Office of the Director of
**Telecommunications
Regulation**

Extending Choice

Opening the Market for Third Generation Mobile
Services (3G Mobile)

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Consultation Paper

Contents

Foreword

This consultation marks a significant step in introducing further choice and diversity into the Irish mobile communications market. Third generation (3G) mobile represents a major evolution in mobile communications, bringing the full power of the Internet, with high quality audio, video and graphics, to people on the move. Data rates up to 200 times those of existing mobile phones will enable large files to be transmitted almost instantaneously and new applications like electronic postcards and mobile video conferencing to become commonplace.

I plan to offer four 3G mobile licences later this year. This document describes the proposed approach to licensing 3G services and seeks views on how to maximise the benefit to the Irish consumer from this major new development.

Etain Doyle,

Director of Telecommunications Regulation

Executive Summary

This consultation document addresses a number of technical, commercial, economic and regulatory issues relating to the introduction of 3rd generation (3G) mobile services in Ireland. 3G represents the next major step in the evolution of mobile communications, with the emphasis on data rather than voice services. This reflects similar trends in fixed telecommunications, where the rise of the Internet has recently seen data overtake voice traffic for the first time.

The positioning of 3G in the wider telecommunications market can best be encapsulated in terms of bandwidth and mobility capability, as follows:
- Current 2G mobile networks are capable of providing high mobility, narrow band services;
- Current fixed networks are capable of providing low mobility, wide band services;
- 3G mobile networks will be able to provide high mobility, wide band services.

This consultation paper seeks views on the design of the competition process for the award of 3G licences in Ireland. In awarding licences the Director is seeking, in line with her statutory functions, to ensure that good quality, innovative telecommunications services are available to all consumers at the lowest price possible consistent with the sustainability of a competitive market. To achieve this as speedily as possible, Ireland needs to maintain its position at the leading edge of telecommunications development. That in turn requires extensive network coverage provided as quickly as possible and the development of a competitive mobile telecommunications market.

The Director wishes to invite comments from interested parties in relation to any of the questions raised in this paper. The closing date for receipt of comments is **15th September 2000**. Please see Section 7 for details on submitting comments.

This consultation paper 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 legislation.

1 Introduction: What is Third Generation?

Current mobile phones use either first generation ("1G") analogue or second generation ("2G") digital technology. The former has been in use since 1985 and is expected to cease operation in Ireland within the next few years. The great majority of mobile phones currently in use, including all new phones, are 2G devices operating to the international Global System Mobile ("GSM") standard, which was introduced in Ireland in 1993. Compared to 1G, GSM provides significant user benefits including enhanced speech quality, security from eavesdropping, international roaming and the ability to convey data as well as voice services. The technology also provides much greater capacity in the available radio spectrum, making possible the rapid increase in subscriber numbers that has been achieved in recent years. This has transformed the mobile phone from a specialised and expensive business tool to a mass-market consumer product.

Third generation ("3G") represents the next major step in the evolution of mobile communications. What principally differentiates 3G services from their current 2G counterparts is the emphasis on data rather than voice services. This reflects similar trends in fixed telecommunications, where the rise of the Internet has recently seen data overtake voice traffic for the first time.

The principal enablers of 3G mobile are:
i)   availability of radio spectrum, first identified at the 1992 World Administrative Radio Conference (WARC-92) and to be supplemented by future expansion spectrum identified at the recent 2000 World Radio Conference (WRC-2000);
ii)   development of a global family of standards under the banner "IMT-2000" (International Mobile Telecommunications 2000).

In Europe, the introduction of 3rd generation services has been supported by the European Commission, CEPT and ETSI. EU Decision 128/1999/EC addresses the co-ordinated introduction of 3G mobile services in the Community. Spectrum for 3G service in Europe is identified in CEPT Decision ERC/DEC (97)07. A more recent CEPT Decision, ERC/DEC(99)25, defines channel spacings, minimum carrier separations and the apportionment of spectrum between licensed and unlicensed UMTS services. These aspects are considered in more detail in section **Error! Reference source not found.**.

2 Current international situation

2.1   Europe

EU Decision 128/1999 EC requires Member States to take all actions necessary in order to allow the introduction of 3G services by 1 January 2002 at the latest, and to establish an authorisation system for 3G by 1 January 2000. So far only Finland, Spain and the UK have issued 3G licences, although a number of other countries are currently in the process of allocating licences.

2.2   Elsewhere

Outside Europe, the greatest interest in 3G has been in Japan, largely in response to increasing congestion arising on existing 2G mobile networks. Japan intends to issue 3G licences later this year, with a view to services commencing in 2001.
The situation in North America is less clear, since part of the spectrum earmarked for 3G services has already been auctioned for 2G personal communication services. However, the North American cellular industry and standards bodies are participating fully in global 3G standards development.

3 Economic and Market factors

3.1   Market Definition

At the moment there is some uncertainty about how the 3G market will develop. For example, it is unclear whether it will it be dominated by business use, as in the early days of 1G and 2G, or whether mass-market applications such as gaming or on-line music and video will drive the market. Some analysts have suggested that the mass consumer market could be a major driver of 3G services and applications.

The positioning of 3G in the wider telecommunications market can best be encapsulated in terms of the bandwidth and mobility capability, as follows:

- Current 2G mobile networks are capable of providing high mobility, narrow band services;
- Current fixed networks are capable of providing low mobility, wide band services;
- 3G mobile networks will be able to provide high mobility, wide band services.

This is illustrated in **Error! Reference source not found.** below:
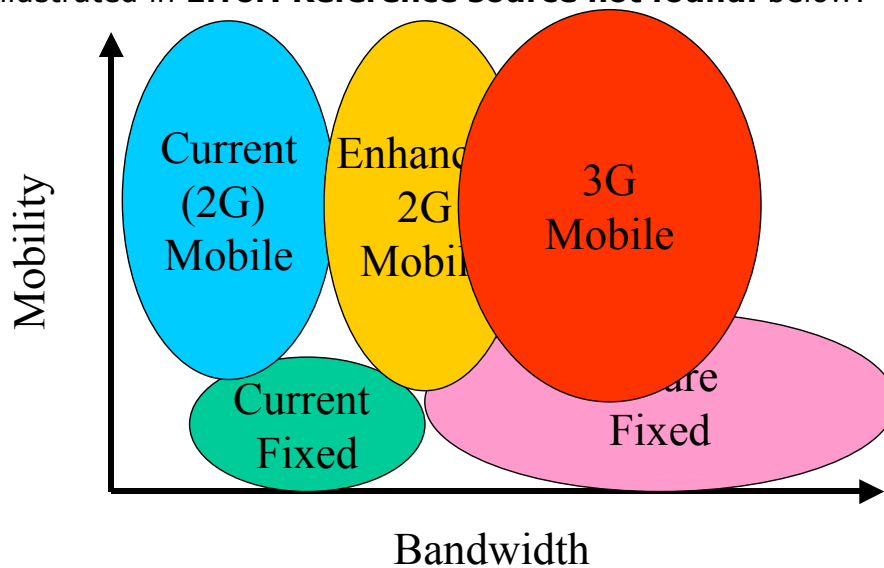
Figure 3.1: Position of 3G mobile in the wider telecommunications market

3.2   3G mobile market relationships

3G mobile market relationships are likely to be complex, involving for example value added content providers, network operators, service providers and retailers. Content and value added services may account for a much more significant proportion of 3G mobile revenue than is the case for today's 2G networks. A useful analogy is broadcasting, where there is an increasing emphasis on subscription based services delivering premium content such as sport or movies.

Error! Reference source not found. shows some of the potential market relationships for 3G mobile services. Note the key roles that may be played by value added service providers and virtual networks, which have their own network identity but no radio spectrum. The success of these players in developing innovative new services and applications may depend upon the terms under which they can gain access to the air interfaces of the licensed 3G network operators.
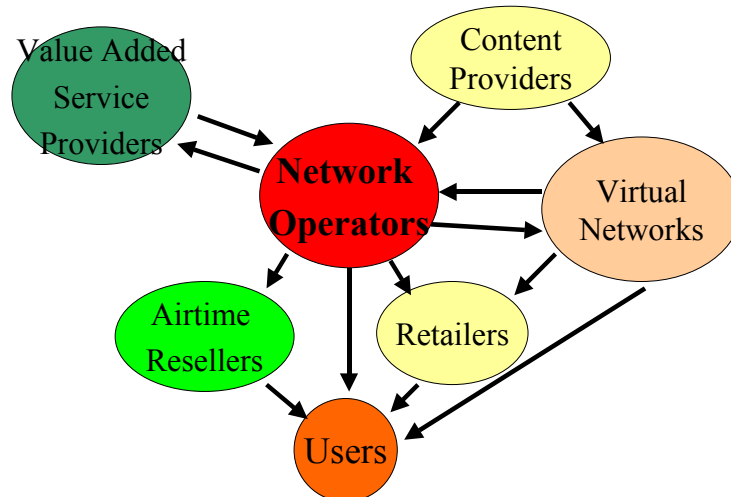
Figure 3.2: 3G mobile market relationships

Question 1. Do you have a view on the role of content providers, service providers and virtual network operators in the delivery of 3G services?

3.3   Recent international market developments

The cellular telephony market worldwide is growing at an unprecedented rate. There were over 550 million cellular subscribers at the end of May 2000[1], with no sign of any reduction in the growth rate. Penetration in Ireland now stands at over 50% of population, while in some European countries levels of 70% have been achieved. Some analysts are forecasting long term penetration levels of over 100% as users acquire multiple phones for different purposes (e.g. one for home, one for work or different terminals for voice and data services).

Around the world, mobile operators are increasingly focussing on value added data services, which are likely to be the biggest mobile growth area over the next decade. Currently these are mostly delivered using narrow band technologies such as SMS[2] and WAP[3], however there is a growing industry consensus that in the future users will demand a richer multimedia experience whilst on the move.

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[1] Source: EMC World Cellular Database (Quarterly)

[2] Short Message Service

[3] Wireless Application Protocol

E -mail and Internet access are already available over 2G mobile networks and the advent of built-in infra red modems in the latest phones and PCs has simplified the process, stimulating further the demand for mobile data services. Exponential growth in SMS traffic suggests users are increasingly comfortable with the concept of mobile data.

Over the next couple of years mobile data services are expected to migrate to "enhanced 2G" services such as the General Packet Radio Service ("GPRS") which will enable both higher speeds and improved efficiency, by connecting to the network only when data packets are actually being sent or received. GPRS will also provide the core network base for 3rd generation mobile services. A report produced for the UMTS Forum[4] estimated that the mobile multimedia market in Western Europe will be worth 24 billion Euros per year by 2005. In Ireland, as in much of the rest of Europe, there are over twice as many mobile phone users as there are Internet users, and Motorola has suggested that more than half of all Internet connections will come from wireless devices by 2003.   A number of major corporate alliances are being formed to develop this vision.

3.4 Current state of Irish mobile market

Rapidly increasing take up of mobile phones, driven largely by prepay, had brought Ireland up to 51.7% penetration by July 2000[5]. This is almost identical to the penetration level in the UK (52.5%) and higher than the average for Western Europe as a whole (50.0%). Annual growth in Ireland over the year to July 2000 was 66% and mobile penetration now exceeds that of fixed lines.

3.5 Fixed Mobile Convergence

3G mobile services are expected to provide a fully portable service portfolio accessible from substantially any fixed or mobile telephone, subject only to the subscriber being able to identify him or herself to the network. This concept is known as the "virtual home environment" (see section **Error! Reference source not found.**). 3G services will thus combine the terminal mobility provided by current 2G networks with the personal mobility provided by personal numbering and indirect access schemes.

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[4] The Future Mobile Market: Global trends and developments with a focus on Western Europe, UMTS Forum, March 1999

[5] Source: Financial Times Mobile Communications Newsletter

4 Technical Issues

4.1   3G Standards and Technology

4.1.1   IMT-2000

IMT-2000 is intended ultimately to be a global service. This will be achieved by the adoption of a comprehensive "family" of terrestrial and satellite radio interface specifications. Initially numerous standards were submitted to the ITU's IMT-2000 committee. In November 1999 after a long process of harmonisation and selection, a definitive set of radio interfaces was approved, as shown in **Error! Reference source not found.**.
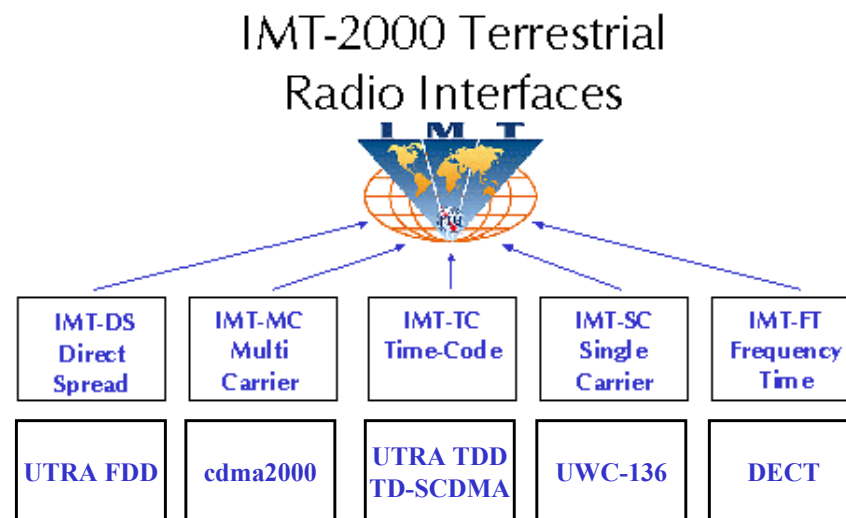
Figure 4.1: The selected IMT-2000 radio standards.

The five definitive standards are:
i)   **UMTS Terrestrial Radio Access (UTRA):** Frequency Division Duplex (FDD) and Time Division Duplex (TDD) standards are primarily being fostered by the 3rd Generation Partnership Project (3GPP), which has ETSI (Europe) and ARIB (Japan) among its members
ii)   **Code Division Multiple Access 2000 (CDMA200)** is submitted by the TIA of America.
iii)   **Time Division – Synchronous Code Division Multiple Access (TD-SCDMA)** is proposed by China Academy of Telecommunication Technology (CATT).
iv)   **Universal Wireless Communications (UWC-136)** is submitted by the TIA of America.
v)   **Digital Enhanced Cordless Telecommunications (DECT)** is proposed by ETSI (Europe)

Any of the above IMT-2000 standards may be used for 3G licences, however to facilitate international roaming the European Commission requires each member state to licence at lease one 3G network using the UTRA air interface standard. Further information on these standards may be obtained from the Third Generation Partnership Project web site at www.3gpp.org.

4.2 Radio Spectrum Requirements and Availability

4.2.1 Currently Available Spectrum

The spectrum currently available in Ireland for 3G mobile services based on the IMT 2000 standards is shown in **Error! Reference source not found.** below. A total of 155 MHz is available. Note that most of the spectrum (2 x 60 MHz) is paired, i.e there are matched sub-bands for network to mobile and mobile to network transmission, as is the case with GSM. This type of operation is known as "frequency division duplex" (FDD). The remaining 35 MHz is unpaired and individual channels are likely to be used for both network to mobile and mobile to network transmission, a technique known as time division duplex (TDD). TDD is currently used by digital cordless technologies such as DECT.
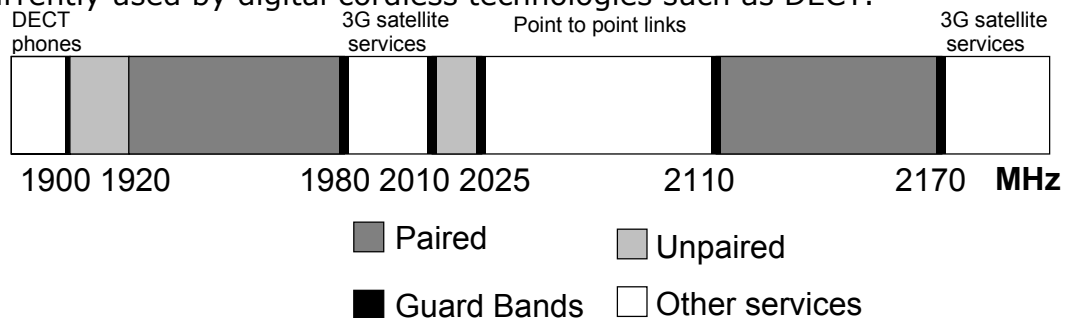
Figure 4.2: Currently available spectrum for 3G mobile services

Note that the reference in the above diagram to DECT refers to the current (2G) allocation below 1900 MHz. Variants of DECT may also in the future be deployed as a 3G technology within the designated 3G bands.

4.2.2 Spectrum Requirement per Operator

Work carried out by the UMTS Forum recommended that a minimum spectrum allocation of 2 x 15 MHz paired and 5 MHz unpaired would be required to provide a full range of UMTS services[6].   The Director is minded to follow this recommendation and therefore proposes to offer each 3G licensee spectrum comprising 2 x 15 MHz paired and 5 MHz unpaired. This is addressed in more detail in section 5.1. Note that any guard bands that may be required between adjacent channels must be accommodated within each operators' assigned radio channels.

4.2.3 Future Expansion Spectrum

As services mature, it is likely that more spectrum will be required to deliver the capacity and data rates demanded by users. In recognition of this, the recently concluded World Radio Conference agreed to make available on a global basis three further frequency bands for future expansion of terrestrial IMT-2000 services. The three bands are:
- 806 – 960 MHz
- 1710 – 1885 MHz
- 2500 – 2690 MHz

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[6] Minimum spectrum demand per public terrestrial UMTS operator in the initial phase, Report no. 5 from the UMTS Forum (www.umts-forum.org), September 1998.

This decision does not preclude the use of these bands for other applications or services for which they are allocated; each country will decide on the timing of availability at a national level, according to need. Countries will be able to select those parts of the bands where sharing with existing services is the most suitable, taking account of existing services.

4.2.4 International co-ordination

Co-ordination of 3G services will be required near the UK/ Ireland border. Unlike GSM, it will not be possible to simply apply a "preferred channel" approach, since the channel widths are much wider and their number much fewer. Instead, a form of CDMA code sharing is likely to be needed. Cross-border co-ordination issues are currently being addressed by CEPT in ERC Task Group 1.

Question 2. Do you have a view on how cross-border co-ordination between 3G mobile networks might be approached, taking account of the technologies that might be involved?

4.3 Relation between 2G and 3G networks

4.3.1 Introduction

Whereas 2G digital networks were completely separate entities from their 1G analogue counterparts, 3G networks will have much in common with 2G and delivery of a full range of mobile services is likely to require access to both 2G and 3G radio networks for some considerable time. 3G core networks will be based on the GSM GPRS standard, enabling existing GSM operators to provide 3G services using either a GPRS or 3G air interface[7]. Most 3G terminals are expected to be multi-mode, providing access to 2G and 3G radio networks[8].

4.3.2 Enhanced 2G services ("2.5G")

Prior to the introduction of 3G services, significant enhancements to existing 2G networks are likely to be implemented. High Speed Circuit Switched Data ("HSCSD") and the General Packet Radio Service ("GPRS") enable TDMA time slots to be combined to provide potential bit rates of 56 kilobits per second and beyond, albeit at the expense of base station capacity. A further enhancement, Enhanced Data Rates in a GSM Environment ("EDGE"), is anticipated in 2 – 3 years as the final evolutionary step towards 3G mobile networks, and will provide potential bit rates over short distances of up to 384 kilobits per second. These enhancements are collectively referred to as 2.5G services.
GPRS introduces to GSM for the first time the concept of packet switching, offering considerable advantages to data users over conventional circuit

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[7] In practice, only the 3G air interface will provide the highest data rates (up to 2 Mbit/s), however many 3G services such as web browsing or audio downloads may not require such high speeds.

[8] In some cases, access to other radio interfaces such as satellite networks or cordless base stations may also be provided.

switching. GPRS provides an "always on" connection to e-mail and Internet services, but only uses network resources when data packets are being sent or received.

4.3.3   Handover between 2G and 3G networks

Handover, which is the continuation of a call as the mobile moves from one cell to another, is currently only feasible within a single network using a single standard. However, since many 3G networks may initially be operated as overlays to existing enhanced 2G networks, the 3G standards provide for handover between the two. There are three potential approaches to handover between 2G and 3G networks, namely:

i) **Hard Handover**: the connection is broken with Network A before a connection is made with Network B. This is the least complex handover algorithm, but the worst handover algorithm in terms of customer connection quality, particularly for real time services such as voice telephony.

ii) **Seamless Handover**: The connection is broken with Network A once a connection has been set-up with Network B through use of the signalling channel.

iii) **Soft Handover:** A connection is set-up with Network B while maintaining a connection with Network A, i.e., the mobile station simultaneously communicates with both networks. The handover algorithm decides when the connection with Network A is dropped. This is the best handover in terms of quality of connection to the customer. In UMTS (a CDMA network), there is soft handover between cells.

For handover between 2G and 3G services, the network and terminal must be able to:

• Access both the 2G and 3G networks (Dual Mode terminals);

• Have the ability to perform measurements on the 2G network while communicating on the 3G network, and vice versa;

• Roam freely between the 2G operator and the 3G operator networks.

Inter-network handover presents both technical and commercial difficulties. In GSM networks, handover is controlled within the operator's core network and there is therefore no provision for handover between different operators' networks.   It is not yet clear whether this limitation will apply to 3G networks in the long term.

4.4   Roaming

Roaming is currently deployed between 2G networks to enable calls to be made or received outside the home network's country, but is not widely available between networks in the same country. National roaming would allow the user to initiate and receive calls on networks other than the subscriber's own in the home country, i.e., to access the roamed network's air interface, but as with international roaming it would not allow the user to continue an existing call when moving from one network coverage area to another.

In the first few years at least, 3G services are expected to be complementary to 2G services, in which case 3G operators may require access to 2G networks to deliver a full service package. It is the

Director's view therefore that 3G operators who do not also have a 2G network will require access, such as national roaming, onto others' 2G networks. A similar requirement may arise where 2G operators do not also have 3G licences. Roaming will also be necessary for new entrant 3G operators in the short term to enable national coverage to be provided at an earlier stage. Such coverage is essential to provide credible competition to incumbent operators. The Director takes the view that roaming is therefore a significant factor in enhancing competition between 3G networks and plans to require agreement to national roaming between 3G and 2G networks as a pre-selection criteria for the licence competition. This is addressed in further detail in section **Error! Reference source not found.** below.

4.5 Home Environment and VHE

The "Home Environment" is a concept defined in 3G standards as a facility enabling a user to obtain services in a consistent manner regardless of the location or terminal used, within the limitations of the serving network[9]. The home environment is provided by the organisation with whom the user has a subscriber relationship, that is, the provider of the SIM card used in the terminal. In current 2G networks this is the mobile network operator, but with 3G services, the home environment might be provided by a service provider or virtual network operator ("VNO").
Virtual Home Environment ("VHE") is a 3G system concept for personalised service portability between serving networks and terminals. VHE will enable services and features that the subscriber is familiar with at home to be replicated fully when using any other network.

4.6 Numbering and Addressing Issues

4.6.1 General

Current developments in the 3G Partnership Project (3GPP) standards forum suggest that IMT-2000 networks are likely to be entirely packet switched, probably based on the emerging IPv6 protocols. The IPv6 forum has recently joined the 3GPP as a market representation partner. IPv6 will provide a very large increase in the number of available IP addresses.
The range of services provided using 3G networks will be large and diverse, and the numbering, naming and addressing arrangements are likely to be strongly related to these services. However, 3G networks will need to interconnect with existing fixed and mobile networks which rely on existing numbering schemes. Basic telephony is therefore likely to be supported with the existing E.164 numbers and some additional services such as video telephony may also use the same number ranges.
Since the service is likely to be provided in conjunction with 2G, it is planned to continue to use the '08' numbering space for all mobile services.

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[9] The serving network is the network to which the terminal is connected at any particular time.

Mobile Network Codes ("MNCs"), as defined in the ITU-T E.212 standard, are required to identify a specific 3G network. MNCs form part of the International Mobile Subscriber Identity ("IMSI") which is a unique identification allocated to each mobile subscriber. The IMSI is composed of a 3 digit Mobile Country Code ("MCC"), a 2 or 3 digit MNC and a 9 or 10 digit Mobile Station Identification Number ("MSIN"). The IMSI cannot be more than 15 digits long. MNCs in Ireland are 2 digits in length. A mixture of 2 and 3 digit MNCs within a single MCC area is currently not considered feasible.

The ODTR will allocate a MNC to each 3G network. A network operator providing GSM and 3G services may wish to use the same MNC for both. The MNC requirement for other types of organisation and application is being investigated further.

4.6.2 Number Portability

Mobile numbering was the subject of a recent consultation, and a Decision Notice[10] published in April 2000 outlined options for the future.

In the absence of full mobile number portability and continuing with the existing partial number portability scheme[11], existing operators would retain their discrete 08X National Destination Codes ("NDCs") for 2G and potentially for 3G services. If such an arrangement continued, new operators could potentially be catered for with discrete 08X codes. See ODTR Document 00/50 for a status report on the Irish Telephony Numbering Scheme.

If mobile number portability is introduced, the existing relationship between operator and NDC will no longer be supported. However, the Director considers that as mobile penetration and the number of operators increases in Ireland, the absence of mobile number portability and the continued use of partial portability will cause an increasingly ineffective and inefficient use of numbering capacity. Left to continue, a change in subscriber number length from 7 digits to 8 digits would be required within 18 months for all existing users (based on information supplied by the existing operators). The timely introduction of full mobile number portability would remove this requirement for a number change.

In addition to the issue of efficiency, the Director recognises that the absence of full mobile number portability could pose a significant obstacle to the development of further competition. Mobile number portability offers the opportunity to subscribers who value their number highly to change networks without changing numbers. This can result in cost savings to the subscriber and also potential cost savings to those who call the subscriber. Cost-benefit analyses conducted elsewhere have indicated that mobile number portability offers a net economic benefit.   The removal of the number change requirement for existing users could also bring additional cost-benefits.

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[10]'Expansion of Mobile Numbering Capacity' - Decision Notice D5/00, April 2000.

[11] With partial portability, users retain the subscriber part of their number when they change operator. For example, a user changing from Eircell to Digifone will change numbers from **087** 234 5678 to **086** 234 5678.

The above analysis is consistent with the European Commission's most recent draft proposal for a Directive covering user's rights relating to electronic communications networks and services[12], which provides for extending the obligation of number portability to mobile operators. It is not expected that this Directive will be transposed into national law for some time. However, several EU member states have already mandated mobile number portability through their domestic legislation and licensing schemes to further encourage competition.

Given the likely competitive and economic benefits, the expected European legislative requirement and the additional numbering benefits particular to Ireland, the Director considers that an early implementation of mobile number portability can provide considerable consumer benefit.

She therefore proposes to conduct a further internal study on this issue. The study will take account of responses received on mobile number portability to date, and any responses received in the context of this consultation which indicate the extent to which mobile number portability is required within 3G networks and between earlier networks and 3G networks.

In order to ensure all relevant views are available for consideration, the Director has invited interested parties to submit comments on any issues that they consider are outside the scope of this consultation or other consultations that have been held to date. This invitation is set out in ODTR document 00/53; "The Regulatory Framework for Access in the Mobile Market; Report on the Consultation", which is available on the ODTR website; www.odtr.ie.

In order to realise the potential benefits of mobile number portability the Director is also considering the possibility of requiring operators, as part of the entry conditions for the competition, to agree to the introduction of mobile number portability. This issue is further addressed in section 5.2.2.

Question 3. Do you have a view on the likely numbering, naming and addressing requirements for 3G services? What implications might this have for management of the national numbering scheme?

Question 4. Focussing on E.164 numbering requirements and bearing in mind the existing mobile numbering scheme, what specific arrangements would you favour for 3G?

Question 5. Do you have a view on possible requirements for Mobile Network Codes beyond the identification of a GSM or 3G network?

Question 6. Do you agree with the analysis of mobile number portability, as set out above? If not, why not?

Question 7. What are your views on the requirement for mobile number portability within 3G networks and between earlier networks and 3G networks?

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[12] COM (2000) 392, 12 July 2000, Proposal for a Directive of the European Parliament and of the Council on Universal Service and User's Rights Relating to Electronic Communications Networks and Services.

5 Regulatory Issues

5.1 Number of licences

In the interests of ensuring the efficient use of radio spectrum, the Director has the power to limit the number of licences to be issued for 3G operations[13]. The majority of European countries have opted for the UMTS Forum's recommended minimum of 2 x 15 MHz of paired spectrum plus 5 MHz of unpaired spectrum per operator. On this basis, four operators could be accommodated in the spectrum currently available in Ireland.

In some of the larger European markets where there are already four 2G operators and there is a desire to enhance competition in these markets further by licensing a fifth or even a sixth 3G operator, smaller spectrum packages have been offered on the basis that these would be sufficient for an existing operator with access to 2G spectrum.
Having due regard to the current state of the Irish mobile telecommunications market and the recommendations put forward by the UMTS Forum, the Director is minded to offer four equal 3G licences, each comprising 2 x 15 MHz of paired spectrum plus a further 5 MHz of unpaired spectrum. To provide an equitable apportionment of spectrum between 2G and 3G operators, the Director proposes to reserve one of the four licences for a new market entrant and to include within this reserved licence spectrum in the GSM 900 and GSM 1800 bands, comparable to that currently assigned to the three incumbent GSM operators.

Question 8. Do you agree with the proposal to offer four equal licences of 2 x 15 MHz + 5 MHz? If you do not agree, please state why and suggest alternative configurations.

Question 9. Do you agree with the proposal to reserve one of the four licences for a new entrant, and to include GSM spectrum within this licence? If you do not agree, please state why.

5.2 Licensing Selection Procedure

5.2.1 Type of Selection Procedure

The Director has considered in detail two particular methods for running a competitive process for the award of 3G mobile licences, namely:
- **Comparative selection,** where there are measurable indicators set out against which applicants can be judged, and
- **Auction**, where the licence is awarded to the highest monetary bidder.
The Director has concluded that the licences should be awarded using a comparative selection process. A more detailed explanation of this decision is set out in ODTR document 00/48; "Introduction of 3rd Generation Mobile Services in Ireland; Response to Briefing Note and Request for Views issued on 18th April 2000".

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[13] Regulation 10, European Communities (Telecommunications Licences) Regulations, 1998

5.2.2 Competition Structure

The Director proposes a two stage selection process, comprising a preliminary pre-qualification round followed by a comparative selection procedure. The pre-qualification phase will require certain minimum commitments to be made with a view to ensuring that the licences for use of this valuable spectrum resource are awarded to the strongest players who will be able and willing to comply with licence conditions to be imposed, and who are willing to provide the kind of commitments necessary to deliver competitive, leading edge 3G telecommunications services to the Irish end-user. Such conditions and commitments may include, inter alia:

- minimum financial and technical capability criteria;
- minimum coverage and roll out criteria;
- agreement to permit network access, including roaming, upon reasonable terms and, in the event of disputes on this issue, to comply with dispute resolution by the ODTR and abide by findings of the office;
- agreement to implement full mobile number portability.

The comparative selection phase will enable further offerings by applicants in these and other areas to be marked on a comparative basis and will invite performance guarantees from bidders to underpin the commitments. The performance guarantees will also be marked on a comparative basis.

The details of the competition format will developed over the next few months.

> *Question 10. Do you have views on the minimum set of conditions that applicants should be required to meet in order to allow entry to the competition? Please suggest any deletions or additions you consider appropriate and give reasons for your views.*

5.2.3 Timing of the Competition

The Director anticipates that the competition will commence by mid-November 2000 with the publication of the competition details, with award of licences taking place by May 2001.

5.3 Position of incumbent mobile operators

Under Regulation 10 of the Licensing Regulations, the Director is obliged to give due weight to the need to facilitate the development of competition when she decides on the number of licences for a service. This implies a need to consider whether new entrants may be disadvantaged vis-a-vis incumbents and whether there may be a consequential need for regulatory intervention.

3G networks are expected to complement rather than replace 2G networks, at least in the short term. Most terminals are expected to be dual mode (2G/3G) and the IMT-2000 standards cater for roaming between 2G and 3G networks. The 3G core networks will be based on the enhanced 2G platforms used to deliver GPRS.

If existing 2G operators gain 3G licences they are likely to enjoy advantages over new market entrants who do not hold current 2G licences, for example the ability to offer immediate national coverage by delivering 3G services using enhanced 2G technologies such as GPRS or EDGE, enabling 3G spectrum deployment to be concentrated in areas of highest demand.

This coverage advantage could be significant, since coverage is one of the key determinants for customers when choosing a mobile network. One option to level the playing field in this regard is to enable new entrants to gain access to the established 2G networks of incumbents, by way of "national roaming". This approach has been taken in the majority of EU countries. In general, where roaming is mandated, it is for a limited period only, to allow the new entrants' network roll out to catch up with the incumbents. For example, in the UK roaming is required until 2009 and in Italy for up to 5 years after licence issue.

The Director is keen to maximise the level of competition in the provision of 3G services and is of the view that the availability of national roaming between 3G and 2G networks will be a necessary factor in achieving this goal. The Director therefore proposes to make access to the comparative selection process conditional upon a commitment to permit national roaming.

In addition, in designing the pre-qualification criteria the Director will consider whether it is appropriate to include a requirement for applicants to commit to providing some level of access for third parties to their networks and she will also consider inviting applicants to include in their applications offers of further levels and types of access which can then be marked on a comparative basis. This is addressed further in section 5.4 below.

> *Question 11. Do you agree with the Director's proposal to include a commitment to provide roaming between 3G and 2G networks as a condition of entry to the competition process? Do you have any view on the nature and extent of roaming that should be required, or the duration for which roaming should be required?*

5.4   Virtual Network Operators and Value Added Service Providers

Virtual networks are organisations which have their own mobile network identity but do not have access to their own radio spectrum. Such networks may operate their own location registers, switches or internet portals and provide their own SIM cards to their subscribers. In order to provide service to their customers, they need to gain access to the air interface networks operated by licensed 2G or 3G operators, which is likely to entail some form of roaming. Unlike existing service provision and wholesale airtime agreements, virtual networks may require interaction between their own location databases and those of the networks whose spectrum they wish to use. The UMTS service principles, as defined by ETSI and the 3GPP[14], provide for the separation of bearer network functions (access, transport and signalling) and subscriber functionality (billing, authentication, SIM issue). The former are defined as being the responsibility of the organisation providing the home

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[14] ETSI Technical Specification 122 101, version 3.8.0, January 2000: UMTS Service Principles

environment, whereas the latter are the responsibility of the serving network. Certain functionalities, notably service control, quality of service negotiation, mobility management and roaming may be the responsibility of either the home environment or the serving network.

In principle, the home environment may be defined either by the network operator itself (as is currently the case for 2G) or by a service provider or virtual network operator. Only a licensed operator with its own radio spectrum can provide the serving network. The interface with the subscriber is ultimately the responsibility of the home environment provider, although some aspects of the interface (such as billing or equipment service) may be delegated to a service provider or dealer. The principal relationships between the potential market players are illustrated in **Error! Reference source not found.** below:
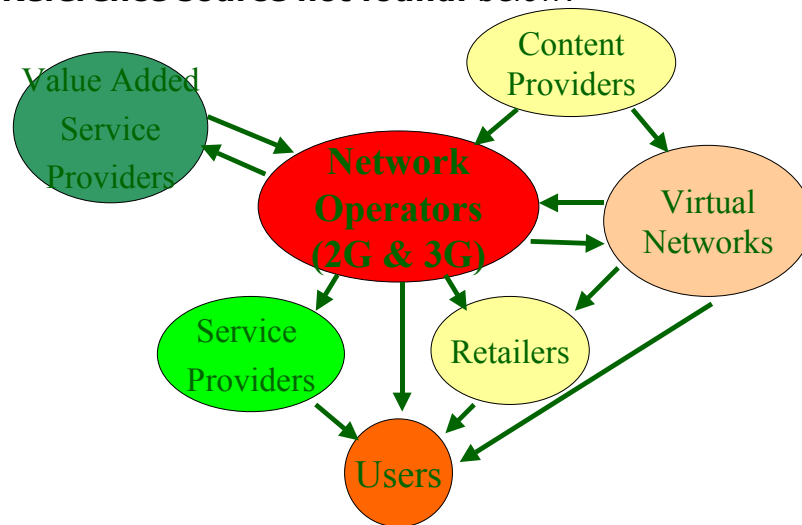

Figure 5.1: 3G mobile potential market players

A range of views were expressed in response to the recent ODTR consultation on access in the mobile market[15], on whether regulatory provisions are required to facilitate access for mobile networks for service providers and virtual network operators. These are summarised, along with the Director's position on the various issues raised, in the ODTR's response to the consultation[16].

Following that consultation, the Director's position is that alternative mobile access providers have the potential to increase competition in the mobile market by providing consumers with more choice and possibly lower prices. The Director considers that the current legislative framework provides a basis for the commercial negotiation of access agreements and that there are no barriers to network operators concluding such negotiations. She strongly believes that mobile network operators should negotiate fair commercial agreements with qualifying organisations seeking to become potential alternative mobile access providers. In the event that such negotiations fail the Director will accept requests for dispute settlement

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[15] ODTR Consultation paper "The Regulatory Framework for Access in the Mobile Market", document ODTR 00/32, May 2000

[16] "The Regulatory Framework for Access in the Mobile Market; Report on the Consultation", Document ODTR 00/53, July 2000

and is minded to take all appropriate regulatory action as swiftly as possible to ensure that access on fair and reasonable terms is achieved. With regard to specific forms of access, the Director concluded the following:

- **Airtime Resale** – Whilst welcoming competition at the retail level, the Director considers that this is a commercial issue for the operators concerned. She noted the views in response to the consultation that the benefits to consumers from simple resale are limited in nature. The Director concluded that regulatory action was not warranted, however resellers are free to negotiate commercial terms with mobile operators.
- **Indirect access –** In order to provide this service, third parties must negotiate interconnection agreements with one or more mobile network operators. All mobile operators with SMP on the mobile market[17] are obliged to negotiate interconnection with appropriately qualified organisations, and operators designated as having SMP on the national market for interconnection[18] are obliged to apply cost oriented rates to interconnection.
- **Mobile virtual network operators** also require interconnection and therefore the same provisions as described above apply. In addition MVNOs must have access to the mobile network air interface. This is likely to involve a form of roaming.

In the context of the introduction of 3G services into the Irish market, the Director considers that the added introduction of alternative providers such as MVNOs would enhance competition. Therefore she is considering the following steps:

- requiring all applicants for 3G mobile licences to agree to provide such access as a pre-qualification criterion for entry into the competition for 3G licences, and/or
- inviting all applicants for 3G mobile licences to offer commitments to provide access to their networks, including access for MVNOs. These commitments would be assessed as part of the comparative selection procedure for licence award;
- inviting applicants to offer commitments on inter operator pricing.

Question 12. Do you have a view on the inclusion of agreement to offer access as a pre condition to entry into the competition for 3G licences?

Question 13: Do you have a view on the proposal to invite applicants to offer commitments on providing access (including roaming), and/or commitments on inter-operator pricing as part of the comparative selection process?

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[17] Currently Eircell and Esat Digifone

[18] Currently Eircell

5.5 Status of Licence Exempt spectrum and self-provided 3G systems

ERC Decision ERC/DEC(99)25 identifies two unpaired carriers (i.e. a total of 10 MHz) for "self provided applications operating in a self co-ordinating mode". Applications of this spectrum are likely to include cordless data terminals for homes and businesses, some of which may connect to public telecommunications networks in a similar fashion to today's cordless telephones. It is proposed that such applications should be licence exempt. Since both public and private 3G systems will deploy the same IMT-2000 technology, it is likely that some terminals will be capable of accessing both public and private systems. Such dual mode terminals might, for example, automatically route calls through the private system when at home or in the office and roam onto public systems at other locations.

It may also be possible for such self co-ordinating systems based in multiple occupancy building to provide limited services to third parties. Examples might include hotels, hospitals, shopping malls and office complexes. Views are sought on whether provision of such third party services should be provided for in the 3G mobile licensing regime or whether self co-ordinating systems should be restricted to private, self-provided services.

Question 14. Should the 3G licensing regime cater for provision of limited services to third parties using self co-ordinating systems operating in the spectrum identified for such systems in ERC Decision ERC/DEC(99)25? If so, do you have a view on whether specific regulatory constraints, such as limits on the numbers of users or terminals, the geographic area covered or the nature of the services provided, should apply to such systems?

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6 General principles of licensing to be applied

In Ireland, each public 3G licensee will require two types of licence, namely:

- a telecommunications service licence pursuant to section 111 of the Postal and Telecommunications Services Act, 1983, as amended (the '1983 Act'), which will permit the operator to operate a network for the provision of mobile telecommunications services;

- the relevant licence issued under the Wireless Telegraphy Acts, 1926, as amended (the '1926 Act'), which will allow the licensee to use appropriate equipment in a designated part of the electromagnetic spectrum.

In accordance with the licensing regulations[19], all mobile telecommunications operators are required to be licensed under section 111(2) of the 1983 Act, i.e. a (mobile) telecommunications service licence, therefore, the issue of a WT licence to a 3G operator will be subject to them holding a (mobile) telecommunications service licence and to them using the spectrum so licensed for the provision of 3G mobile services only.

6.1 Conditions

6.1.1 Wireless Telegraphy Licence

The 1926 Act Licence (the 'WT Licence') will contain conditions relating to the use of spectrum, such as maximum signal or interference levels, together with other conditions that are common to all WT licences such as the Director's power to vary and revoke licences and provisions for dealing with interference. It is likely that such conditions will reflect those of the 2G licences. The WT licence will not prescribe particular services, however the telecommunications service licence may do so. The WT licence will set out conditions under which an operator may run a mobile telecommunications system and provide services over it, whereas the mobile telecom licence deals with issues affecting the provision and quality of telecommunications services.
The WT Licence will authorise the possession and use of radio equipment in Ireland and will prescribe the conditions under which that equipment may be used to provide 3G services. The Director will be able to impose certain obligations on the licensee in the licence, such as approved standards for the radio equipment, network rollout and fees.
Regulations will need to be drawn up to facilitate the granting of the WT licences. These regulations will most likely be in the style and format of those applying to the licensing of spectrum for 1G/2G mobile services together with appropriate adjustments. The consent of the Minister for Public Enterprise is required to the making of such regulations.

6.1.2 Telecommunications Service Licences

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[19] European Communities (Telecommunications Licences) Regulations, 1998

The existing 2G telecom service licences were amended recently to bring them into line with other telecommunications licences issued by the ODTR and therefore provide a ready platform for the licensing of 3G. A practical method of licensing 3G would be to amend the present 2G mobile telecommunications licence to reflect the additional authorisations granted with respect to 3G. This may involve amending the body of the 2G telecom service licence or supplementing it with an extra section that would apply to those operators successful in a competition for 3G spectrum. In any event, it is likely that many of the present obligations in the current 2G-telecom service licence would apply to 3G licensees. The Minister for Public Enterprise may specify public service conditions for inclusion in telecommunications services licences.

6.2   Licence Duration

The current 1G/2G telecom service licences are of 15-year duration, whereas the current 1G/2G WT licences are of annual duration. The proposed duration of the 3G WT licence is 15 years. The Director reserves the right to review spectrum availability for 3G services from time to time, taking account of national and international developments. Such reviews may include (but are not limited to) the introduction of further 3G licences, the allocation of further spectrum to existing licensees or the allocation of further spectrum for self co-ordinating private 3G systems. The Director is however under no obligation to make any further 3G spectrum available for any of these purposes, other than to comply with relevant European Directives or Decisions. Where additional spectrum is made available for licensed systems, a competition process is likely to be involved.

> **Question 15. If you think that the proposed licence term for the 3G WT licences should be longer or shorter please state your reasons.**

6.3   Fees

The level of fees will be established later taking account, inter alia, of relevant legislative provisions and developments in 3G competitions elsewhere in Europe. The consent of the Minister for Finance is required on fees, and this will be sought at the appropriate time.

6.4   Linkages with 2G Telecommunication Licences

Where an existing 2G (GSM) operator succeeds in obtaining 3G spectrum, telecommunication services may in the future be delivered using a combination of both networks. A single telecommunications licence might therefore be appropriate for the combined 2G/3G service. Such an approach raises the following questions in regard to the duration of any combined licence. Views are sought on these questions.

> **Question 16. Should the expiry date of the amended licence remain the same as for the existing 2G licences or should it be extended in line with the duration of the licence(s) awarded to new market entrants?**

> **Question 17. If the latter option is chosen, should the amended licence include provision to withdraw the 2G spectrum at the expiry date of the current 2G licences, i.e before the expiry of the amended licence?**

6.5 Mast sharing

While voluntary mast sharing already takes place to some extent, it is often difficult for new market entrants to reach satisfactory commercial agreements with incumbent operators.   The higher frequency and higher data rates delivered by 3G systems will mean that a substantial number of new base stations may be required in the longer term to match the coverage provided by 2G networks. Many of these may be low power "micro" and "pico" stations which can be incorporated into street furniture or installed within buildings, however there will almost certainly be a requirement for further conventional masts in rural and suburban areas. Wherever possible, the Director is keen to encourage the use of existing sites, whether those of incumbent 2G operators or other radio site owners.

One way to facilitate this may be for operators and site owners to establish a radio sites database to enable existing masts to be identified and evaluated more readily. Another approach may be for operators to develop a code of practice that obliges them to consider all available sharing options before proceeding with a new mast. Such initiatives have been adopted in other European countries, notably the UK, as an alternative to mandatory sharing regulations. Site sharing is mandatory under current law in Denmark and Norway.

> **Question 18.   How might mast sharing with existing services, or between new operators, best be promoted to minimise the need for new masts?**
>
> **Question 19.   Do you agree with the establishment of a radio sites database to facilitate site sharing, and do you have a view on how such a database might operate in practice?**
>
> **Question 20. Do you agree with the establishment of a code of practice requiring network operators to consider all available sharing options before proceeding with installation of a new transmission mast?**
>
> **Question 21. Do you foresee any requirement for mandatory site sharing in the longer term and if so do you have a view on what form this should take?**

7. Next Steps

This is the next stage in a very wide ranging consultation process on the issue of licensing of 3G mobile services and networks in Ireland. The consultation process started with a workshop on 18th April when a Briefing Note and Request for Comments was also published[20]. On 26th July the Director published a response to the very helpful comments received in response to that briefing note[21] and announced that the competition format to be used would be a "beauty contest". She also announced her proposal to issue four licences for 3G in Ireland.

This paper now seeks views on a range of complex and important issues that will be considered in the design of that competition process.

Following the receipt of comments in response to this paper, the Director anticipates that the competition for 3G licences will commence by mid-November 2000 with the publication of the competition details, with award of licences taking place by May 2001.

The consultation period will run from 31st July to 15th September 2000. Comments should be submitted in writing before 5.00 p.m. on 15th September 2000 to:

> Ms. Jean Bonar,
> The Office of the Director of Telecommunications Regulation,
> Abbey Court,
> Irish Life Centre,
> Lower Abbey Street,
> Dublin 1

> or

Comments may be submitted via email before 5pm on 15th September 2000 to:
bonarj@odtr.ie

All comments are welcome, but it would make the task of analysing responses easier if comments reference the relevant question numbers from this document. In order to promote further openness and transparency the ODTR will publish responses received to this consultation paper, excluding commercially sensitive information. Where material that is commercially sensitive is included in a response, this should be clearly marked as such and included in an Annex to the response.

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[20] Briefing Note and Request for Views on the Introduction of 3G Mobile Services in Ireland ODTR Document 00/29

[21] Introduction of 3rd Generation Mobile Services in Ireland; Response to Briefing Note and Request for Views issued on 18th April 2000; ODTR Document 00/48

ANNEX A: GLOSSARY

3GPP 3G Partnership Project, international body developing 3G air interface standards. Partners include ETSI and other regional standards bodies from North America and the Far East.

ARIB Association of Radio Industries and Businesses, Japanese government sponsored trade association.

CEPT European Conference of Postal and Telecommunications Administrations, regional planning and regulatory body for telecommunications and radio communications services

CDMA Code Division Multiple Access

DECT Digital Enhanced Cordless Telephony. Principal 2G digital cordless phone standard in Europe and elsewhere.

ERC European Radiocommunications Committee, a constituent body of CEPT, responsible for frequency management at a European level

ERC Decision Measures approved by the ERC on significant harmonisation matters in the radiocommunications regulatory field, within the context of long term ERC strategy and policy. Administrations that formally endorse an ERC Decision are committed to implementing its terms.

EDGE Enhanced Data in a GSM Environment. Enhancement to GSM enabling packet or circuit switched data transmission at data rates up to 384 kbit/s

ETSI European Telecommunications Standards Institute, regional standards body responsible for development of harmonised telecommunications and radio communications standards at a European level.

FCC US Federal Communications Commission

FDD Frequency Division Duplex, where transmission and reception are carried out on separate radio frequencies, using "paired" radio channels

GSM Global System Mobile, the 2G cellular standard used throughout Europe and much of the rest of the world.

GPRS General Packet Radio Service. Enhancement to GSM enabling packet data transmission at data rates up to 64 kbit/s

HSCSD High Speed Circuit Switched Data. Enhancement to GSM enabling continuous circuit switched data to be conveyed at up to 115 kbit/s.

IMT-2000 International Mobile Telecommunications 2000, ITU designation for 3G mobile standards and services

IP Internet Protocol

ITU	International Telecommunication Union, the United Nations agency that co-ordinates and manages radio use worldwide
kbit/s	Kilobits per second
Mbit/s	Megabits per second
Mobile Data	Transmission of information in digital form across a mobile communication system or network.
Narrowband	Generic term for telecommunication systems capable of conveying data at rates of up to 64 kbit/s
Roaming	The use, by a customer of one mobile network operator, of another mobile network operator's network to make and/or receive calls.
SMS	Short Message Service, facility for conveying text messages over GSM networks
TDD	Time Division Duplex, where transmission and reception is carried out on the same radio frequency but separated in time
TDMA	Time Division Multiple Access
Telecommunications Acts	The Postal and Telecommunications Services Act, 1983, as amended, and the Telecommunications (Miscellaneous Provisions) Act 1996.
TIA	Telecommunications Industry Association, North American trade body
UMTS	Universal Mobile Telecommunications Service, the European variant of IMT-2000.
UTRAN	UMTS Terrestrial Radio Access Network
UWC-136	Universal Wireless Communications standard 136, North American variant of IMT-2000.
VHE`	Virtual Home Environment
WARC	World Administrative Radio Conference (forerunner of WRC)
WAP	Wireless Access Protocol, a global standard for providing narrow band mobile access to web-based information over mobile networks such as GSM
Wideband	Generic term for telecommunication systems capable of conveying data at rates between 64 kbit/s and 2.048 Mbit/s
WRC	World Radio Conference, convened by the ITU every 2 - 3 years to consider specific radiocommunication matters as prescribed in the adopted conference agenda. The final acts of the conference are then used to revise the Radio Regulations.

ANNEX B: Summary of Consultation Questions

The following specific questions have been raised in this consultation document. The supporting arguments giving rise to each question can be found in the main text of the document.

1   Do you have a view on the role of content providers, service providers and virtual network operators in the delivery of 3G services?

2   Do you have a view on how cross-border co-ordination between 3G mobile networks might be approached, taking account of the technologies that might be involved?

3   Do you have a view on the likely numbering, naming and addressing requirements for 3G services? What implications might this have for management of the national numbering scheme?

4   Focussing on E.164 numbering requirements and bearing in mind the existing mobile numbering scheme, what specific arrangements would you favour for 3G?

5   Do you have a view on possible requirements for Mobile Network Codes beyond the identification of a GSM or 3G network?

6   Do you agree with the analysis of mobile number portability set out above? If not, why?

7   What are your views on the requirement for mobile number portability within 3G networks and between earlier networks and 3G networks?

8   Do you agree with the proposal to offer four equal licences of 2 x 15 MHz + 5 MHz? If you do not agree, please state why and suggest alternative configurations.

9   Do you agree with the proposal to reserve one of the four licences for a new entrant, and to include GSM spectrum within this licence? If you do not agree, please state why.

10   Do you have views on the minimum set of conditions that applicants should be required to meet in order to allow entry to the competition? Please suggest any deletions or additions you consider appropriate and give reasons for your views.

11   Do you agree with the Director's proposal to include a commitment to provide roaming between 3G and 2G networks as a condition of entry to the competition process? Do you have any view on the nature and extent of roaming that should be required, or the duration for which roaming should be required?

12   Do you have a view on the inclusion of agreement to offer access as a pre condition to entry into the competition for 3G licences?

13   Do you have a view the proposal to invite applicants to offer commitments on providing access (including roaming), and/or commitments on inter-operator pricing as part of the comparative selection process?

14   Should the 3G licensing regime cater for provision of limited services to third parties using self co-ordinating systems operating in the spectrum identified for such systems in ERC Decision ERC/DEC(99)25? If so, do you have a view on whether specific

regulatory constraints, such as limits on the numbers of users or terminals, the geographic area covered or the nature of the services provided, should apply to such systems?

15   If you think that the proposed licence term for the 3G WT licences should be longer or shorter please state your reasons.

16   Should the expiry date of the amended licence remain the same as for the existing 2G licences or should it be extended in line with the duration of the licence(s) awarded to new market entrants?

17   If the latter option is chosen, should the amended licence include provision to withdraw the 2G spectrum at the expiry date of the current 2G licences, i.e before the expiry of the amended licence?

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

19   Do you agree with the establishment of a radio sites database to facilitate site sharing, and do you have a view on how such a database might operate in practice?

20   Do you agree with the establishment of a code of practice requiring network operators to consider all available sharing options before proceeding with installation of a new transmission mast?

21   Do you foresee any requirement for mandatory site sharing in the longer term and if so do you have a view on what form this should take?