182.5 MHz Platform: Alcatel-Lucent
DAB-IP, T-DMB	WorldDMB Association, Abertis Telecom, 3G Association	5 channels	RF freq: 9D-11C Platform: Eureka-147 DAB

In Spain, the number of consumers paying for TV content is proportionally less than in most other European countries and this may influence the type of business model adopted for DVB-H.

The number of pay-TV households in Spain is approximately 3.6 million (or 22.5 percent of total households, which may suggest that a pay-TV business model will face more hurdles in Spain than in some other countries (see table below).

Several mobile operators (for example, Vodafone and Movilstar) have launched 3G TV services as have a number of content providers (for example, Sogecable) via their own portals. The number of 3G TV subscribers is estimated to be around 150,000 (mid-2007) but growth has stagnated as successive free-trial periods terminated and consumers were obliged to pay for the services.

The Spanish TV market (March 2007 figures)

Platform	Households	Penetration (%)
Terrestrial TV:		
- Analogue	15.9 million	99.0%
- Digital	3.0 million	19.4%
Satellite:		
- Free-to-Air	2.6 million	16.4%
- Subscription*	2.04 million	12.6%
IPTV (ADSL)*	0.44 million	2.5%
Cable*	1.141 million	7.2%
*pay-TV services		

3G mobile TV services are offered on a monthly subscription or pay-per-day or pay-per-view (i.e. individual programmes) basis. Some channels carry advertising and are free to the consumer. According to Sogecable, the ad-supported channels are more popular with Spanish consumers. Sogecable believes that mobile TV in the future will be predominantly advertising based rather than subscription based. An advertising-based mobile TV will probably be more lucrative for broadcasters than a pay-TV business.

Outlook

Despite an unequivocal agreement on the technical standard for mobile TV, it seems unlikely that mobile TV via DVB-H will start in Spain until at least the end of 2008 and maybe not even until 2009 due to legislative delays.

A twelve month delay could have important implications for the roll-out of DVB-H in Spain. DVB-H has a window of opportunity in Europe at present but if the uptake of services in other countries is disappointing, MNOs could lose interest in DVB-H and decide to put more emphasis on their own 3G-related technologies (HSPDA and MBMS) rather than a dedicated mobile broadcast platform such as DVB-H.

Sweden

Summary: Although all mobile operators in Sweden offer mobile TV services via their 3G networks, the launch of mobile TV services via a dedicated mobile broadcast networks seems a distant prospect at the present time and there are several options regarding the most appropriate technology platform.

Spectrum and regulation

There are five DVB-T multiplexes currently in operation, one operated by the public broadcaster SVT and four by commercial broadcasters. All five DVB-T networks are operated by Teracom, a company wholly owned by the Swedish government. Analogue TV was switched off on the 15th October 2007.

The digital dividend in Sweden consists of 56 MHz of spectrum in VHF Band III and additional space in UHF Bands IV and V which is sufficient for two national DVB-T coverages.

The Swedish government is presently deliberating on how to allocate the digital dividend spectrum. The first part of this process involves deciding whether or not to allocate further spectrum to DVB-T broadcasting. The government is currently reviewing a number of amendments to the existing broadcasting law which will probably have an impact on digital dividend spectrum allocation in Sweden.

A Broadcasting bill has been submitted to the Swedish parliament. The main purpose of the bill is to open up the DVB-T pay-TV market in Sweden. Currently, there is only one operator, Boxer, which is jointly owned by network operator Teracom (70 percent) and venture capital company 3i (30 percent). The bill proposes to allow other pay-TV platforms to operate on the DVB-T network thus giving content providers and consumers a choice of service providers.

Another proposal in the bill is to transfer radio and TV licensing from the government to the Radio and TV Authority. At present, it is the government that issues broadcasters with licenses.

As part of the bill, it is expected that the government will also announce whether DVB-T will be allocated further spectrum. This could be part of the digital dividend spectrum (i.e. one multiplex), all (i.e. both multiplexes) or no spectrum at all.

This is expected to be an interim or partial decision and the final decision on the usage of the digital dividend spectrum is not likely to be taken for several years. The Swedish parliament is expected to vote on the bill before the end of 2007 or early 2008.

Key players

The telecoms regulator PTS has published a report on the future use of the digital dividend in Sweden. In the main, the report suggests that the digital dividend spectrum (both VHF and UHF) should not be awarded for broadcasting applications but rather should be auctioned on

a “technology-and service-neutral” basis.

As a result, it is possible that some or all of the VHF Band III spectrum (i.e. a total of 56 MHz) could also be auctioned. However, the interest in acquiring this spectrum will only become clear once the decision on the UHF spectrum is taken.

The PTS is also of the view that Sweden should adopt a “wait-and-see” attitude with respect to making any decisions about the use of spectrum in Bands III, IV and V. The agency warns against making any irrevocable decisions until a consensus has been reached with other European countries regarding the most appropriate use of the digital dividend frequencies.

The main interest is in the UHF spectrum and a number of players have expressed an interest in acquiring this spectrum.

SVT wishes to acquire the digital dividend spectrum in order to start the process of transitioning to MPEG-4 AVC and to introduce HDTV services. Both the satellite and cable TV operators in Sweden are offering or plan to offer HDTV services and SVT argues that if it is not able to follow suit then viewers will desert the DVB-T platform in a few years’ time. However, commercial DVB-T operators appear to be less keen on HDTV and seem to be more interested in acquiring new spectrum to extend their SDTV offerings.

The broadcasting industry argues that it must plan for the transition from MPEG-2 to MPEG-4 AVC and needs new spectrum for simulcasting for a number of years. It proposes that this spectrum could be reclaimed by the government once the transition to MPEG-4 AVC is complete.

The interest in using UHF spectrum for mobile TV via DVB-H amongst the broadcasting industry seems to have decreased during the past few months. The broadcasters and the network operator Teracom believe that the spectrum should be used for fixed TV broadcasting (either SDTV or HDTV) rather than using exclusively for mobile TV via DVB-H or any other technology.

An option being proposed by SVT and supported by the pubic radio broadcaster Swedish Radio is to use VHF Band III frequencies for mobile TV and to reserve the UHF spectrum for fixed TV broadcasting. This would entail the use of Eureka-147-based mobile TV technologies such as T-DMB or an IP-based alternative such as DAB-IP. Such a strategy could offer a number of advantages:

- Lower network costs and higher population coverage. Due to the lower frequencies, the cost of building a mobile TV network would be much lower and it would be possible to provide a much higher coverage than a DVB-H network in the UHF frequencies
- An Eureka-147 based mobile TV network could also carry DAB digital radio and various DAB data services. Swedish Radio is obliged to provide 98.8 percent population coverage and hence an Eureka-147 based digital radio and mobile TV

network could be a cost-effective solution

Although part of the VHF Band III spectrum is currently being used for DAB by Swedish Radio, the government has not addressed the issue of whether to continue (and expand) DAB services or whether to use other alternative technologies for digitizing radio in the future.

Sweden was one of the first countries in Europe to launch digital radio services via DAB. However, for various reasons the development of DAB has stalled and the government announced in 2005 that it was adopting a "wait-and-see" strategy with respect to the transition of radio to digital.

At the same time, the government commissioned the Swedish Radio and Television Authority to monitor the development of various digital radio technologies by publishing a series of three annual reports. The first two reports were published in mid-2006 and mid-2007 and the final report is expected in mid 2008. The government has stated that it will address the digital radio issue after the third and final report has been published.

It should be noted that the Authority's brief is to produce background material in order to compare the different types of technology – and not to recommend a specific digital platform for radio in Sweden.

Technology and services

Sweden is a large but sparsely populated mountainous country with a population of around 9 million. Most of inhabitants live in the south of the country in the major cities of Stockholm, Gothenburg and Malmo. A major issue in Sweden is the cost of rolling out a DVB-H network and whether it is possible to generate a return on the investment.

A solution being proposed by Nokia is to build a hybrid DVB-T/DVB-H network whereby one part of the multiplex is used for DVB-T and another part is used for DVB-H. This may be a plausible solution in the future, but such a proposal seems unworkable under the current broadcasting legislation as SVT is obliged by law to provide its programming to 99.8 percent of the Swedish population.

This requires extensive network coverage and building a hybrid DVB-T/DVB-H network which would need many more transmitters than for DVB-T alone and thus increase network costs significantly compared to a normal DVB-T network. The increased costs could not be carried by SVT alone and any reduction in the network coverage obligation would necessitate a change in the broadcasting law.

An alternative solution being discussed is to provide the required coverage via the use of multiple-platforms. This would entail building a seamless network based on various technologies such as DVB-H, T-DMB, DVB-SH and 3G.

There is also strong interest in using the digital dividend spectrum for mobile applications, in particular, via MBMS. Ericsson, a major Swedish company, is a leading player in this market

and there is support for the view that the government's industrial policy should support Swedish companies and Swedish technologies. However, the interest is probably for the long-term as no mobile vendors (with the exception of DVB-H hardware vendors) currently manufacture equipment for UHF frequencies.

Although a number of countries (including Sweden) have expressed an interest in using parts of the UHF spectrum for mobile applications, there is no certainty that these frequencies will be available in a harmonized way across Europe. As a result, it is unlikely that vendors will develop equipment for these bands - or that any mobile service provider would be prepared to bid at auction for these frequencies - until the answer to this question become clear. The issue will probably not be resolved until 2011 and the frequencies will not be available on an European wide basis until 2015, when protection for analogue TV transmissions ends.

Outlook

The Swedish parliament has indicated in the past that it favours allocating additional spectrum to broadcasting. However, there is a strong lobby from the mobile community and it is unclear whether the government still supports this view.

It is expected that the Swedish parliament will announce how much (if any) of the new digital dividend spectrum will be allocated to fixed broadcasting by the end of 2007 or early 2008 and whether this will be on a temporary basis (as proposed by the broadcasting industry) or on a permanent basis.

Beyond this, it is likely that the government may adopt the same strategy it adopted with digital radio and decide to postpone a decision on mobile TV and the use of the digital dividend spectrum until it becomes clearer how the mobile TV is developing in other European countries and the issues regarding spectrum harmonization (particularly for mobile applications) across Europe have been resolved.

The table below summarizes the results of a study undertaken in Sweden to evaluate the economic benefits of various broadcast and mobile wireless technologies

Comparison of estimated economic benefits of different broadcast and mobile wireless technologies in Sweden[19]

	More SDTV	HDTV	DVB-H	MBMS	WiMAX	Mobile Broadband
Consumers willing to pay	724,000	553,000	1,617,000	1,617,000	240,000	0
Payment Per customer (SEK)	17	32	40	40	230-1180	NA
Willingness to pay (SEK million/year)	119	212	783	783	947	NA
Other revenues (SEK million/year)	61	110	92	92	-	-
Total revenues (SEK million per year)	180	322	975	975	950	-
Frequency requirements	8 MHz*	8 MHz*	8 MHz*	Reused spectrum	Reused spectrum	2 x 8 MHz*
Infrastructure Investment (SEK million)	130	130	1400	1400	3000	820
Investment in terminals (SEK million)	0	550	600	600	480	-
* internationally coordinated spectrum						

[19] Source: *The use of radio spectrum following the switch-off of analogue terrestrial television broadcasting*, PTS Report, Stockholm, September 2006

Switzerland

Summary: It is likely that there will be two mobile TV services in Switzerland: one a pay or subscription service controlled by the mobile industry and targeted at mobile phone devices and the other a free-to-air service controlled by broadcasters and targeted (initially at least) at non-phone devices

Spectrum and regulation

Switzerland has a total of seven DVB-T coverages, two of which are being designed to be suitable for DVB-H portable outdoor services.

There is also ample spectrum for mobile TV via the Eureka-147 DAB standard. Sufficient spectrum exists today for three DAB coverages plus the possibility to split one DVB-T block in VHF Band III and use it for DAB applications. The regulator ComCom is currently investigating the technical and legal issues associated with this process.

A call for tender for a national mobile TV license using the first multiplex was launched by the Swiss Federal Office of Communications (ComCom) on the 5th June 2007. Two candidates submitted bids: Mobile TV Schweiz AG (with partners T-Systems Media & Broadcast GmbH and South Korea Telecom) and Swisscom Broadcast AG, a subsidiary of the incumbent telecommunications provider Swisscom.

The bids were evaluated on a beauty contest basis and the criteria used included coverage and rollout schedules, business and service plan, contribution to media diversity, compliance with license conditions, legal requirements and financial credibility.

On the 28th September, it was announced that the winning bid was Swisscom Broadcast. It is believed that one of the key reasons for awarding the license to Swisscom was that the company was better placed to roll-out the DVB-H infrastructure in time for the European football championships in June 2008. Swisscom Broadcast is the only broadcast network operator in Switzerland and controls access to most of the transmitter sites in Switzerland.

The license will be for ten years and Swisscom Broadcast will be required to comply with a number of license conditions:

- Network coverage: In its call for tender, the regulator stipulated that the network operator should provide at least 30 percent network coverage by the end of May 2008 (including Euro 2008 host cities Basel, Berne, Geneva and Zurich) and at least 50 percent by the end of 2012. However, Swisscom Broadcast proposed to provide 44 percent population coverage by the end of May 2008 and approximately 60 percent by the end of 2012
- Technical standards - although the call for tender did not specify that a specific technical standard should be used, the regulator favors DVB-H and Swisscom Broadcast proposed to adopt this standard

- Unlike many other countries, there are no “must-carry” obligations for broadcasters. However, Swisscom Broadcast is obliged to provide “all TV broadcasters and telecommunications providers with equal access to the platform under equitable and non-discriminatory conditions in accordance with article 51 of the Law on Radio and Television.”
- Swisscom Broadcast must comply with network planning regulations and adhere to the strict non-ionising radiation limits in Switzerland. In practice, this could limit DVB-H reception in a mobile environment (for example, on cars and trains), unless extra transmitters are built which will clearly add significantly to network costs
- At least 70 percent of the multiplex capacity should be used for radio and television transmission.
- There are no regulatory requirements to allow non-connected devices to access the DVB-H platform (and it is highly unlikely that this will happen)

It is likely that a large proportion of the content on the platform will be from the public broadcaster SRG. In Switzerland, all FTA TV content can be re-distributed by paying a small fee which is regulated by the government. This means that any content aggregator, for example, a DVB-H platform provider, has the automatic right to include FTA content in its content package. Copyright charges are included in the fee, which are paid directly to the copyright authorities. The broadcasters receive a portion of the fee from the copyright authorities.

Although Swisscom Broadcast is obliged to provide access to all TV and telecommunication service providers it is clear that the DVB-H service in Switzerland will be under the control of the mobile operators.

It is unclear exactly how access to the capacity will be shared between the four main MNOs. However, operators will have a right to appeal to the regulator if they deem that they are not being treated fairly.

Unfortunately, the same does not appear to be the case for the broadcasters. Switzerland is the only country so far not to issue “must-carry” rules and although broadcasters can try to influence the platform operator and the MNOs, it appears that it is the MNOs that will have the final say. However, it is inevitable that Swisscom Broadcast will offer SRG channels on its platform as it is the dominant broadcaster in Switzerland.

Clearly, this is not good news for broadcasters but it may mean that the MNOs, particularly Swisscom Mobile, will be more committed to allocating resources to market DVB-H services than they might have been if the business model was operated by a “neutral” third party.

Key players

The key player in the Swiss mobile TV market is clearly Swisscom. Swisscom Broadcast is

owned by Swisscom which also owns Swisscom Mobile, which is by far the dominant mobile operator in Switzerland.

Hence, it can be expected that Swisscom Mobile will have considerable influence on the platform. MNOs such as Swisscom Mobile will also decide issues such as the extent of indoor coverage (if any), coverage on public transportation such as trains, etc. MVNOs will receive DVB-H services via their respective MNOs.

Technology and services

The DVB-H platform will be deployed in 12 different coverage areas and will use UHF Channels 21-42. Swisscom proposes to use a non-proprietary OMA BCAST platform from Nokia for encryption.

Although the Swiss public broadcaster SRG will provide content for the DVB-H network, it also intends to launch T-DMB services on the third Swiss DAB multiplex. The broadcaster believes that T-DMB will provide higher quality reception in every mobile environment and particularly at the high speeds encountered on the Swiss railway network.

SRG is fully committed to the Eureka-147 DAB standard for digital radio and intends to launch a free-to-air service starting in 2010 in the major towns and cities.

SRG is funded by a license fee (60 percent), advertising (30 percent) and the remainder (10 percent) from other sources such as programming sales, DVDs, etc. The company believes that it can finance and build its own T-DMB networks. As SRG is a public service broadcaster it is obliged to provide 99.8 percent population coverage. SRG is working with the Swiss railway authorities and plans to have all tunnels equipped with T-DMB repeaters so that T-DMB services can be received in every train carriage in Switzerland.

In contrast to the DVB-H service which is focused on mobile phones, the focus of SRG will be on non-phone devices.

Outlook

With the Euro 2008 football tournament being hosted jointly by Austria and Switzerland in June 2008, the Swiss authorities have embarked on an ambitious plan to launch commercial DVB-H services prior to the tournament.

Despite the political goodwill amongst market players, launching commercial DVB-H services in time for the Euro 2008 will be a challenge. However, the biggest challenge of all is likely to be convincing consumers to pay for mobile TV services, particularly after the end of the football tournament.

Although not directly competing, it will be interesting to see how two different mobile TV businesses develop in a country where broadcasting is dominated by the public broadcaster.

United Kingdom

Summary:

UK regulation

- *Ofcom, the UK communications regulator, is currently pursuing a technology neutral approach to spectrum licensing, and hence no spectrum will be set aside specifically for mobile TV*
- *Furthermore, despite the European Commission's attempt to centralise mobile TV broadcasting standards around DVB-H, this conflicts with Ofcom's position of technology neutrality, and currently any of the principal technologies could be used in the UK*
- *Spectrum allocation will be through auctions, with L-Band spectrum due to be auctioned in H1 2008 and UHF spectrum from the digital dividend now likely to be auctioned in early 2009*
- *Before 2012, there are only limited options for a mobile TV network in the UK, with Channel 36 in the UHF band and the L-Band the main contenders, while TDD and VHF spectrum remain outside possibilities*

Mobile TV to date

- *Broadcast mobile TV services were launched in the UK by BT Movio in October 2006, using DAB-IP technology in VHF Band III spectrum. However the service has not managed to attract significant customer numbers or sufficient interest from the mobile operators, and it is due to close at the start of 2008*
- *All of the four front-running technology contenders, DAB, DVB-H, MediaFLO and TDtv have been tested in trials in the UK*
- *Mobile TV services are available over 3G from four of the UK's five mobile network operators, with channel package pricing ranging from £3 to £10 a month, although there has been limited reported success for these services to date*

Mobile TV outlook

- *The prospects for broadcast mobile TV in the UK remain uncertain, as none of the main players in the UK has yet committed to running a platform, and competition for spectrum from other technologies such as WiMAX means there is no guarantee that spectrum will be available.*
- *Evidence of consumer demand for paid services has yet to be demonstrated, with the BT Movio service failing to garner sufficient interest. However Sky is having some success with its premium packaged content*

- *While uptake remains low the mobile operators have sufficient capacity on their own networks to operate mobile TV services over non-broadcast 3G networks, however this cannot not present a long term solution for a mass market service.*
- *Most industry players believe that broadcast mobile TV services are likely to be launched in the UK in the next few years, with the most likely scenario seen as a single platform operator using a content aggregation model and offering wholesale services to mobile operators*

Regulatory environment and spectrum availability

Ofcom

Established by the Office of Communications Act 2002, Ofcom is the regulator for the UK communications industries, with responsibilities across television, radio, telecommunications and wireless communications services. Ofcom is in the middle of a series of spectrum auctions, and in total is reallocating around 400MHz of spectrum over the next few years. It is pursuing a technology neutral approach to licensing.

Ofcom's view of mobile TV is that it represents an interesting consumer proposition and that it has significant potential; however they cannot know how successful it will be. As such, Ofcom's position is that it is not its job to second guess the market, but rather to create a set of conditions and environment within which services can be tried, tested and rolled out and within which the most successful services can thrive. In its view, consumer interest will be maximised if the opportunities for the market to offer a whole variety of services exist, and the market will decide which technologies will be adopted.

While they are seeking to make spectrum available for mobile TV services, they will not reserve spectrum for mobile and in doing so prohibit other potential users.

In further measures introduced in by Ofcom that apply to all upcoming auctions, spectrum trading will be permitted, with the aim of establishing a secondary market as a way to ensure optimum usage of spectrum. There will be no 'use it or lose it' obligations attached to spectrum licences.

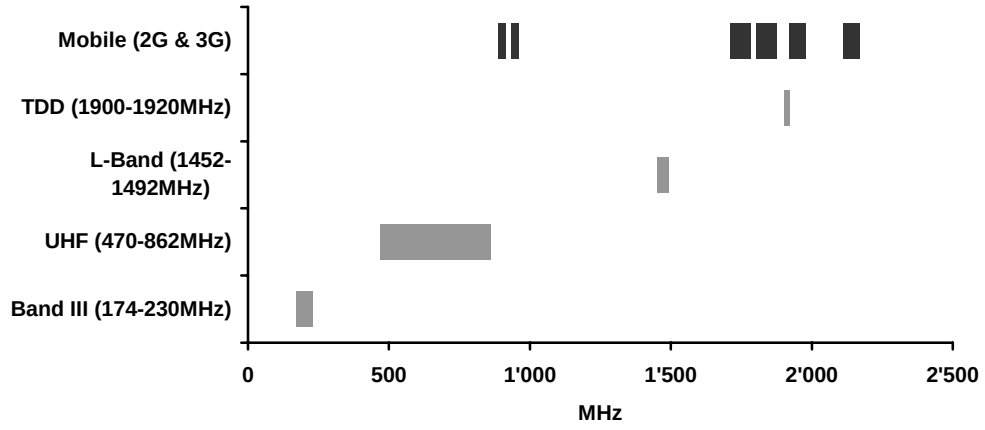
Spectrum availability

Like all wireless services, mobile TV requires space in the spectrum in which to operate, and except in some instances, spectrum that is free from other users. With significant demand and a finite amount of usable frequencies, spectrum is a scare resource, particularly as government bodies and military establishments continue to hoard large swathes. The properties of each area of spectrum such as its ability to propagate vary with its frequency, and hence certain areas are more suitable for some uses than others. As Ofcom will not reserve spectrum specifically for mobile TV, it must therefore 'compete' against other services for suitable spectrum as it comes available.

There are several areas of spectrum which fit the criteria of being both potentially suitable for

mobile TV and either currently or potentially available for use.

Positioning of spectrum bands potentially available for use by mobile TV



VHF Band III (174MHz-230MHz)

VHF spectrum is at the lower end of spectrum that is being considered for mobile TV and although the signal propagation characteristics are good, the higher wavelengths mean that it is increasingly difficult to pick up the signal on a small mobile device antenna, and hence external aerials are required. Band III spectrum has been assigned for use by DAB (Digital Audio Broadcasting) radio services on a pan-European basis (although some legacy use continues in many countries, such as analogue TV in France and Italy). As DAB technology can be used to transmit video as well as audio, there has been significant interest in the potential for using the spectrum for mobile TV, particularly where DAB networks have already been built.

Spectrum availability

In the UK, the BT Movio/Virgin Mobile service is using all of the nationwide capacity that is currently available for mobile TV in Band III, as there is only one nationwide commercial multiplex, and utilisation for non-audio-programming content is capped at 30 percent of capacity. While there is spare capacity on some of the regional/local multiplexes that can potentially be used for mobile TV, this is not the case universally, and the capacity is generally in more remote areas which hold less interest to mobile TV (or any other) service providers.

Ofcom, allotted a further nationwide commercial service in a beauty parade to Channel 4 in mid-2007, although services are not due to begin transmission until H2 2008, at which point it could provide additional capacity for mobile TV. However, international interference restrictions from radio in Netherlands, Belgium and France, and analogue TV in France and Ireland, mean that the network cannot operate in large areas of the UK.[20] The service will also be subject to the same 30 percent usage limitation as the existing multiplexes, although

[20] Areas impacted will be coastal areas of East Anglia, almost all of Kent, significant parts of Sussex and some coastal areas west thereof, Northern Ireland, West Wales, coastal West Scotland, all of Cornwall, North Devon and rural areas of South Devon, Somerset, Dorset and the South Coast.

this can be averaged over a 24-hour period.

Potential for further mobile TV use

Due to the improved propagation characteristics of signals at lower frequencies, a transmission network in Band III would require significantly less transmitters than in the other available bands, potentially by a factor of ten, leading to significant cost savings in construction. Furthermore cost advantages derive from the award of the licences through a beauty parade rather than an auction, the service can "piggyback" on existing infrastructure (albeit with additional investment required to improve coverage), and the spectrum offers immediate availability. However, the bandwidth available even if the maximum allowed capacity on both national multiplexes was used, would only amount to around 800kbps. This would limit both the number and quality of channels, while the requirement for external aerials further reduces the appeal.

UHF Bands IV and V (470MHz-862MHz)

UHF spectrum is predominately used in the UK for analogue TV broadcasting, and hence in general will not be available for other use until the completion of the switchover to digital broadcasting in 2012, although there are some niche opportunities which may be available before then. UHF is the favoured location for mobile broadcasting, as it has a good signal propagation while remaining amenable to reception by small handheld receivers; however, these same characteristics are favoured by all broadcasters, and any spectrum that is available is also likely to be in demand from other industries.

Spectrum availability and regulation

Availability of UHF spectrum is very limited due to use by analogue television and digital terrestrial broadcasting. In the medium term, the completion of the switch to digital television broadcasting, which allows a more efficient use of spectrum, will reduce the amount of spectrum required for current television broadcasting and the surplus capacity will become available to the national regulators to redistribute. However, while this process is due to start in 2008 in the UK (a trial in Whitehaven began in October 2007), due to the complexities involved it will take several years to complete. There are three categories of UHF spectrum that could be considered for mobile TV: the main channels currently used for broadcasting, interleaved spectrum and three channels not used for broadcasting.

In the UK, UHF bands 4 and 5 represent 392MHz of spectrum, split into 49 different 8 MHz channels, 46 of which are currently used to provide the current mix of digital and analogue television broadcasting. 32 of these channels will be required to continue broadcast the six existing DTT multiplexes following digital switchover (this is greater than the current amount used as digital coverage will be improved). This leaves only 112MHz or 14 channels – the 'digital dividend' – which Ofcom will release in its auction. These will gradually become free on a region by region basis throughout the UK, beginning in 2008/9 with the Border region and currently scheduled to end in 2012 in London, the South East (Meridian), Tyne Tees and Ulster. As such, while mobile TV services could operate in some regions before 2012, a

nationwide service would not be possible for 6 years, and hence this is likely to severely limit interest from would-be operators, particularly as the most profitable areas are among the last to be cleared.

Also available will be 'interleaved' spectrum, which is made up of the DTT frequencies that are left unused in each region to avoid interference. While these frequencies cannot be used for high power broadcasting, low power networks could operate although they would require some constraints to stop interference with neighbouring cells. Furthermore, the availability of interleaved spectrum is different from region to region, with some – such as London – having very limited availability. Although a nationwide service could potentially be cobbled together with a patchwork quilt approach, its use is much more constrained is likely to limit the interest for use by mobile TV. Ofcom has highlighted its likely use for local/regional DTT coverage or PMSE use.

Of the three UHF channels not currently in use for broadcasting, one is not under consideration, as Channel 38 will continue to be used for radio astronomy. The other two channels, 36 and 69, are used by airport radar and PMSE (wireless microphones etc) respectively, but in both cases their usage is under review as radar use has been declining and PMSE can potentially be moved elsewhere. These have been of particular interest to potential new users (including mobile TV operators) and because they are not currently used by either analogue or digital television broadcasting would be available immediately on a nationwide basis if cleared.

Channel 69 is not usable for mobile TV, due to expected interference with GSM signals if the two technologies co-exist in the same handset (Channel 69 is at 855MHZ which is close to the GSM bands at 876MHz), Channel 36 would be ideal from a signal propagation perspective. As such, there has been significant interest around Channel 36 from mobile TV operators, with good signal propagation meaning a comparatively low cost network build, better reception by mobile devices than the low frequency Band III, and nationwide availability. Ofcom has secured an agreement with the existing owner, BAE Systems, to vacate the spectrum in early 2009, which removes a significant hurdle for its use. On the negative side, official European authorisation is still required to allow mobile TV usage, there are very significant potential interference issues with channel 5 which uses neighbouring channels, and finally there may also potentially be interference issues with some VCR equipment that use channel 36 to output signals to televisions.

Given the high degree of substitution between L-Band and UHF spectrum for would-be mobile TV platform operators, many industry players had requested that Channel 36 be auctioned at the same time as the L-Band spectrum (due for auction in H1 2008 and detailed later in this report), in order to improve the information in the bidding process.

Auction plans

Ofcom revealed its proposals for how it intends to release the UHF spectrum at the end of 2006, with the most significant result for mobile TV being that the UHF auctions will be held

in H2 2008 at the earliest, and this date now appears likely to slip into H1 2009. Regarding Channels 36, Ofcom confirmed that this will not be dedicated to mobile TV as some had hoped, but would be open to all technologies. Furthermore, the proposals stated that will be included in the auction along with the other channels, and not auctioned separately at an earlier auction. While it appears that there is a possibility that its auction could be brought forward, it is unlikely to be able to be moved by more than a few months. This inflexibility partly reflects Ofcom's belief that it expected to take "at least two years" (or until the end of 2008) to allow for clearance of the existing users and to get international permission to use the band, and hence its auction would probably be at around the same time as the rest of the UHF spectrum. According to Ofcom this will be more likely to lead to an efficient solution.

The same characteristics that make UHF popular for mobile TV also mean that UHF spectrum is greatly in demand for other uses, predominantly in digital television but also potentially mobile, broadband and other industries. In the UK, Ofcom has identified over 10 different industries that would be interested in the UHF spectrum, including mobile multimedia, DTT SD, DTT HD, Local TV, Mobile Communications, BWA (Broadband Wireless Access), PMSE, low power, Satellite and Public Safety. Under Ofcom's technology neutral approach, all of these will be able to bid against would-be mobile TV operators.

Potential for further mobile TV use

From a mobile TV perspective, the interest in UHF spectrum is widespread due to its optimal signal propagation that allows large areas to be covered with fewer transmitters and good indoor signal penetration, as well as wide channel bandwidth. It is particularly suitable for operators with plans to use either DVB-H or MediaFLO technologies.

Channel 36 represents the only viable option for nationwide service launches in UHF before 2012, although other areas could be used for services post-switchover. Although the cost benefits of operating mobile TV in UHF are better than in the L-Band, the interference issues outlined above are likely to significantly impair its value to would-be operators.

Ofcom's current position that Channel 36 will either be auctioned along with the remaining UHF spectrum or only a few months earlier means that it is likely that L-Band auctions will have taken place before Channel 36 is auctioned. Even if mobile TV operators still want to use Channel 36, the current auction date implies that commercial services could not start before H2 2009 at the earliest, assuming at least a year for the first round of network rollout (or H1 2010 if the auction date does indeed slip back to H1 2009). However this could still provide a service in time for the 2012 Olympics in London.

L-Band (1452MHz-1492MHz)

The L-Band represents 40MHz of spectrum between 1452 and 1492Mhz although, for the purposes of current regulations (which are Europe-wide), it is split into two unequal halves, with the lower 27.5MHzs allocated to terrestrial DAB usage, which the upper 12.5MHz being reserved for satellite-based DAB broadcast services. Both halves of the spectrum are very sparsely used across Europe, and hence have potential for use for mobile TV. Under the

DAB allocations, the spectrum is currently allocated into 1.7MHz bandwidth channels, with a Europe-wide frequency usage assignment designed to allow local broadcasting without interference.

These allocations mean that in its current state the spectrum is suitable for both DAB-IP and DMB broadcasting, and a DMB service is currently in operation in the L-Band in Germany. While the regulations do not actually prevent national regulators from allowing other technologies or frequency allocations, interference with services in neighbouring countries would still have to be avoided and hence severely limit the areas of the UK, particularly in the South East, in which a service could be used without international agreement co-ordination.

The L-Band spectrum has significantly worse signal propagation characteristic than UHF spectrum due to its higher frequency, limiting the ability of the signal to pass through walls and travel long distances, and hence denser networks of transmitters would be required to compensate. On the positive side, the shorter wavelength of the signals improves their ability to be received by small antenna, such as those in mobile phones, and hence it remains attractive for mobile TV operators.

Spectrum availability and regulation

The original regulations which limited usage of the L-Band to DAB services have been removed, and agreement has been reached to allow the repurposing of the spectrum from the 1.7MHz bands to allow services to operate in bandwidths of 5MHz (including the ability to transmit at the frequencies previously used as guard intervals). This significantly increases the number of technologies that can potentially operate in the spectrum, and is now sufficient for either DVB-H or MediaFLO.

Ofcom's discussion document noted the need for European-wide negotiation to prevent the UK adopting different regulations from the rest of Europe, however it argued that it could be preferable to push ahead rather than waiting for EU regulation. The auction is currently scheduled for the first half of 2008, and will be structured so as to allow maximum flexibility for differing technologies to compete.

Although use of the upper 12.5MHz is very limited, radio regulations require that the reception of those few registered satellite services in neighbouring countries is protected, which will limit the potential usage of this spectrum in the UK. While it is possible that regulations governing use of this spectrum will be relaxed, it is not part of the ongoing CEPT mandate. Ofcom's current proposal is to auction the upper half of the L-Band as a separate block from the lower 27.5MHz, and as such is unlikely to be suitable for mobile TV services.

Potential for further mobile TV use

From a mobile TV standpoint, the 27.5MHz in the lower half of the L-Band could potentially provide sufficient capacity for five 5MHz multiplexes – around three times the bandwidth of UHF channel 36. However, while at lower frequencies a single frequency band can provide nationwide coverage, there is currently some debate as to whether single frequency

networks (SFNs) are workable in the higher frequency L-Band, or whether multiple frequency networks (MFNs) would be required instead. Were MFNs required, neighbouring regions would be covered by different frequencies in a 'patchwork quilt' effect. However, this means that each nationwide multiplex would require 3-5 frequency bands, and hence the whole available capacity would not be able to provide more than one complete nationwide multiplex, providing a maximum of around 20-30 quality programme channels in any given reception area.

From a network build-out perspective, the higher frequencies will require a significant increase in density of transmitters to attain acceptable coverage as a similar network in the UHF band, and we estimate that for full coverage a DVB-H network would require around 2-3 times the number of transmitter required in the UHF spectrum.

Despite the additional cost of a mobile TV network in the L-Band, there are several factors that will lead to demand for the service in the auction:

- Even with the delay to the auction process to the first half of 2008, the L-Band auction may still occur up to a year before that of the UHF spectrum, potentially allowing preliminary services in core locations to be launched in 2009
- The L-Band has very few current users, all of whom have been required by Ofcom to vacate the spectrum by March 2007.
- The high levels of interest for UHF spectrum mean that operators may not be able to bank on securing spectrum in the auction, and hence may bid for L-Band spectrum as a fall back option. The presence of a secondary market which could allow the spectrum to be sold on if not required, potentially encourages this behaviour

TDD spectrum (1900MHz-1920MHz)

Along with the paired FDD spectrum acquired by European mobile operators in the 3G spectrum auctions, most operators also received 5MHz of unpaired spectrum for TDD, (although there are some notable exceptions including Vodafone UK, O2 in Germany, all of the Belgian and some Austrian operators). It has remained largely dormant since its allocation, and hence its widespread availability could provide the basis for a pan-European standard.

Spectrum summary to 2012

Despite the variety of different spectrum available, the options available in the UK for mobile TV service provider to launch a service before 2012 are comparably limited. Excluding the high frequency TDD spectrum, even if the entire spectrum available was used, the total potential usable capacity could only support around 50 channels of mobile TV (at 250kbps), from a maximum of four multiplexes, only two of which could support a large range of channels.

UK potential for near-term mobile TV in the UK

Spectrum	Bandwidth	Maximum nationwide mobile TV capacity from new spectrum available before 2012	Total potential channels QVGA @250kbps
VHF Band III	1.7MHz	1.0 MHz (30% of 2x1.7MHz channel)	~4 channels on 2 multiplexed
UHF	8MHz	8MHz Channel 36	~25-30 channels on 1 multiplex
L-Band	5.1MHz (assuming re-banding)	1 x 5MHz channel using a multi-frequency network	~15-20 channels on 1 multiplex
TDD	2000	4 x 5MHz bands	~10-15 channels per band

Band III only has a very limited amount of spectrum available to mobile TV and upcoming awards will only increase this marginally, only allowing four high quality channels in total (although more if streamed at lower quality). Although the cheapest solution from a network perspective, the requirement for external aerials and the small channel bandwidths further dampens its appeal, and we anticipate that it will likely only be used in the absence of alternative spectrum.

Large quantities of UHF spectrum will be made available following digital switchover and while the spectrum is ideal for mobile broadcasting, most of the capacity will not be available nationwide until 2012-15, preventing its use for mobile TV in the short term. The only suitable option remains Channel 36, which will be potentially available from 2008; however, it is not free of pitfalls with issues remaining over the existing users, cooperation with neighbouring countries and potential interference with VCRs. Nevertheless, this is attracting significant interest. However, while regulation in some countries may specifically reserve some areas for mobile TV, this is not the case in the UK where mobile TV operators must contend for spectrum in the 2008 auction against all other potential users. This not only increases the likely cost of the spectrum, but also increases the chance that a mobile TV operator will not secure spectrum.

L-Band spectrum is high frequency and hence would incur the greater costs from a network standpoint due to reduced propagation of signals, although there are benefits for signal reception by small antennas such as those in mobiles. Despite usage currently being restricted to DAB-based technologies, this has been liberalised and wider-bandwidth technologies such as DVB-H and MediaFLO will be able to operate in 5MHz channels. Given the uncertainty over securing spectrum in the UHF auction in 2008/9, interest in the L-Band auction in 2008 should be further buoyed by those looking for a security policy in the event that they cannot secure UHF spectrum. Although Germany has already begun using of the spectrum for DMB broadcasting, it is generally unused across Europe which gives potential for cost advantages through economies of scale, although other countries currently appear to favour using UHF spectrum.

TDD spectrum remains widely available across Europe as it is held by nearly all mobile operators (with some notable exceptions including Vodafone UK). It is high frequency and

hence has very poor signal propagation, requiring a significant network infrastructure to achieve dense coverage. While its availability is an asset and could allow operators to build their own networks, its possession by operators is less conducive to a (more efficient) 3rd party service provider model.

Key players and strategies

Mobile operators

The UK market has 5 mobile network operators, four of which operate both GSM and 3G networks (Vodafone, Orange, O2 and T-Mobile), as well as H3G which only has a 3G network. There are also over 100 MVNOs over varying sizes, although only one, Virgin Mobile, has achieved significant market scale. Unlike most countries in Europe where the mobile market is characterised by the dominance of one or two players, the UK market is very competitive with the four GSM networks all having around a 20-25 percent share of subscribers (see table below).

UK mobile network operators

	Vodafone	O2	Orange	T-Mobile	H3G	Virgin Mobile
Ownership	Listed company	Telefónica	France Telecom	Deutsche Telecom	Hutchison Whampoa	Virgin Media (UK Cable Operator)-
Launch	1985	1985	1991	1991	2003	1999
2G Network	900MHz 1800MHz	900MHz 1800MHz	1800MHz	1800MHz	-	MVNO on T-Mobile network
3G Network	2100MHz	2100MHz +TDD	2100MHz +TDD	2100MHz +TDD	2100MHz +TDD	
Subscriber market share	25.0%	24.9%	21.4%	16.7%	6.2%	5.8%
Broadcast Mobile TV – Commercial service	-	-	-	-	-	DAB-IP (closing)
Broadcast Mobile TV trials	TDtv	DVB-H	TDtv	-	TDtv	DAB-IP
3G Mobile TV Commercial service	3G	-	3G	3G	3G	-

The traditional view of mobile operators in the UK is that they have a preference for keeping control of their customers and owning their own networks, allowing them strategic positioning and the potential for differentiation through service quality. Mobile operators are in the best position to afford the network investment required given their high cash generation, and four of the operators (but not Vodafone) already have 5MHz of TDD spectrum which could be used to offer mobile broadcast services using TDtv technology. This raises the prospect that there could be multiple mobile TV networks, with each operator owning and running its own service for the benefit of their own subscriber base, using exclusive content deals as a way of acquiring subscribers, either using their own TDD spectrum or competing for space in the UHF or L-Band.

However this is unlikely to be the case. On the content side, most of the main providers have viewed that it is in their interests to be available to the largest number of subscribers, and

hence have made their content available to each of the networks, removing the opportunity for differentiation. While mass market mobile TV could not be carried over current mobile networks, the relatively low demand for services has meant that mobile TV can be carried on the spare capacity in 3G networks, and hence broadcast networks have not been required as early as originally expected. The lower levels of demand for pay services have also lessened the business attractiveness, such that it is unlikely that having more than one network would be unlikely to be profitable, let alone one from each mobile operator. While it is theoretically possible that the mobile operators could combine their assets to create a platform that they could all use, this is viewed as a distant possibility and it is far more likely that they will wholesale mobile TV from an independent platform provider.

Nevertheless, involvement in mobile TV is high among the operators, with each of them having launched commercial services on 3G or been involved in trials of one of the potential technologies. However, the only one of the operators that has launched a commercial broadcast service is the MVNO Virgin Mobile, and this is now closing at the start of 2008 due to a lack of demand from customers and interest in the underlying wholesale service from other mobile network operators. Four of the mobile network operators offer mobile TV services over their 3G networks, each offering around 25 channels, with subscriptions to packages of channels priced at from £3.5-£5.00 for standard content and £5 per pack for premium Sky content.

Content providers / broadcasters

Programming the UK is dominated by the five main free to air terrestrial channels, BBC1, BBC2, ITV1, Channel 4 and Channel 5, which combined account for over 60 percent of total viewing and are available via all four main broadcast platforms, analogue, digital (Freeview), satellite (Sky) and cable (Virgin Media). Sky channels represent around 7 percent of viewing in multichannel households, but are only available through pay TV platforms.

In terms of mobile, nearly all of the main content providers have been involved in mobile TV services to date, making their channels available for commercial broadcast trials and 3G services. As detailed earlier, content providers have moved away from exclusivity deals with mobile operators, preferring instead to reach the largest possible audience, and most of the main channels mentioned above are available on most of the 3G services (see table below).

Content currently available on UK 3G mobile TV services

Category	Channels	Type	Vodafone	Orange	T-Mobile	O2	H3G
Own-brand packages	BBC 1, BBC 3, BBC News 24, ITV1	LIVE	**4**	**4**	**-**	-	**4**
	Channel 4	MFM	**1**	**1**	**1**	-	
	Others	LIVE	**1**	6	**1**	-	**7**
		MFM	**5**	15	**4**	-	**2**
Sky branded packages	Sky Sports, Sky News, Music Channels	LIVE	**14**	7	**13**	-	**-**
	Sky One, Cartoons, Sports, Entertainment	MFM	**19**	10	**14**	-	**-**
Total Channels		LIVE	19	17	14	-	11
		MFM	25	26	19	-	2
Pricing	Own packages		£3 per month	£5 / £10 per month, 40p per hour	£1 for 24 hours £3.50 for 31 days	-	£5 per month
	Sky packages		£5 per pack	£5 per pack	£5 per pack	-	-
Definitions: 'Live'- simulcast alongside existing channels. 'MFM'- 'Made for Mobile' looped content.							

BBC

The BBC is funded through the licence fee, its two main channels (BBC1 & BBC2) account for over 30 percent of overall UK terrestrial viewing. Since the advent of digital broadcasting it has expanded its range of programming and now transmits eight channels within the UK. BBC content is available across all of the UK's broadcast platforms, including digital and analogue terrestrial, satellite and cable. Furthermore the BBC is currently examining opportunities for internet distribution of live and archive programming. Although the BBC channels are free-to-air, they are also available as part of pay-tv subscriptions, but as the BBC's content has already been paid for by the license fee, it must be made available on the lowest pricing tier, and the same rules will apply to mobile TV.

It is understood that the BBC has made content available to all of the mobile TV services that have asked for it to date, although the current agreements are under trial licenses as part of an experimental programme (which is why only BBC1, BBC3 and News24 are currently available). There are not understood to be any major barriers to the full range of BBC content being available to future mobile TV services.

BBC content is therefore likely to form part of the mainstay of programming on any UK mobile TV service, but it is also feasible that the BBC could have a further role to play outside of content provision. The BBC is a shareholder in Freeview, the UK digital terrestrial

TV platform operator, as well as being a DAB radio platform operator, and it could conceivably run a mobile TV platform if consumer demand for mobile TV services was very high and likely to lead to a very high penetration and usage within the UK population. However, this is not the case, and with economics and spectrum availability both likely to limit the potential for multiple platforms, there would be no place for the BBC to run its own platform. Furthermore, question marks over the number of people who would benefit from mobile TV may also prevent the remaining scenario of the BBC becoming a shareholder in a jointly owned platform.

BSkyB

Sky is the UK's main pay-tv content provider, and operates the UK's satellite TV distribution platform. Sky has taken up a strong position in the mobile TV space, and has been involved in three different areas; as a content provider to mobile operators, offering its own mobile TV services to its pay-tv subscribers and as a potential platform operator.

As shown in the table above, Sky branded packages are part of three of four 3G mobile TV services, and make up the majority of the live and made for mobile programming content outside of the terrestrial channels. Sky's ownership of premium content – particularly Sky's ownership of the majority of the UK's live premiership football rights – have allowed them significant bargaining power. As such, not only are the channels branded Sky, but the end consumer pricing and the way the channels are packed is the same in each network. Whereas the mobile operators usually retain control of relationships with their customers, for Sky packages the contractual relationship remains with Sky, although billing and customer care is provided by the operators.

As well as wholesale services to mobile operators, Sky also offers its own standalone mobile TV service. Sky customers who subscribe to premium channel content (either sports or movies) and who have a compatible handset can watch the same content that they have at home on their handset via a downloadable application. Users incur data charges from their mobile operators, which could be very expensive without an unlimited data package. Further integration also allows Sky+ customers (PVR service) to set their set top box to record via their mobiles.

Sky provided content to most of the broadcast mobile TV trials to date, but also ran its own trial in partnership with Qualcomm to test the performance of MediaFLO technology in Cambridge. Run without the top-line participation of any of the mobile operators, the trial is seen as a possible indication of Sky's positioning to run a mobile TV platform.

Other players

BT

BT is the fixed line incumbent operator, and was the previous owner of the UK's second largest mobile network, O2 (formerly BT Cellnet) before it was demerged in 2001. Since then BT has continually expanded its interest in wireless services through the launch of an

MVNO, the development of BT Fusion, investment in WiFi hotspot rollouts and the launch of BT Movio, the UK's only broadcast mobile TV service to date.

BT Movio was launched in October 2006, with the aim of offering wholesale mobile TV services to mobile operators. However it was only taken up by Virgin Mobile. Despite sizeable advertising expenditure, it failed to gain traction with subscribers and is now due to close at the start of 2008. BT has been keen to indicate that this does not mark the end of their involvement in mobile TV. As such, BT may yet be a candidate to run a mobile TV platform in the future, however, the decision to close the BT Movio service only a few months before the first of the auctions for new spectrum is seen as significantly reducing the prospect of BTs involvement in the L-Band auction process.

Arqiva / National Grid Wireless

Arqiva and National Grid Wireless are the UK's only broadcast transmission providers, although Arqiva is in the process of acquiring National Grid Wireless. Currently the two businesses are being held separately pending the completion of a review by the UK competition commission. Preliminary findings from the commission indicate that they have concerns that the merger may have a detrimental impact on future competition in the provision of broadcast services and hence it is possible that they may act to prevent the takeover. However, the full findings are not yet determined and will be published in January 2008.

One or other of the two entities is nearly certain to be involved in any future mobile TV services as the infrastructure provider, however there is also the potential for them to be involved in other areas of the value chain, potentially through the acquisition of spectrum.

Platforms

Overview

Despite the fact the European Commission supported the positioning of DVB-H as the sole standard for mobile TV in Europe, this view is not supported by Ofcom, and as such there are no regulatory barriers to any particular technology being used in the UK. The four leading protagonists remain DVB-H, DAB-based standards, MediaFLO and TDtv, and while 2006 has seen some jostling for position, none have delivered a knockout blow.

Technology summary

Beneath the surface, there are many similarities between the technological solutions, and all use the same CODFM signal modulation for their transmissions, with the exception of TDtv (which uses TDD-CDMA). Furthermore, similar mechanisms for error correction and reducing power consumption are in use by or being developed across all of the standards. Differences between the technologies include the required channel bandwidth, suitable frequency, technological inheritance and the relative openness of the standard

Overall the technology landscape has seen few seismic movements over the last year, with no winner yet emerging despite some service launches. There has been limited scope for

objective comparisons of performance to date; however, the picture is slowly becoming clearer (see table below):

- DVB-H remains best placed, with three networks in operation across Europe offering a wide range of channels, numerous trials, and continued support from equipment manufacturers such as Nokia
- DAB-based serviced have also staked a claim with two commercial services now in operation; however, due to capacity constraints both only offer 4-5 channels. While their link to DAB allowed these services to start quickly by using existing networks and spectrum assigned to DAB, their small scale and limited potential for expansion means they can increasingly be seen as a fill-in solution until a multi-channel broadcast offering is launched
- MediaFLO may yet be the dormant dragon, as there has been little activity, with one European technical trial with Sky in the UK. The upcoming national US service launch with Verizon may galvanise its appeal, and it claims to be the most efficient service. MediaFLO is targeting platform operators rather than mobile operators; however, it needs to show its hand soon or it may miss out
- The case for TDtv looks the most fragile, with little news flow over the last year and little evidence of the performance of the technology; however, it continues to benefit from widespread availability of suitable spectrum

Summary of broadcast technologies attributes

Technology	DMB/DAB-IP	DVB-H	MediaFLO	TDtv
Spectrum availability	√ DAB assignments but small capacity	X Need to acquire L-Band or UHF spectrum	X Need to acquire L-Band or UHF spectrum	√√ Mobile operator holdings
Spectrum usability	X Narrow bandwidth	√√ Wide bandwidth, suitable for UHF	√√ Wide bandwidth, suitable for UHF	X Too high frequency
Handset availability	√ Limited models in commercial services	√√ Commercial services have multiple models	X None to date	X None to date
Technological performance	√√ Inherent design for portable	√ Legacy issues but significant improvements made	√√ Ground up design	? Little evidence to date
Openness of standard	√√ Open standard	√√ Open standard	X Proprietary	X Proprietary
Potential for re-use of existing assets	√ DAB	√ DVB-T	√ DVB-T	√ 3G

The choice over which technology is used is likely to be defined less by technical merit and more by other factors such as the business model used and most importantly the spectrum that is available. While differences in performance may impact consumer interest if they impact qualities such as the number of channels that can be carried on a multiplex or the

time to change channels, the availability of suitable technology is not a limiting factor in the provision of mobile TV services, as limited spectrum availability will present a far larger hurdle.

Commercial service launches & technology trials

BT Movio in the UK: DAB-IP

October 2006 saw the launch of BT Movio's service in the UK, which is provided over Band III spectrum rented from the UK's national commercial multiplex operator, Digital One (see table below).

Summary of BT Movio DAB-IP service

	Summary	Detail
Content	5 channels @ 96kbps	BBC1, ITV1, C4, E4, and ITV News
Pricing	Contract: free Prepay: monthly fee	€5 per month for basic channels Premium channels included for first 3 months
Handsets	1 Handset	HTC 'Lobster' – Windows Smartphone Free with contracts above £25, £99 on prepay (reduced from £199 at launch)
Network and coverage	85% nationwide population coverage	Based on coverage estimates for DAB radio; indoor mobile coverage is likely to be much lower than this

The service remains in operation, although is due to close at the beginning of 2008 following insufficient adoption by consumers.

- **Content**: Although launched with only four channels, one of which was made-for-mobile rather than simulcast, by December 2006 this was expanded to five simulcast channels - BBC1, ITV1, C4, E4, and ITV News – which, it is estimated, accounted for around 55 percent of UK terrestrial viewing. Around 13 percent of terrestrial programming was unavailable at launch to mobile viewers due to rights restrictions. The service also includes a 7-day electronic programme guide, as well as allowing access to all of the UK's DAB radio stations

- **Pricing**: The service was available to subscribers of the MVNO Virgin Mobile, and was priced at £5 a month for prepay subscribers but wass included free of charge for contract customers. The service was only available on one handset, the HTC 'Lobster' a high-end Windows Smartphone which was provided free with contracts from £25 a month, but was priced at £199 for prepay subscribers (the prepay price was reduced to £100 before Christmas 2006)

- **Network and coverage**: The wholesale service itself was provided to Virgin Mobile by BT Movio, which received a monthly fee per subscriber. BT Movio rents 30 percent of the capacity on the national commercial DAB radio multiplex from its owners UK Digital (the maximum percentage that they are allowed to use under current regulation), which allows the five channels to be transmitted at 95kbps each. The multiplex provides DAB radio coverage to 85 percent of the UK population, although it has required major

improvements with fill-in transmitters to allow for mobile TV reception, particularly indoor. (The number of transmitters in London was increased from two to around ten to enable reception during the early trials.) While this has been performed in some areas, the process is still ongoing and hence the actual coverage level for indoor mobile reception is likely to be significantly below this

Other trials

As well as the commercial service launch of DAB-IP, the UK has hosted trials of all of the other front-running technologies (see table below).

UK trials of other mobile TV technologies

	DVB-H	MediaFLO	TDtv
Trial dates	H2 2005	Q4 2006	Q4 2006
Mobile Operators	O2	None	Vodafone, Telefónica , Orange, 3UK
Other participants	Arqiva, Nokia	SKY, Qualcomm, Arqiva	IPWireless
Content	16 channels	11 Sky Channels	11-14 Channels
Location	Oxford 8 transmitters	Cambridge	Bristol 12 transmitters
Spectrum and output		5MHz 240kbps per channel	5MHz TDD spectrum
Handsets	Nokia 7710	Proprietary Qualcomm	Proprietary

The decision to close BT Movio was driven by a range of factors, however these fall into two main categories:

- Deficiencies in the service: Much of these are caused by the limited bandwidth that BT Movio had to operate in – with only 30 percent of 1.7MHz. They were limited both in the number of channels that they could broadcast and the quality at which they could be shown. Further limitations came from the limited availability of handsets, with only one ever making it to market, and the fact that it required an external aerial.
- Lack of interest from the mobile operators: Had more of the mobile operators committed to the service, it could potentially have gained greater traction, notwithstanding the underlying issues in service quality mentioned above. Broadcast networks would be a necessity for mobile operators in a successful mass market proposition, as 3G networks do not have the capacity to simultaneously stream large volumes of content to large numbers of people. However due to level of consumer demand for the service being lower than anticipated, mobile operators had sufficient capacity on their 3G networks and did not the need BT Movio's wholesale service.

Many of the operators and other industry players are drawing similar conclusions from both the trials and the BT Movio service:

- The availability of premium quality content on the service is viewed as crucial, with

mainstream services required to headline the proposition for consumer interest

- Mobile TV should however cater for a wider range of interest than simply the top few channels, and hence a proposition should include a large bouquet of channels, with 20-30 being seen as an appropriate number
- Quality of service is a key determinant of consumer interest, with 200-250kbps being seen as a base level for transmission speed, while some view 400kbps as the required level for sporting content
- Handsets are a key part of the proposition, both in terms of the range of handsets offered and minimizing the size weight premium over other handsets in the market

Outlook

With the lack of progress towards broadcast mobile TV over the last year in the UK, it is now unlikely for any service to be operational in time for the 2008 Olympics or European Football Championships.

Looking further ahead, there remains significant uncertainty over the potential for services to be launched before 2012. Because none of the players have yet to make a commitment to run a platform, there is a chance for spectrum to be taken by other technologies other than mobile TV. Furthermore, consumer demand for paid-for services to support the business model lacks evidence.

Timeline:

- 2008: Commencement of digital switchover in UK
- H1 2008: L-Band spectrum auction
- Late 2008/H1 2009: UHF auction of digital dividend spectrum
- H1 2012: Planned date for completion of digital switchover
- Summer 2012: UK hosts Olympic Games

Despite the uncertainties referred to above, the perception in the industry is that broadcast TV services will be launched in the UK in time for the 2012 Olympics, and that lessons will have been learned from the from BT Movio service.

The most likely solutions in terms of spectrum are the UHF Channel 36 and L-Bands, as these are in the best locations for signal propagation and both allow DVB-H, the European Commission's preferred technology. The choice between these two options is very uncertain, however, the interference issues with Channel 36 and its later auction date may outweigh the greater cost associated with L-Band spectrum, leaving L-Band as the more likely option.

Given the technology-neutral approach of the UK regulator, the potential for a technology other that DVB-H to provide services is higher than in other countries. However DVB-H

remains the front-runner due to the existing deployments in Italy and confirmed support from other countries, which should ensure that there is both a range of handsets available and potentially help to reduce infrastructure costs through economies of scale. Nevertheless, MediaFLO remains a strong contender in the UK, as its high-power transmission could help to reduce the site requirements for deployment in the L-Band in comparison to DVB-H, but also due to its links to Sky.

Looking at the potential structure and the scenario of multiple mobile TV networks is increasingly unlikely, due to limited evidence of sufficient consumer demand for pay services to fund multiple networks. Furthermore, the indication is that content providers will not look for exclusive agreements, but rather look to maximise their audience reach, and hence the potential differentiation benefits from owning a service will be reduced. The most likely scenario is viewed as a single-platform operator model, run by an independent player, who will aggregate content from the producers and offer it to operators on a wholesale basis.

In December, Ofcom revealed details of its plans to auction L-Band (1452-1492 MHz) spectrum. Possibilities include: mobile multimedia services including mobile TV; satellite digital radio; and broadband wireless access or high speed internet. The auction process will start in spring 2008 and will be based on a technology and service neutral basis and licenses will be tradable.

Non-European markets

China

Summary: The Chinese market is very complex due mainly to the number of competing mobile TV standards, several of which are backed by different regulatory bodies. As a result it is difficult to predict how the market will develop. However, the Chinese authorities are keen to showcase mobile TV technology to the world during the Olympic Games in 2008 and this could well be a major catalyst for mobile TV in the country.

Mobile TV standards in China

There are a number of mobile TV standards, both domestic and international, being proposed for the Chinese market.

- CMMB – or China Mobile Multimedia Broadcasting is the new commercial name for the main national Chinese mobile TV standard. Also known by its technical acronym STiMi (Satellite and Terrestrial Interactive Multimedia Infrastructure), it was developed by the Academy of Broadcast Sciences and operates at VHF and UHF frequencies for terrestrial broadcasting and S-band for satellite broadcasting.
- DMB-TH – or Digital Multimedia Broadcasting Terrestrial/Handheld is a handheld version of DMB-T, which is one of the standards used in China's new fixed digital TV standard.
- T-MMB – or Terrestrial Mobile Multimedia Broadcasting is being developed by Nufrontsoft (a Beijing software company), the Communications University of China and Southeast University. This is based on the Eureka-147 DAB standard.
- T-DMB – is also allowed in conjunction with DAB for audio but only for FTA services. However, retailers are not yet allowed to sell T-DMB mobile phones.

Other international standards such as DVB-H and MediaFLO have been tested in the laboratory but are unlikely to be adopted as they compete directly with DMB-TH in the same UHF bands.

CMMB has already been approved as a national standard but it remains to be seen which of the others will achieve the same status.

At present, a key issue for the Chinese government is whether these standards will be available commercially in time for the 2008 Olympic Games.

At IBC 2007, SARFT officials insisted that CMMB was on schedule and claimed that the first CMMB chipset had been developed by a Chinese company called Innofidei. SARFT expects to have pre-commercial mobile TV services based on CMMB in six Chinese cities by the end

of 2007 and to launch two satellites in Spring 2008. CMMB based mobile TV services will be available in 60 cities before the Olympics according to SARFT.

China's track record for implementing home-grown technologies is not good and the schedule proposed by SARFT appears very optimistic. It seems increasingly unlikely that mass market CMMB devices will be available by the middle of 2008 and this may provide an opportunity for foreign standards such as T-DMB.

Eureka-147 DAB in China

The Eureka-147 DAB standard has been trailed for many years in China and several Chinese broadcasters have been issued with commercial licenses following the standard's adoption in 2006 as China's digital radio standard. Several of these broadcasters, for example, Beijing Jolon, Guangdong Mobile Television and Shanghai Oriental Pearl Group have also been trialling mobile TV services via T-DMB and DAB-IP.

All three broadcasters were issued with commercial licenses by the Ministry of Radio, Film and TV (SARFT) in May 2006. However, the licenses prohibit Beijing Jolon and Guangdong Mobile TV from offering encrypted T-DMB video signals – which effectively means that they cannot offer subscription-based mobile TV services. This restriction however does not apply to Shanghai OPG which plans to launch commercial mobile TV services using a variant of DAB-IP before the end of 2007.

Another complication is that the Ministry of Information and Industry (MII), which is responsible for issuing licenses for all mobile phones in China, has not yet granted any licenses for T-DMB or DAB-IP phones. As a result, Shanghai OPG plans to start services using non-phone receivers. A number of such devices manufactured by Chinese manufacturers are already available in Chinese retail outlets.

Several Chinese manufacturers are also developing T-DMB mobile phones and the MII may be delaying issuing phone licenses to prevent the home market from being flooded with Korean devices.

There is a lot of support for T-DMB from the broadcasters and it is likely that T-DMB could be approved as a regional standard alongside CMMB

South Korea

Summary: There are two competing mobile TV services in South Korea: a FTA T-DMB service operated by the broadcasters and a competing S-DMB pay-service operated and marketed the main mobile operator SK Telecom.

Broadcasters and content

There are six T-DMB broadcasters in South Korea: three incumbent terrestrial broadcasters (KBS, MBC and SBS) and three new service providers (YTN DMB, U1 Media and KMMB). They offer a total of seven TV channels on six multiplexes. Each multiplex typically carries one video channel broadcasting at a data rate of between 512- 544 kbps per channel.

The licenses have been granted for a whole multiplex and broadcasters are able to offer any mix of service – TV, radio or data services (see table below).

T-DMB programming in South Korea

Service provider	DMB channel content
KBS	TV: KBS Mobile 1 (GP) Radio: KBS Mobile 3 (Music), KMMB-R (Economics), OZIC (Music) Data: KBS Mobile 5 (GP)
MBC	TV: MBC-TV (GP) Radio: MBC Radio (GP) MBN (Business & economics) Arirang (English channel) Data: MBC Data (GP)
SBS	TV: SBS-TV (GP) Radio: SBS (GP), RBS (Traffic information) KyungKi FM (local) Data: SBS Data (GP) Hangyurae Data (Jobs, Education)
YTN	TV: YTN Plus (GP) Radio: TBN (Traffic information), Satio+ (Music) Data: YTN Premium (GP)
U1 Media	TV: KMMB-TV (GP) KBS Mobile 2 (Family culture) Data: KMMB-Data
Hankook DMB	TV: K-DMB TV (GP) Radio: i4U (Culture), Live4U (Music, Live show) Data: K-DMB Data
GP = General Programming	

Broadcasters typically offer a mixture of existing TV programming and new content specifically designed for the mobile environment. For example, KBS broadcasts its two existing TV channels: KBS1 and KBS2 and about five hours of new content specifically targeted at users in a mobile environment.

Network coverage and regional expansion

The initial batch of licenses was for the capital area only, i.e. the Seoul/Kyonggi district. Channels 8 and 12 in VHF Band III are used in this area providing a total of six multiplexes. Each 6 MHz TV channel can accommodate 3 T-DMB multiplexes. The Korean government

is also considering using Channel 10 for T-DMB in the Seoul area.

The Ministry of Communication (MIC) recently issued regional licenses to KBS, six local MBC stations and 11 relay stations affiliated to KBS. The services were due to be launched in May 2007 by KBS, August 2007 by the local MBC branches and September 2007 by other local broadcasting companies. These new licenses mean that T-DMB services will be available to 75 percent of the country's population by the end of 2007.

In order to improve the service quality, transmitter outputs will be doubled from 2kW to 4kW. There is also a plan to introduce new advanced modulation technology in 2008, a year earlier than planned, which will double T-DMB multiplex capacities, thus enabling the number of TV channels per multiplex to be doubled. This will help to address imbalances in channel availability from region to region.

Receiver sales and availability

According to the MIC, around 7.5 million units of T-DMB devices have been sold since the service was introduced in December 2005. In addition, satellite S-DMB subscribers have reached 1.13 million which means that the total number of mobile TV subscribers in South Korea now exceeds 8.63 million (May 2007).

A surprisingly large proportion of T-DMB devices – approximately 40 percent – are car navigation devices - equalling the number of T-DMB mobile phone devices sold. In contrast, the majority of S-DMB devices - around or 96 percent - are mobile TV phones with only a small proportion being car navigation devices.

There is strong competition between T-DMB and S-DMB in South Korea. After SK Telecom launched its S-DMB service via TU Media in May 2005, LG Telecom and KTF (the second and third largest mobile operators) started marketing T-DMB services with the help of broadcasters such as KBS and SBS.

The T-DMB market is supported by a broad range of receiving devices – there were approximately 100 T-DMB products available in the Korean market at the end of August 2006. The types of devices range from mobile TV phones and car receivers to USB-type devices for laptops and PCs, set-top-box devices for vehicles, home TVs and even T-DMB enabled digital cameras.

Data services

All six T-DMB broadcasters have reserved capacity for data services to be used either by themselves or leased to third-party service providers.

In early 2007, devices permitting unidirectional services based on TPEG, Broadcast Web Sites (BWS) and Slide Show (SLD) became available and several broadcasters have started offering these services. Consumers are obliged to buy a TPEG device and pay a one-off fee (approximately $100) to a broadcaster which provides them with a lifetime access to the services.

Although the TPEG data signal is not encrypted, consumers must decide which service provider they prefer when they purchase a terminal, as for example, a KBS TPEG terminal cannot access MBC TPEG services and vice versa.

TTI services via TPEG are widely regarded as a killer application in South Korea and are boosting the sales of T-DMB car navigation devices. T-DMB-based TTI services are being combined with various location-based services (LBS) and telematics. Typically, a TPEG service will use a bit rate of around 96-128 kbps.

In late 2006, the Special Committee for Korean Terrestrial DMB appointed KTF, the second largest mobile operator in South Korea, to develop and operate an interactive data portal which will be used by all six T-DMB broadcasters in South Korea.

Pay data services using this portal were introduced in mid-2007. The business is based on a revenue share model between the broadcasters, mobile operators and the data portal operator.

Main issues and challenges

With more than 7.5 million devices sold in less than two years, the growth of T-DMB has been impressive. However, the main issue facing Korean broadcasters and other players is how to generate revenues, i.e. can a viable T-DMB business model be developed?

T-DMB is being marketed as a FTA service with broadcasters expected to generate revenues primarily from advertising. Adopting a FTA business model has undoubtedly helped to ramp up device sales and reduce unit prices quickly.

However, advertising revenue has been extremely low. According to the Korea Broadcasting Commission and KOBACO, the revenues of the six T-DMB providers totalled only 1.95 billion won (€1.5 million) from March to September 2006, far less than the target of 52.7 billion won (€40.5 million) for 2006. However, the providers spent 116.9 billion won (€90 million) on network investment and program production. The lack of revenue is believed to be hampering further investment in network infrastructure.

The Korean broadcasters believe that advertising revenues will grow once a threshold of 10 million devices has been reached – which could happen in early 2008. However, there may also need to be some regulatory changes to facilitate the required growth in advertising revenues. For example, broadcasters claim that they are constrained as they are only allowed to advertise at the end of programmes rather than during programmes.

However, there are a number of other potential revenue streams. New technology could enable the number of TV channels transmitted per multiplex to be doubled and there are rumors that any new TV channels would be offered as a pay service rather than FTA which will provide an additional source of revenue for broadcasters.

Another potential source of revenues is data services. Broadcasters are already generating revenue via their share of a $100 one-off license fee on the sale of every TPEG receiver. In

future, there should also be additional revenues from the KTF interactive data portal, although it remains to be seen how willing the Korean will be to pay for these services.

Clearly, 2008 will be a decisive year for T-DMB in South Korea and all players involved in mobile TV around the world will be interested to see whether the Koreans will be the first to create a viable mobile TV business.

Conclusions

Mobile network operators have already been delivering video to mobile phone users for several years across European markets using existing cellular technologies. Broadcast solutions have emerged because of the inevitable capacity limits of UMTS networks; the need for mobile operators for differentiation and value added services in a highly competitive environment; and the widespread belief that consumer demand for broadcast services will grow.

So far, the growth of mobile broadcast television services in Europe has been tepid and the its real potential is still unknown. Slow development is the result of a shortage of spectrum in many key markets (e.g. UK); a lack of consensus on business models (e.g. Finland); and difficulties in many countries in establishing the regulatory framework needed to launch (e.g. Spain).

The most advanced market in Europe is Italy which launched full commercial services in 2006 and now has approximately 800,000 DVB-H subscribers, although its success may be questioned. The UK and Germany also have launched services with very little success, together accounting for several tens of thousands of mobile viewers. This may be due to the limited service offering provided to viewers.

Scenario for Mobile Broadcast Television in Europe (DVB-H)

Market drivers	2008	2009	2010	2011	2012	2013	2014	2015
New Commercial Launches								
Austria, Switzerland, Finland, France, Netherlands, Germany								
Spain								
Others								
Content Drivers								
More channels launched on existing capacity								
UEFA European Football Championship								
Olympics/ World Cup								
Mobile copyright issues resolved								

Other factors influencing the services
Network Coverage/Spectrum availability[21]
Coverage reaches beyond large population centres New spectrum becomes available (e.g. by ASO) 3G networks reach limits
Consumer demand
Interactive applications develop with use of telecom return channel Handset prices decline substantially Greater competitiveness and consumer choice in the handsets offered in the majority of markets
Technology
Future development of second generation DVB-H Improved Displays/power/local storage
Business Models Evolution of initial market launch models Potential development of free-to-air advertising models

[21] See individual country chapters for more details

Several key markets are expected to launch services in 2008, including Austria, Finland, France, Germany (DVB-H), the Netherlands, and Switzerland. Spain will wait until 2009 to launch its mobile TV services given the delays to the regulatory regime caused by the upcoming elections.

Apart from Finland, the Nordics are more in a wait-and-see mode while smaller markets, like Greece and Portugal, and countries in central and eastern Europe may move forward if results in other markets prove positive.

The high profile launches in 2008 may encourage a period of optimism. However, a steady growth of subscribers will be necessary to prevent stagnation until 2012-2015 when certain key drivers and other factors influencing the services kick in (see charts above). While it will be possible to deploy a successful mobile television offer, a mass market potential will be difficult to achieve until significant swathes of spectrum become available.

Meanwhile, lessons can be learned from beyond Europe. In Asia, mobile television has proven to be successful with 10 million users in Japan and 7 million users in Korea. While this is due in part to the offer of free-to-air television services, the offer of such applications as traffic information has also proven popular with users.

The United States remains in early stages of development with total mobile broadcast service subscribers less than half a million. Overall in the US, only five million of the 220 million mobile users subscribe to a mobile television or video service.

The subscription-based model is the clearly emerging business model

To the extent mixed models develop only the subscription segment will contribute any significant revenue in the medium term. In most currently launched platforms as well as impending launches, most generalist broadcasters have initially accepted the requirement of a subscription model although some would prefer a free-to-air model in the long-run. It is likely that any pay-model would be based on several tiers, including a basic subscription package for a small access fee supplemented by premium services. However, the penetration of mobile television receivers embedded in mobile phones could provide generalist broadcasters and advertisers with a sufficient market to allow for the launch of free-to-air services, perhaps sooner than expected.

Coverage will depend on spectrum availability

In most countries launching mobile television services, coverage planning is for less than 50 percent of the population. For example in Finland, current coverage reaches 30 percent of the population and will increase to 40 percent by spring 2008. In France, 30 percent population coverage will be reached only 3 years after launch as required by the broadcast regulator although candidates are encouraged to commit to higher coverage figures. Current plans aim at covering over 50 percent of the population by 2011.

Exceptions include Italy which has a population coverage of 60 percent for DVB-H services.

In Germany, the network operator has agreed to cover 80 percent of the population by mid 2010, once analogue switch-off has been completed. Services will be launched in several countries and achieve large scale significance well before analogue switch off is completed, nevertheless services in some countries will not achieve high capacity and population reach until ASO makes sufficient spectrum available.

Analogue Switch-Off (ASO) timeline for analogue television

	Official target	Expected range
Fast track		
Finland	2007	**2006-2008**
Sweden	2007	
Netherlands	2006	
Germany	2008	
Switzerland	2008	
Middle term		
Belgium	2011	**2009-2012**
Norway	2010	
Denmark	2009	
Austria	2010	
Ireland	2012	
Last		
Italy	2012	**2012-2015**
UK	2012	
France	2011	
Spain	2010	
Portugal	2012	
Greece	2012	

Mobile network operators continue to advance their multimedia offers

Most mobile phone operators have implemented 3G television services on their networks with a wide variety of pricing schemes. They continue to develop content, roll-out services, and refine business models. In this context, broadcast mobile TV will only be one element in a very competitive market for mobile content which now is dominated by games and music. At the same time, wireless network improvements like HSDPA and MBMS will alleviate to some extent the unicast constraints on those networks and allow for some expansion of usage.

Consumer demand for mobile broadcast TV needs further confirmation

Early trials in Finland, Berlin, and then in the UK, Spain, and France in 2005/06 were encouraging to operators. Willingness to pay ranged from 40 to 75 percent, satisfaction was high, and daily viewing averaged about 20 minutes. However, these results seem to have been extrapolated by many into the general and universal belief that most people wanted to watch TV on mobile devices and were willing to pay for the service.

Recent studies are not as encouraging. In a Gartner study of European consumers published in September 2007, mobile television and video downloads ranked close to the bottom of consumer interest: 95 percent of Europeans expressed no interest in watching television or video on their mobile phones in the coming year. In the UK, new research from BMRB showed that more than half never watched a video clip or downloaded music, and 75 percent said they were unwilling to pay even £5 a month for mobile TV services. InStat, in the US, conducted a survey of 1000 potential users and found that less than 7 percent would pay $15 per month for television services.

Willingness of mobile customers to pay will be dependent on the amount of the service access fee. If drawing the parallel with other pay-TV services in Europe is valid, then the development of cable and satellite pay TV in Europe may teach us that penetration rates will remain low and grow to either a natural ceiling or a limit above which growth will be extremely slow.

Moreover, the type of content that has been successful on pay TV is very specific and may include exclusive content, primarily sports and films and also thematic channel packages. With mobile television, feature length films are unlikely to be consumed by mobile customers, leaving the implication that sports and news are likely to be the key drivers, while a bouquet of premium thematic channels represent the content that can boost the chances for pay mobile broadcast television. Audience data released by 3 Italia tend to confirm this pattern of usage.

Looking forward, a mass market can only develop when content is widespread, most of the population is covered, and consumer equipment passes beneath a certain lower price point, if it is not subsidised by service operators (mobile telecom operators and/or pay-TV operators).

Public Service Broadcasters will be key players

Public Service Broadcasters (PSBs) are involved in content provision and to some extent in all key launch plans. The notable exception is YLE in Finland where copyright issues have hampered the broadcaster's ability to join the platform.

PSBs have experimented with offering their content on 3G networks in an effort to reach their audiences. For example, the BBC has provided a range of TV channels to the 3G networks of Orange, Vodafone and 3. Copyright-cleared content from BBC1, BBC News 24 and BBC Three has been made available for syndication. Projects like these have helped to develop the BBC's future mobile strategy.

PSBs (excluding those that run a network business) do not necessary have a vested interest in a mobile TV platform. The situation is not the same as with the Digital Terrestrial Television (DTT) platform, for example, when their core business was at stake and they did drive the whole process forward from technical testing, to content provision, and coverage expansion. The success of DTT today is in large measure attributable to public service

broadcasters. Their involvement also persuaded many governments to provide the financial support that was necessary in many cases. If mobile broadcast TV is not viewed as a public project, support like this may be less forthcoming.

The role of PSBs in mobile TV will in most cases be that of content providers to commercial platforms. PSBs are expected to manage this relationship in much the same way as they have with pay cable and satellite bouquets.

Therefore, until a free-to-air mass market develops, the imperatives for PSBs will be to monitor developments and try to ensure a conducive regulatory environment for the future. Beyond this, it will be important to focus on the content side for all mobile platforms: repurposing programmes and channels, developing applications, providing on-demand services etc.

Broadcasters may face - either competitively or cooperatively - a new type of content player emerging in the mobile broadcast industry. The audio and video constraints of mobile transmission technology require specialized production skills. Short-form, made-for-mobile content producers and aggregators are developing strong businesses with mobile network operators to meet this need. For example, in the US companies like MobiTV and GoTV provide packages of tailored TV content to mobile networks. Although major carriers have been acquiring rights directly from broadcasters, producers, and sports rights agencies, the short-form producers/aggregators are now offering a vast array of ready-made content that is a better fit to the mobile medium.

However, as long as viewers consider mobile television as a true 'television' service, broadcasters will have a key role in providing content. Their skills in generating content combined with their strong brand appeal will be essential in the provision of mobile television services.

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