Office of the Director of
Telecommunications
Regulation

Extending Choice…

Opening the market for fixed wireless point to multi-point access services

Consultation Paper

Document No. ODTR 98/32 **27 AUGUST 1998**

Oifig an Stiúrthóra Rialála Teileachumarsáide
Office of the Director of Telecommunications Regulation
Abbey Court, Irish Life Centre Lower Abbey Street, Dublin 1.
Telephone +353-1-804 9600 *Fax* +353-1-804 9680 *Web*
www.odtr.ie

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Foreword by the Director

This consultation marks a major step in bringing full competition in telecommunications to reality. The uneven distribution of population across our country gives delivery of services by radio a particular importance. Radio access can help to ensure that all sections of society, whether in remote rural communities or cities, have the opportunity to participate fully in the information revolution. In the same way, the new competitive opportunities for broadband telecommunications services, for enterprises of all sizes, offer a further stimulus to the vital development of electronic commerce.

Please take this opportunity to influence these crucial developments through your response to this consultation.

Etain Doyle

Director of Telecommunications Regulation

Introduction

Fixed Wireless Point to Multipoint Access (FWPMA) services, (sometimes described as wireless local loop services), offer telecommunications operators' unique opportunities for low market entry cost and rapid deployment. They also avoid much of the social disruption inevitable in laying new cable or optical fibre access. Such services can provide the vital 'missing link' of local distribution in the development of comprehensive telecommunications competition. The Director believes that FWPMA services will have a vital role in the nation's response to both the opportunities and threats posed by the burgeoning growth of the internet and electronic commerce. Universal access to high quality communications will be a prerequisite for success in the Information Age.

This paper, issued in the context of the full liberalisation of the telecommunications market by 1st December 1998, seeks views on a proposed framework for the early licensing and introduction of FWPMA services. It addresses the crucial need both to improve telecommunications service delivery to rural areas and to provide for the growing needs of business customers of all sizes through competitive service provision.

This consultation only concerns public FWPMA services. The existing licensing regime already supports access via fixed point to point links.

This consultation paper is not a legal document and does not constitute legal, commercial, or technical advice. The Director is not bound by it. The consultation is without prejudice to the legal position of the Director or her rights and duties under relevant legislation and does not form part of any formal tender process.

Structure of the paper

This paper is structured in a number of main sections as follows:

- section five outlines the FWPMA services market and describes the three market segments for which competitive licenses are proposed;
- section six identifies the general principles which are expected to apply to all FWPMA service licenses;
- section seven describes the nature of the licenses expected to be offered by competition in each market segment; and
- section eight outlines the proposed licensing process, highlighting key areas where information is likely to be sought from applicants.

Consultation procedures and timetable

The consultation period will run from Thursday 27 August to Friday 25 September. Written comments should be submitted before 5.00 p.m. on Friday 25 September to:

Martina Sheridan
The Office of the Director of Telecommunications Regulation
Abbey Court
Irish Life Centre
Lower Abbey Street
Dublin 1

All comments are welcome, but it would make the task of analysing replies much easier if:

- comments reference the relevant question numbers from this document; and
- responses cover both the general questions raised in sections five, six, eight and ten of this document and one or more of the specific competitions described in section seven.

The Director expects to publish the results of this consultation. If there are elements of any response which are commercially confidential, then it is essential that these are clearly identified, they will then be treated in confidence.

The Director regrets that it will not be possible to enter into correspondence with those supplying comments.

The timetable for liberalising the telecommunications market is very tight and as a result it has not been possible to make a longer period available for comment. The Director intends to issue her response to the consultation by 19 October 1998.

Segmentation of the fixed wireless access services market

The Director recognises that there are a wide variety of different customer requirements for 'Fixed Wireless Point to Multi-point Access (FWPMA) services. Appendix one provides some relevant definitions. An essential context for effective consultation is a clear definition of the individual market segments into which such requirements can be grouped. Appendix two illustrates the proposed segmentation in diagrammatic form, against the basic parameters of population density and customer class. Three segments have been selected as of immediate interest in the context of telecommunications liberalisation. These are:

- urban 155 Mbits/sec service;
- urban, suburban and rural town up to 2 Mbits/sec service; and
- rural and suburban ISDN 144kbits/sec service, with an optional 32 kbits/sec service to remote rural locations.

These segments are defined in more detail below

Urban 155 Mbits/sec service

This is a service targeted at large organisations, or at the owners of major buildings or campuses. It would have a range of potentially up to 5 kms from any base station. The service would have a maximum data rate to a single customer or site of 155 Mbits/sec, though it would be possible to configure multiple, separate, streams to deliver an aggregate bit rate in excess of 155 Mbits/sec. The service can be split, based on multiples of 2 Mbits/sec to serve multiple customers within a single site or building from the single 155 Mbits/sec stream[1]. As a future enhancement, it may be possible to service a number of separate sites with intermediate bit rates (8,16,34,…Mbits/sec) based on 'drop and insert' techniques within the 155 Mbits/sec stream.

Urban, suburban and rural town up to 2Mbits/sec service

This service is key to ensuring competition in serving small/medium enterprises (SMEs). The service would have a maximum data rate to a single customer of 2 Mbits/sec, though it would be possible to configure multiple separate streams to deliver an aggregate bit rate in excess of 2 Mbits/sec. The service can be split, on multiples of 64kbits/sec, to deliver intermediate bit rates between 144kbits/sec and 2 Mbits/sec.

Rural and suburban ISDN 144kbits/sec service

[1] Such splitting may have telecommunications licensing implications for the operator of the on-site multiplexor if the stream is split among a number of separate customers.

This service is targeted at bringing competitive digital facilities, at affordable prices, to the residential and 'small office – home office' (soho) markets, whether in rural areas, small towns or the suburbs. In rural areas it parallels the RURTEL service provided by Telecom Eireann, which is limited, by current license conditions, to the West Coast. RURTEL provides an analogue presented telephone and low speed data service derived from 32 kbits/sec ADPCM digital connections[2].

This segment can make a vital contribution to the maintenance of 'universal service' and to ensuring that all parts of Ireland have the opportunity to participate in the 'Information Society'. The main target data rate is basic ISDN (144 kbits/sec), to support both voice and high speed Internet access. Multiple streams could be configured to provide more aggregate capacity. (Note: basic ISDN is not available on RURTEL). The option of a minimum data rate of 32 kbits/sec is retained for a low cost, basic voice and low speed data, service to remote rural areas.

This segment also represents a service, which could be combined with digital MMDS to provide an interactive TV, voice and data service.

Question 5.1 – Do these segments correctly address the priority requirements? Should other segments be defined and addressed?

Question 5.2 – How will the growing demand for fast internet access and the development of electronic commerce change these markets?

General principles of licensing to be applied

It is proposed that licenses will be issued under the Wireless Telegraphy Acts, 1926 to 1988 for the FWPMA services described in this consultation document. In addition, the successful applicants would be expected to hold already, or to obtain, the relevant telecommunications licenses for the services which they expect to provide.

Number of licenses to be issued

The Director recognizes the crucial importance of facilitating competition throughout the telecommunications marketplace. FWPMA services are an important element in the establishment of that framework of competition. The Director notes however that it will be necessary to strike a balance. Radio spectrum availability is finite and spectrum allocated to FWPMA services is thus denied to other uses. Similarly it is important that sufficient spectrum is available not merely to launch a service but to sustain competitive providers as usage grows to maturity. The Director has suggested the following principles, which underpin the specific proposals in this document:

- a minimum of three licenses should be made available for any agreed segment of the FWPMA market;
- more licenses should be issued where there is both clear market demand and sufficient spectrum to sustain viable operation; and
- there should be no restrictions on those who may apply for licenses, beyond standard tests of commercial and technical viability. Thus incumbent operators should be free to apply[3].

[2] RURTEL does not fall strictly within the definition of FWPMA service, as it normally uses a wired final connection from the pole to the customer premises.

[3] The Director reserves the right, in publishing the criteria against which bids for licenses in any given market segment will be evaluated, to include the promotion of effective competition as an element in the evaluation

Question 6.1.1 – Is the principle of a minimum of three licenses per market segment, with more offered against clear demand subject to spectrum constraints, the appropriate balance to strike?

Question 6.1.2 – What should the balance be between licenses offered nationally and those split, to be offered on a regional basis?

Standard license structure and terms

License duration

The Director must balance the need for security of tenure for those investing in the provision of FWPMA services with the need to ensure that spectrum not properly utilized can be withdrawn and made available to other FWPMA service providers, or reallocated to other uses. The Director suggests:

- an initial five year license, issued against payment of annual license fees and subject to compliance with license terms and conditions, including spectrum utilisation requirements;
- after this five years, annual renewal against payment of a fee, subject to satisfying the Director that the licensed spectrum is being used in accordance with the National Table of Allocations and in line with appropriate national and regional spectrum utilisation targets and also that the quality of service provided meets the agreed targets; and
- the ability, with due notice, to migrate services to new spectrum allocations in order to comply with spectrum allocation decisions reached through the World Radio Conferences (WRCs) of the International Telecommunications Union (ITU), or through the Decisions made by the European Radio Committee (ERC) of the Confederation of European Postal and Telecommunications Administrations (CEPT).

The Director reserves the right to terminate these licenses ten years after first issue. This would enable any necessary re-planning.

Question 6.2.1 – Is the minimum five year duration and subsequent annual renewal cycle the appropriate basis for FWPMA services?

Coverage and roll out timetable

The Director places great importance on both the early introduction of services and the rapid spread of their availability. The Director does not wish however to be proscriptive at this stage as to the form of roll out and coverage commitments.

Question 6.2.2 – Given the Director's clear priority on roll out and coverage, how might license conditions best be drafted to achieve these goals whilst leaving the maximum commercial freedom with licensees?

Question 6.2.3 – How might mast sharing with existing services, or between new operators, best be promoted to minimise the need for new masts?

Equipment standards

The Director favours light handed regulation and thus would prefer, within the limits imposed by European law[4], to remain neutral on the technologies which might be deployed to provide

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of responses. The Director may also decide to re-issue WT Act licenses relating to existing services in the context of these competitions.

[4] The European Telecommunications Standards Institute (ETSI) establishes standards for telecommunications equipment and services within the European Union. It is not open to Member States to license services using standards which conflict with those published by ETSI, or in areas where ETSI has a programme of standardization in progress.

FWPMA services. Licensees could choose however to operate conflicting technologies adjacent to each other within the same overall spectrum allocation. Should this occur, guard bands would be required between operators. The Director wishes to make it clear that this 'guard' spectrum would have to come from the operators' assignments and would not be provided as additional spectrum.

Question 6.3.1 – Should a particular technology be selected for each segment in order to avoid the requirement for spectrally inefficient guardbands, or should licensees be free, within the framework of ETSI standardization, to select their own technology?

Code or sequence sharing

The Director notes that, in some spectrum bands, it may be appropriate to deploy Code Division Multiple Access (CDMA) or other frequency agile technologies. These offer the option of sharing a single allocation of spectrum between several operators on the basis of different spreading code sets or frequency hop sequences.

Question 6.4.1 – Should sharing by code or sequence, within an overall spectrum block be permitted? Would it be possible for operators to manage fair sharing of spectrum capacity, and the achievement of specified quality of service targets, within such an environment?

Applying geographic limits to services

The market segmentation used draws distinctions between areas of different population density. For licenses with coverage or regional restrictions, the Director will define the geographic areas to be covered. An appropriate reference will be used such as an aggregate of Counties or geographic telephone numbering areas.

Question 6.5.1 – What is the practicality of applying geographic limits? If used, how might these best be defined?

Question 6.5.2 – If regional systems are licensed, how should the spectrum sharing between different regional operators be handled?

Fee structure envisaged

The Director proposes to use the evolving fee structure for fixed point to point links[5] as the basis for developing a fee regime for FWPMA services. These FWPMA fees are likely to reflect:

- the amount of spectrum assigned;
- the band from which that spectrum is drawn;
- the re-use possible (on a regional or national basis) to support a number of different base stations each servicing customers in the same spectrum but in different geographic areas;
- the ability to use some degree of sectoring or antenna discrimination at each base station; and
- the use of lead in discounts as networks are built.

The Director also proposes to charge a fee for the documents relating to entry into the competition for each license and an administration fee to cover the cost to ODTR of evaluating the competition responses.

[5] As indicated in the radio links guidelines (document number ODTR 98/14), these fees are due to be revised and will be the subject of a separate consultation.

Question 6.6.1 – How should the fee structure for access to FWPMA spectrum be developed to give the maximum incentive for:

- *early roll out of services;*
- *the most efficient use of the spectrum assigned; and*
- *the maintenance of quality standards in the service provided?*

Managing spectrum as services develop

In the new markets to be developed by FWPMA services, it is not possible to be certain what the ultimate level of demand may be. It is also difficult to predict how that service demand will be translated into spectrum requirements, as the spectral efficiency of radio systems rise and the cost of equipment falls (making more intensive re-use of spectrum economic). Where possible, the Director plans to make further spectrum available against demonstrated need. In pursuit of this the Director has carried out a careful review of the spectrum available for allocation to FWPMA services and the balance to be struck against competing demands for other uses. The results of this review are reflected in the spectrum allocations proposed in section seven of this document.

Question 6.7.1 – Should all the proposed spectrum be released to the successful applicants at the outset or should it be released against demonstrated need, after an initial assignment, as proposed?

Question 6.7.2 – What should be the criteria for releasing additional spectrum to successful licensees? Should this be on the basis of equality for all or instead reflect the degree of market success of individual licensees?

Question 6.7.3 – Should spectrum which remains unused by a licensee in a particular region be taken back by the Director, after a suitable warning and notice period?

Licenses to be offered by market segment

Urban 155 Mbits/sec service

The Director proposes to issue five licences, each comprised of 56 + 56 MHz (e.g. 112 MHz per licence), in the 28GHz band. This comprises some 30% of the available spectrum in this band.

The Director wishes to make clear that the use of the remainder of the spectrum in this band will be reviewed after one year against the options of:

i) releasing additional spectrum to the licence winners against demonstrated need;
ii) licensing further operators on similar terms if there is clear demand;
iii) releasing spectrum for other uses; or
iv) holding a further review.

These licences will be offered on a national basis, though the Director recognises that the service is only likely to be deployed in major urban centres. Roll out conditions are likely to be imposed such that service is provided in a number of designated centres within a fixed period of time. The maximum data rate allowed per link will be 155 Mbits/sec and the minimum capacity, which may be delivered to a single customer, is 2 Mbits/sec.

Question 7.1.1 – Is five the appropriate number of licenses to be issued at this stage?

Question 7.1.2 – Does the provision of 56 + 56 MHz of spectrum per license provide enough initial capacity for the launch of services?

Question 7.1.3 – Which urban centres should be designated for mandatory coverage?

Question 7.1.4 – What phased deadlines should be set for service roll out?

Urban, suburban and rural town up to 2Mbits/sec service

The Director proposes to issue three licenses each comprised of up to 20 + 20 MHz, (e.g. 40 MHz per license) as follows:

i) two licenses in the 3.5 GHz band with potential expansion spectrum held in the 4 GHz band; and
ii) one license in the 10.5 GHz band[6], again with potential expansion spectrum.

It should be noted that there would be significant constraints to other services in making additional spectrum available for this segment.

The Director expects, through license conditions, to place greater roll out and coverage requirements on the 3.5 GHz band operators, in order to balance the competitive position against the shorter range possible for the 10.5 GHz operator.

These licences will be offered on a national basis, though the Director recognises that the service is only likely to be deployed in urban and suburban areas and rural towns. Roll out conditions are likely to be imposed such that service is provided in designated areas within a fixed period of time. The maximum data rate allowed per link would be 2 Mbits/sec.

The Director does not envisage the use of Radio Local Area Network (RLAN) technologies, such as HIPERLAN operating at 5 GHz, to provide this service.

Question 7.2.1 – Is three the appropriate number of licenses to be issue, given spectrum constraints and the need to balance scope for growth of the licensed operators against the introduction of further competition?

[6] The 10.5 GHz band is shared with a number of other uses including: low power devices; police and traffic control radars; and the amateur service.

Question 7.2.2 – Does the provision of 20 + 20 MHz of spectrum per license provide enough capacity for services?

Question 7.2.3 – Which rural towns should be designated for mandatory coverage?

Question 7.2.4 – What phased deadlines should be set for service roll out?

Question 7.2.5 – As an alternative, should limited spectrum from both the 3.5 and 10.5 GHz bands be made available to all operators rather than the split of operation by band proposed above? If so, how might this division be achieved?

Rural and suburban ISDN 144kbits/sec service

The Director proposes to issue by competition one national licence and one licence, split to allow different regional operators. These would each use 30 MHz of spectrum between 2327 and 2400 MHz[7], deploying technologies which do not require split spectrum.

The Director also proposes to replace the WT license held by Telecom Eireann for its 'RURTEL' service. The new license would allow full rural deployment (removing the current restriction limiting use to the West Coast), but on condition that TE:

- migrate the RURTEL service to new technology, using 30 MHz of spectrum between 2300 and 2400 MHz[8] to avoid the growing interference likely from Industrial, Scientific and Medical (ISM) systems and the license exempt low power devices being increasingly used in the part of the current RURTEL spectrum allocation which overlaps the 2.4 GHz ISM band;
- ensure that the new 'RURTEL' would offer an ISDN (144kbits/sec) service capability as well as the current 32kbits/sec service; and
- accept a fixed delay in full deployment to provide entry assistance for the competing services.

In the long term the Director expects to apportion the spectrum between 2300 and 2400 MHz equally between all three licensees.

The Director does <u>not</u> envisage the use of 1.9 GHz DECT band to provide service to this segment. There is insufficient spectrum in the standard DECT allocation and potential conflict with the extensive use of license exempt DECT systems for cordless telephones.

Question 7.3.1 – Is two new licenses the appropriate number to issue, given the extreme spectrum constraints for such long-range services?

Question 7.3.2 – Does the provision of 30 MHz of spectrum per license provide sufficient capacity?

Question 7.3.3 – To what extent should the service be allowed to cover urban areas in addition to the suburban and rural areas targeted?

Question 7.3.4 – Is the overlap in the provision of basic ISDN service at 144 kbits/sec between this segment and that for urban, suburban and rural town services (detailed in section 7.2) desirable?

Question 7.3.5 – To what extent should rural coverage requirements relate to any universal service obligation?

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[7] This spectrum would thus not be available as expansion spectrum for MMDS. The process of conversion of MMDS services from analogue to digital transmission will need to take place within the existing spectrum allocation.

[8] Spectrum in the 2.4 to 2.5 GHz range could be used in the short term to facilitate this changeover.

Question 7.3.6 – What phased deadlines should be set for service roll out?

Question 7.3.7 – Should the minimum level of service provision be basic ISDN or the more limited 32 kbits/sec service?

Question 7.3.8 – Would it be appropriate to offer MMDS operators the opportunity, once their process of conversion from analogue to digital television service delivery is completed, to use some of the spectrum allocated for MMDS (core band 2520 to 2670 MHz) for the provision of services to this market segment?

Question 7.3.9 – Does sharing with a secondary use of this spectrum by the Amateur service present any potential problems?

Licensing process proposed

Competition context

The Director proposes to hold separate competitions for licenses in each of the three market segments identified:

- urban 155 Mbits/sec service;
- urban, suburban and rural town 2 Mbits/sec service; and
- rural and suburban ISDN service.

In each case a standard process is proposed of:

- publishing details of the licenses offered and the competition terms;
- seeking applications;
- assessing the responses; and
- awarding licenses to the highest ranked applications against payment of various fees and the consideration of any appeals against non-selection.

The process is likely to extend over four to five months for each market segment, but it is expected that the competitions would be held to some degree in parallel such that the licensing process can be initiated in all cases by April 1999.

Question 8.1.1 –Would it be appropriate, in the interests of speed to market, to overlap individual competitions? To what extent should any overlap occur? Should the winners in each competition be published before applications close on the next? Alternatively, should all the competitions be held simultaneously?

Question 8.1.2 – If a sequence of competitions is preferred, what should be the order?

Structure of individual competitions

The Director proposes that license applications be ranked against a number of published criteria in a process of commercial and technical assessment. Among other things, it will be important to demonstrate to the Director:

- the commercial and financial backing to achieve early service implementation and roll out;
- the appropriate marketing and sales skills to penetrate rapidly new markets; and
- technical competence and experience in the various radio technologies, which may be deployed, and in the provision of telecommunications services.

Key decision criteria

The Director intends that detailed guidance is issued in the application documents for each competition, but key elements sought in the responses are likely to include, but may not be limited to:

- a business plan, including details of the applicant's ownership, its relationships with suppliers and customers and its financial and managerial resources;
- the contribution that the FWPMA element is likely to make to the overall costs of telecommunications service delivery;
- detailed proposals for coverage and the timescale for network roll out;
- the quality of service expected to be delivered;
- the network design, including the likely demand for additional radio infrastructure such as point to point links;
- a requirement for the applicant to advise the technical details of the system configuration proposed, the range of services to be offered and the customer requirements to be specifically targeted;
- the opportunities the applicant may see for the promotion of new services such as fast internet access or electronic commerce;
- likely sources of equipment, with particular emphasis being given to innovative features;
- details of the technical standards to be employed and their compliance with standards from the European Telecommunications Standards Institute (ETSI) either published or in preparation;
- the technical parameters of the proposed implementation, highlighting how any spectrum sharing required might be accomplished and the extent to which guardbands might be required to minimise interference to other licensed spectrum users; and
- details as to how the security of the system proposed would be protected, with particular emphasis on issues such as preventing fraudulent use and eavesdropping.

Question 8.3.1 – Are there other areas which might be accorded particular importance in the application assessment process?

Question 8.3.2 – How might issues such as promoting effective use of spectrum, coverage and roll out best be defined in order to facilitate objective comparisons between applications?

Implications for existing operators

The Director's proposals in this consultation are non-discriminatory and allow existing service operators, of all types, to participate in the proposed competitions. In particular they offer scope for:

- those who have, or plan to install, digital trunk capacity between towns and cities to add local distribution providing new opportunities for end to end service management and delivery;
- Telecom Eireann to redevelop and extend their important RURTEL service to rural communities avoiding the prospect of growing interference from license exempt services; and
- MMDS operators an opportunity to extend into interactive services.

Consequences for other services

MMDS analogue to digital conversion process

The adoption of the Director's proposals would result in the spectrum between 2327 and 2401 MHz not being available for the extension of TV transmission by the MMDS operators. The analogue to digital transmission conversion process for MMDS would therefore need to take place within the existing spectrum allocation utilising the interleaved channels not suitable for analogue service.

Amateur service

The Director's proposal to use spectrum in the 10.5 GHz band for one operator of the urban, suburban and rural town up to 2 Mbits/sec service, would impact the secondary allocation of spectrum between 10 and 10.5 GHz for the Amateur service. It is suggested that improved access might be given to a portion of this band, whilst the overall secondary allocation to amateurs might be reduced.

The Director's further proposal to use spectrum between 2.3 and 2.4 GHz more intensively for FWPMA services would have an increased impact on the amateur secondary allocation in this band.

Question 10.2.1 – To what extent is the 10 to 10.5 GHz band used by the Amateur service? What Amateur services would be the most important to protect?

Question 10.2.2 – How intensive is the secondary use of the 2.3 GHz band by the amateur service?

Use of higher bands

There is ample spectrum available at 40GHz and above. It would be helpful to have views as to how this important resource might be utilised.

Question 10.3.1 – How might spectrum above 40 GHz be used in the context of further deployments of FWPMA systems?

Conclusions

The Director is pleased to present this consultation paper for comment by interested parties. Comments received will be considered carefully as the process of licensing FWPMA services moves forward. This represents a vital opportunity to assist in establishing the framework for competitive telecommunications access services.

Appendix 1 - Terminology

It is essential to have a framework of agreed definitions to bring focus and clarity to an area where the existing terminology is ambiguous and frequently misleading. Key definitions for terms used in this paper are made below.

Fixed Wireless Access (FWA)

refers to the use of radio spectrum based technologies to link customers to the core network of a public telecommunications service provider. This link is always two way. It may be a dedicated or a shared facility. It may link customers directly to a telecommunications switch or concentrator, or may connect instead to a further fixed network or radio based transmission system. This paper addresses only a specific subset of shared FWA services[9]. Private or closed user group applications of radio links also exist and are the subject of an existing licensing regime not covered here.

Broadcasting

refers to the transmission or retransmission, by wire or over the air, of sounds and/or visual images, whether encoded or unencoded, intended for simultaneous reception by the general public, whether actually received or not.[10] This is a one way service, but can be operated in conjunction with telecommunications services (on fixed or radio based networks) to provide a two way interactive service. This paper addresses only the adjunct telecommunications services and how these might be packaged with a broadcasting service, in the new digital broadcasting environment.

Fixed wireless point to point access services

refers to a subset of FWA, which provides a dedicated two way link between two fixed points; one a single customer network (or closed user group network) and the other a public telecommunications network. ODTR has existing processes for licensing such services and they are not considered further in this paper.

Fixed wireless point to multi-point access services (FWPMA Services)

refers to a further subset of FWA, which supports two way links to a number of fixed, separate, customers or sites from any single base station. There are potentially a wide variety of such services addressing different market segments. The telecommunications regulation, competition and spectrum management issues surrounding the licensing of FWPMA services are the subject of this paper.

These definitions are consistent with the terminology being proposed within the ITU.

[9] The term 'service' is used here in the context of the International Telecommunications Union (ITU) Radio Regulations. In the telecommunications licensing context, Fixed Wireless Access is a facility rather than a complete service.

[10] MMDS, under the definitions used in the ITU Radio Regulations, is not a broadcasting service but a one way, fixed, point to multipoint, telecommunications service. The Courts have however determined that in terms of Irish national law MMDS should be treated as a broadcasting service.

Appendix 2 – Local Loop Segmentation Matrix