Commission for
Communications Regulation

Review of Mobile Numbering

Promoting Innovation and Facilitating New Services

Consultation

Reference: ComReg 18/03

Date: 24/01/2018

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Content

Section Page

Appendices

Section **Page**

Tables and Figures

Section Page

1 Executive Summary

1. The objective of this consultation is to inform ComReg's development of a long-term numbering scheme for all mobile communications services, that factors both interpersonal person-to-person ('P2P') and Machine-to-Machine / Internet of Things ('M2M')[1] communications.

2. It has been prompted by forecasts for exponential M2M growth on mobile networks and an emerging trend for the 'extraterritorial' use of national numbers across the EU and internationally by M2M Service Providers. Although mobile networks are evolving to all-IP networks, many M2M connections will continue to need (E.164) numbers for a variety of technical and operational reasons. Numbers need to be made available for innovative new services, but this must not require any number changes for existing Irish mobile users.

Numbering for P2P

3. The primary use of the existing mobile number ranges (083, 085, 086, 087 and 089) is for P2P communications. Mobile subscriptions for P2P communications have been relatively static in Ireland in recent years and it is not expected that Over-The-Top ('OTT') mobile services will have a significant requirement for new mobile numbers, as most OTT services use the subscriber's existing number.

4. ComReg proposes that number conservation measures agreed with industry in 2016 continue to be implemented and that the 082 and 084 mobile ranges be reserved for future potential demand for numbers for P2P communication. This should ensure that a sufficient quantity of numbers is available for P2P services up to and beyond ComReg's 10-15 year planning horizon.

Numbering for M2M

5. Currently, numbers for M2M communication are assigned from the existing mobile ranges. However, the M2M value chain includes additional actors not present in the P2P value chain, such as M2M Service Providers (M2M SPs). InterConnect Communications ('ICC')[2], the consultants engaged by ComReg on this work, forecast that demand for numbers from M2M SPs could place unprecedented strain on the existing mobile ranges, potentially resulting in their exhaustion by 2020.

[1] "Machine to Machine" for the purposes of this consultation paper means "the exchange of information between machines, through a mobile or fixed network, with limited or no human intervention". For convenience, in this consultation paper we refer to M2M rather than using both terms M2M and IOT.

[2] See ICC report "Review of Mobile Numbering Resources". ComReg reference 18/03a.

6. The projected exponential increase in demand for numbers for M2M is associated with the requirement of M2M SPs to deploy connected devices extraterritorially, as SPs based in Ireland are increasingly developing their products and services for a global market.

7. To address demand for numbers for M2M services, ComReg now proposes to open a new number range (088) dedicated to M2M communications. Numbers in this range are proposed to have a 15 digit length (including the +353 country code). This is the maximum number length as allowed by the ITU. This will remove pressure on the existing mobile ranges and create a sufficient supply of numbers to cater for projected growth in the M2M market over the long term. Several other Member States have similarly introduced new M2M ranges.

8. In addition to E.164 numbers, ComReg also assigns E.212 Mobile Network Codes (MNCs) on behalf of the ITU. These codes are used on the Subscriber Identity Modules (SIMs) embedded in connected devices. ComReg proposes that both M2M numbers and MNCs be assigned to eligible M2M SPs to promote competition and support innovation in the M2M market.

Switching between Service Providers

9. The ability to easily switch between service providers is a legislative requirement[3] and promotes effective competition. Currently, end users can retain their mobile number when they change mobile operator, based on an industry agreed Mobile Number Portability (MNP) process. The MNP process may have a limited role for M2M switching, but this needs further study.

10. The potential to assign MNCs to M2M SPs and the development of a process to transfer large blocks of numbers may also provide a switching option in some cases, but this also needs further study. Finally, Over-the-Air provisioning onto 'eSIMs' is already available in some sectors (e.g. automotive) and this can be used to switch between SPs. ComReg will keep abreast of M2M switching developments internationally and may consult further in future.

Numbers for eCall

11. Member States appear to be adopting a flexible approach on numbering for eCall (an automatic emergency calling capability to be fitted in all new cars sold in the EU from 31 March 2018). Car manufacturers and eCall device providers are already making decisions on what numbers and SIMs suit their needs best. The options include both Irish and overseas mobile numbers/SIMs, and ITU international numbers/SIMs. ComReg's preliminary view is that any new M2M number range could also be used for eCall in the long term.

[3] Regulation 25 of the European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 2011.

12. ComReg invites feedback on the proposals in this consultation document. The consultation period will run until 7 March 2018.

2 Introduction

2.1 Background – The National Numbering Scheme

13. The objective of this consultation is to inform ComReg's development of a long-term numbering scheme that will meet the existing and future needs of mobile communications services for both E.164[4] numbers and for E.212 Mobile Network Codes (MNCs)[5].

14. The scheme needs to take into account both interpersonal mobile communication services (P2P) and non-interpersonal mobile communications services – i.e. Machine-to-Machine (M2M) / Internet of Things (IoT). For the purposes of this Consultation, M2M communications is taken to mean the exchange of information in between machines, through a mobile or fixed network, with limited or no human intervention. Also, for the purposes of this consultation the terms IoT and M2M are taken to have the same meaning.

15. ComReg is undertaking this consultation as part of its function to manage the national numbering scheme and overarching statutory objectives to promote competition and the internal market and to protect consumers. Under Section 10 of the Communications Regulation Act 2002, as amended ("2002 Act")[6] the Commission for Communications Regulation ("ComReg") has the statutory function of managing the national numbering resource. This is done in accordance with any applicable directions issued by the Minister for Communications, Climate Action and Environment under Section 13 of the 2002 Act, and subject to ComReg's objectives as mainly set out in Section 12 of the 2002 Act and regulation 16 of the Framework Regulations.[7]

[4] ITU Recommendation E.164 specifies the structure and functionality of telephone numbers. Mobile numbers are also sometimes referred to as 'MSISDNs' (Mobile Station ISDN number).

[5] ITU Recommendation E.212 covers Mobile Network Codes. MNCs are 2 or 3 digit codes that are part of the IMSI on the SIM that identify individual networks at national level.

[6] Communications Regulation Act, 2002, as amended - http://revisedacts.lawreform.ie/eli/2002/act/20/revised/en/html

[7] S.I. No. 333 of 2011 - http://www.irishstatutebook.ie/2011/en/si/0333.html

16. In addition to meeting the future demand for E.164 numbers, the scheme needs to cater for any Mobile Network Operators (MNOs) and potentially M2M Service Providers (SPs) that have a requirement to issue and manage their own SIMs. ComReg administers MNCs on behalf of the International Telecommunications Union (ITU). In Ireland (and Europe), MNCs are 2 codes that form part of the unique identifier stored on each SIM called the International Mobile Subscriber Identity (IMSI). The first 5 digits of the IMSI identify the MNO in a specific country with whom the subscriber holds an account[8]. The remaining 10 digits are assigned by the MNO to uniquely identify the subscriber. The IMSI is used internally in mobile networks and has a number of functions such as identifying the subscriber, determining network routing and establishing roaming status.

17. In ComReg's view, the following is a list of the main types[9] of connectivity services that need to be factored into a long-term (i.e. 10 to 15 year) numbering scheme for mobile communications services:

    - Irish P2P mobile services (i.e. current and next generation mobile voice and data services);
    - Over-the-Top (OTT) P2P mobile services that need separate Irish mobile numbers and/or SIMs;
    - M2M services provided on mobile networks in Ireland that need numbers and/or SIMs;
    - eCall automated/manual emergency calling from cars (April '18 onwards); and
    - International M2M Services that use Irish mobile numbers and/or MNCs globally. The potential extraterritorial use of Irish mobile numbers and MNCs also needs to be considered in-depth. Extraterritorial use will be considered in detail in Section 5.2 .

[8] For example, Vodafone Ireland is 272 01, where 272 is the Mobile Country Code for Ireland

[9] These connectivity services are not mutually exclusive. For example, a single number/SIM in a car might be used for both M2M (e.g. car telemetry) and for eCall.

18. The scheme also needs to factor that some mobile connections, particularly for M2M will not require mobile numbers, relying on, for example IPv6[10] addresses or using the IMSI for device addressing. ComReg does not manage the provision of IP addresses, but we do need to understand when they will and when they will not be used. There is a perception that mobile numbers will become redundant as mobile networks evolve towards all-IP. However, we are aware from discussions with mobile operators that while the network itself could often function using only IP addresses, operators' Operational Support Systems (OSS i.e. network provisioning systems) and Business Support Systems (BSS) including billing systems nevertheless continue to rely on numbers.

19. Also, some connections are primarily for M2M communications, but have a requirement for occasional P2P communications, and therefore require a number for that purpose. The automotive sector is a good example of this dual requirement, where a single communications module in the car can be used for multiple functions, including eCall. The automotive sector is also at the leading edge of remote Over-The-Air (OTA) provisioning/updating of SIM profiles. OTA provisioning often relies on SMS for security reasons, and this in turn requires a mobile number.

20. Some OTT P2P mobile services may also need numbers. However, many OTT services use their own identifiers, so do not need numbers (at least for on-net communications), or use the user's existing mobile number. The OTT sector needs to be fully understood so that its numbering needs are factored into the scheme.

2.2 Forecasting Demand for Numbers

21. In order to develop a long term numbering scheme, we firstly need to forecast the possible demand for numbers. Assessment of demand for P2P connections are based primarily on population growth, mobile penetration rate, the expected number of devices per person and uptake of existing or new services. Analysis of new OTT services and whether these services will demand dedicated numbers are explored in the ICC report along with demand for eCall. Forecasting demand from operators for numbers also needs to take into account that operators will not achieve 100% efficiency in the use of numbers. Factors that contribute to this are considered in Section 3.

[10] Internet protocol version 6 (IPv6) is developed by the Internet Engineering Task Force (IETF) for use in packet switched networks

22. Forecasting demand for M2M connections (and numbers) is somewhat more difficult in some respects than P2P. There are global, regional and country forecasts available, including for Ireland and thus forecasting national M2M connections is facilitated (although there are sometimes significant differences between the various third party forecasts available). The complication lies in forecasting extraterritorial use of Irish numbers, as there are several factors influencing this demand that cannot be fully modelled (e.g. future commercial models, differences in regulatory regimes between countries or regions, the use of ITU global numbers or other countries' numbers as an alternative, etc.). We nevertheless need to plan for the potential demand that might arise from the most optimistic scenarios.

23. There is real demand for such extraterritorial use. It is already happening in the marketplace, with Irish numbers and SIMs already being used abroad permanently and overseas numbers and SIMs (both EU and non-EU) being used in Ireland. ComReg has also been approached by several specialist M2M SPs based in Ireland that have requirements for large quantities of numbers that cannot reasonably be met from existing mobile ranges.

24. ComReg considers that these requirements for numbers should be addressed, as there are clear benefits for both the Irish communications sector and for the broader national economy. These SPs have already partnered, or intend to partner with existing MNOs in Ireland to provide network access in Ireland and interconnection to networks overseas. We explore these benefits further in the Regulatory Impact Assessment (RIA) in Section 4 of this consultation. The RIA also considers the costs of any future numbering solutions.

25. ComReg also notes that the EC has proposed in its draft European Electronic Communications Code (EECC) that Member States (MS) will be required to make a specific range of non-geographic numbers available for such extraterritorial use, for electronic communications services other than interpersonal communications services[11]. This potential future legislative requirement, coupled with the fact that there is real demand for such extraterritorial use now, makes this consultation both necessary and timely.

[11] The EECC is a single draft Directive to replace the existing European Regulatory Framework. Article 87(4) of the EECC proposes that 'Each Member State shall determine a range of its non-geographic numbering resources which may be used for the provision of electronic communications services other than interpersonal communications services, throughout the territory of the Union'. The text is potentially subject to change, and furthermore as it will be a Directive, the EECC has to be transposed by Member States into national law.

2.3 Key Issues and Challenges

26. ComReg considers that a key constraint on any future mobile numbering scheme is that there should be no need to change existing P2P users' mobile numbers, because the disruption and costs of any such change would be prohibitive and disproportionate. This must be factored into any proposals that we put forward. Coupled with the possible extent of demand for numbers for extraterritorial M2M use, this consultation therefore makes proposals for a new number range for non-interpersonal communications. ComReg is keen to propose a pragmatic solution that can be implemented quickly on both national, and particularly on international networks (including for SMS), and that also minimises cost and disruption for all stakeholders.

27. The introduction of any new number range also needs consideration of the broader regulatory aspects of services that will be provided using these numbers. This may lead to setting specific conditions of use for these numbers. Eligibility criteria for numbers and MNCs (with the resultant ability to issue and manage SIMs) also needs to be considered.

28. In particular, extraterritorial use of numbers and SIMs brings with it some added complexity for technical implementation, for operators negotiating commercial agreements and for regulation. While this consultation discusses many of these complexities, its main focus is on formulating a long term numbering solution. Many of the issues raised are medium-term and global in nature and need to be addressed by regional and global organisations, including the European Union (EU), the European Conference of Postal and Telecommunications Administrations (CEPT), the Body of European Regulators for Electronic Communications (BEREC), the International Telecommunication Union (ITU) and Groupe Spéciale Mobile Association (GSMA). ComReg is nevertheless interested in gathering views from respondents, to help inform the ongoing international debate on these issues.

29. We are particularly aware of the challenge for small specialist M2M players seeking to achieve global connectivity in a short time, and with limited resources. ComReg is particularly keen to learn about problems with roaming agreements and the potential for inconsistent regulatory treatment by National Regulatory Authorities (NRAs), with a view to contributing to their early resolution.

2.4 Current Work

30. To aid this review, ComReg engaged InterConnect Communications Ltd (ICC) to prepare a study to provide forecasts of the demand for numbers together with expert technical advice on the numbering options, and the impact of each option, to meet this demand. In November 2016, ComReg requested CEPT to issue a questionnaire on its behalf. The questionnaire sought information from other CEPT countries on their approach to numbering for M2M and OTT services. We will make reference throughout this Consultation Paper to the 22 countries that responded. In addition, earlier in 2017, ICC and ComReg met with national and international mobile operators and with specialist M2M providers to inform the study. The ICC report is published alongside this consultation and its recommendations are incorporated where appropriate into ComReg's proposals. The consultation also draws on studies completed in 2013[12] and 2016[13] by Analysys Mason for ComReg which ultimately led to agreements with the main mobile operators to implement measures to ensure the more efficient use of all numbers in the future.

2.5 Structure of Consultation Paper

31. The balance of this consultation paper is structured as follows:

32. **Section 3** deals with numbering for interpersonal mobile communication services (P2P) in Ireland. The section includes ComReg's work on number conservation, assessment of demand for numbers and an analysis of available P2P number ranges. The section also provides an analysis of mobile OTT services, their numbering needs and whether conditions of use and eligibility criteria need to be modified to cater for OTT services. Finally a long term numbering strategy for P2P mobile services is proposed.

33. **Section 4** contains the Regulatory Impact Assessment (RIA) on the proposed introduction of a new number range for M2M communication.

34. **Section 5** deals with numbering for non-interpersonal mobile communications services. The section analyses options that take into account both national and extraterritorial number use. Eligibility criteria and conditions of use for numbers are also considered and proposals are put forward. The section also considers eCall as a specific usage case and outlines ComReg's interim and long-term proposals for numbering for eCall. Please note that, as explained in the section, ComReg is especially keen to hear from respondents on how their international carrier partners will cater for the proposals we have set out.

[12] ComReg 13/110 Analysys Mason/Antelope report – Numbering for M2M communications

[13] ComReg 16/20a Analysys Mason report – Conservation measures to meet future demand for mobile numbers

35. The section also considers future needs for MNCs. The new M2M value chain with multiple new Service Providers may increase demand for MNCs. Options to meet this potential future demand are considered.

36. **Section 6** considers Service Provider Switching in an M2M environment. The M2M service value chain has new stakeholders compared with traditional P2P services. One of these new stakeholders is the M2M User that might, for example, be a car manufacturer. The section addresses the ability of an M2M User to switch Service Provider.

37. Where appropriate, we also propose draft numbering conditions of use. However, many of the issues raised by extraterritorial use are only now being considered by the EC, NRAs, BEREC and others. In addition, the debate about the possibilities of harnessing new technology capabilities to meet regulatory requirements (e.g. such as OTA as a provisioning tool to aid switching between service providers) is at early stages.

38. **Section 7** sets out how interested parties can respond to this consultation. As stated, we are particularly interested in learning more about the international implementation of any new number range. Multinational operators and service providers may therefore wish to consult within their own organisations to fully inform their organisations' viewpoints prior to responding.

3 Numbering for Interpersonal (P2P) Mobile Communications Services

3.1 Introduction

39. Mobile numbers currently have access codes 083, 085, 086, 087 and 089 and have 7 digit subscriber numbers. Each number has an associated 8 digit dialable voice mailboxes, formed by putting the digit '5' in front of the equivalent 7 digit subscriber number.

40. Together with having no subscriber numbers beginning with 5, a further digit is set aside for any future need to implement 7 to 8 digit subscriber number change, for example in the case of increasing demand. This means there are 8M subscriber numbers available per access code.

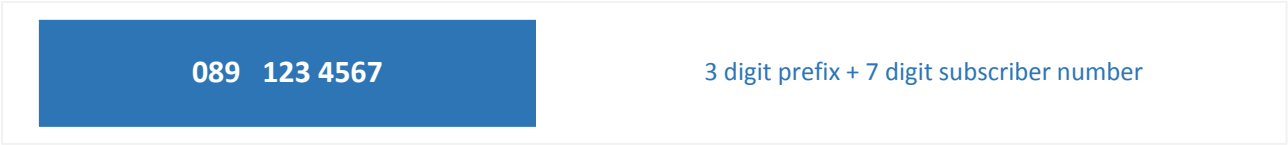

Figure 1 – Mobile Number Example

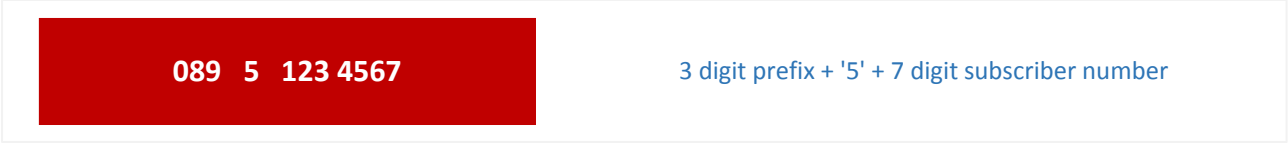

Figure 2 – Mobile Mailbox Number Example

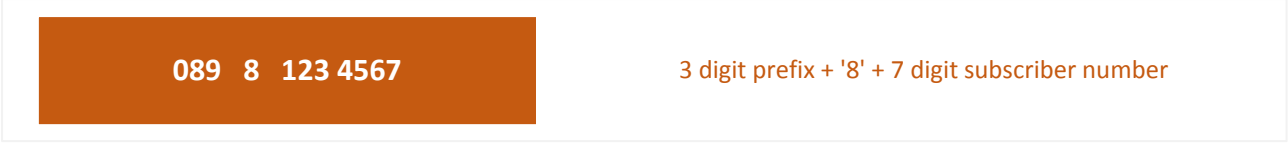

Figure 3 – Mobile Expansion Number Example

41. Numbers will be needed for P2P mobile services for the foreseeable future, and certainly up to and beyond ComReg's 10-15 year planning horizon. This is primarily because they are the lowest common denominator for fixed and mobile phone users worldwide including those who do not have smartphones or other smart terminals, and also for public and private networks that include legacy PSTN/circuit switched elements.

42. In addition to being used as terminal identifiers and for network routing, numbers are also used as subscriber identifiers across mobile operators' operational and business support systems (OSS and BSS). They are therefore vital to the proper functioning of electronic communications services and networks. Finally, they are also 'trusted identifiers', since they are managed and regulated by NRAs at national level.

43. Number changes are costly and disruptive for operators, end users and the economy at large. While smart phones with directories of contacts make numbers less visible, the ability for end users to retain their mobile phone number for the long term (including when changing between operators) is nevertheless important for most end users. End users increasingly provide their mobile numbers as their primary contact number for both their business and social contacts. Their numbers then become embedded in their contacts' directories and elsewhere.

44. Since numbers are trusted, they are also used for authentication and other purposes by operators, OTT services such as WhatsApp and by online services in general e.g. by sending a text verification code as part of an online sign-up process for banking services. Mobile numbers are increasingly also being embedded by end users themselves in all sorts of non-communications online services.

45. Given these factors, ComReg's objective for the long term numbering scheme for P2P mobile services is therefore to ensure that no number changes are needed for existing end users. In order to achieve this, the main proposals are to:

    - Continue to implement mobile number conservation measures agreed with MNOs in 2016;
    - Consider the need for further conservation measures, such as charging for numbers;
    - Move to discontinue the industry practice of branding and default routing based on 08X prefix;
    - Use certain spare 08X ranges for P2P in the future; and
    - Introduce a new number range for national and international non-interpersonal communications services.

46. The starting point for our analysis is to understand the likely demand for numbers in the future. Once we have a reasonable understanding of this future demand the options for using the 080, 081, 082, and 084 ranges for P2P are examined (The 088 range is currently a proposal for M2M). In analysing the demand for numbers a key consideration is the continued implementation of number conservation measures.

3.2 Background to Mobile Number Conservation

47. Conserving existing mobile number ranges is a fundamentally important element of effective numbering scheme management. To this end, ComReg continuously monitors the levels of used and available numbering resources and whether mobile operators are using numbers efficiently.

48. In addition to monitoring existing usage, ComReg also researches market trends and new product developments that could impact the demand for numbers. In 2012, ComReg foresaw the future growth of M2M and realised that combining its potential growth with the ongoing P2P demand could cause exhaustion of the existing mobile ranges and potentially lead to a costly and disruptive number change. This view was shared by several other NRAs in Europe, who subsequently introduced new M2M ranges.

49. In March 2013, ComReg published a consultation which mainly considered the issue of having a dedicated number range for M2M communications (Document 13/33)[14]. ComReg published its response to consultation (Document 13/109)[15] and a related consultants' report (Document 13/110) [16], prepared by Analysys Mason and Antelope Consulting in November 2013. The responses to the consultation and notes from bilateral meetings were published in Document 13/66R[17].

50. The consultation indicated reluctance amongst many operators to the proposal to open a new number range for M2M applications. At the time, respondents highlighted their uncertainty about future demand for M2M and the cost of implementing any new numbers on their systems as the main reasons for not supporting the proposals. The preference, expressed by most operators at that time, was to continue to use mobile numbers for M2M applications. However, using mobile numbers from existing ranges for M2M applications raised the issue of the future availability of mobile numbers, which are a finite resource.

51. ComReg stated in its response to consultation (Document 13/109) that it would not introduce a new number range for M2M applications at that time, but would instead engage with operators in order to discuss and agree upon conservation measures for mobile numbers, some of which were identified in the consultants' report (document 13/110).

[14] ComReg 13/33- Numbering for M2M Communications - consultation
[15] ComReg13/109 Numbering for M2M Communications - Response to Consultation
[16] ComReg 13/110 Analysys Mason/Antelope – Numbering for M2M communications
[17] ComReg 13/66R - Numbering for M2M communications – Publication of responses to Consultation and Bilateral minutes

52. In 2015, ComReg again engaged Analysys Mason to recommend detailed measures for conserving existing mobile numbers. Their analysis showed that there were inefficiencies in some of the current operators' business processes and systems that lead to significant wastage of numbers. In considering the use of assigned numbers, the Analysys Mason report highlighted that, at the end of Q1 2015, the 5,770,638 million mobile subscriptions in Ireland constituted only about 25% of the 23.6 million mobile numbers assigned to mobile operators. In examining this under-utilisation of numbers, Analysys Mason highlighted, for example, that operator supplied data indicated that 6.7 million or 28% of assigned mobile numbers were in the distribution chain, or 'in channel' (i.e. in the operator's distribution chain e.g. as pre-paid SIM packs in shops). These figures indicate that improved efficiency in the use of numbers is necessary.

53. The consultants estimated that continued growth at the average assignment rate would lead to exhaustion of the five currently used 08X ranges by 2023. That forecast did not include the possible substantial growth in demand which might come from additional applications not seen in recent years such as extraterritorial M2M. Analysys Mason stated that growth at the maximum assignment rate from the last five years could lead to significantly earlier exhaustion. Any changes to mobile numbering, arising from a need to avoid number exhaustion, would impose very significant costs on industry and consumers alike. Therefore Analysys Mason considered it necessary that proportionate and low-cost measures were taken immediately to improve the efficiency of mobile number utilisation, as even a modest improvement in utilisation could have a significant effect on the ability of supply to meet demand. The consultants recommended specific conservation measures should be adopted and the measures agreed with operators are listed in the next section.

54. ComReg published an Information Notice on the work in 2016[18], alongside the consultants' reports on mobile number conservation measures. The following section provides details of the specific conservation measures that were agreed and adopted afterwards by ComReg and the main mobile operators in mid-2016.

3.3 Agreed Conservation Measures for Existing Ranges

55. In 2016, ComReg met with the major mobile operators (Vodafone, Three and Meteor) who at the time held 88% of all assigned mobile numbers (21 million numbers). The operators agreed in principle to implement recommended conservation measures as follows:

[18] ComReg 16/20 – Information Notice – Conserving Geographic and Mobile Numbers

- Return to ComReg all blocks of mobile numbers which contain 100,000 contiguous numbers which have not yet been assigned or used, subject to the possible retention by the operator of a single block in the event that its holding of free numbers would otherwise fall below 200,000;

- Make use of free numbers in existing assigned blocks including numbers which have exited the quarantine process rather than opening up new number blocks;

- Review the volume of mobile numbers in quarantine at a minimum of every 3 months or at a maximum of 12 months, in order to identify those numbers which have been in quarantine over the required 13 month period, and return them to active use, with the exception of ported-in numbers, which should be repatriated;

- In conjunction with the relevant industry Mobile Number Portability (MNP) Committee, repatriate any ported-in numbers which have exited quarantine to the original block holder. In general, the time to repatriate ceased numbers, following quarantine, should not exceed 12 months;

- Maximise the efficiency of the operator's number inventory management, in particular with respect to the identification and recovery of 'lost' numbering resources. A particular risk area in that regard seems to be the control of in-channel numbers which sometimes fail to enter service (e.g. certain mobile numbers pre-assigned to SIM cards). ComReg requested that the operator carry out an audit of all numbers held by it which are neither free for use nor in active service and reinstate them where possible as free for assignment;and

- Discontinue mapping the 08x access codes to specific operators. The assignment of specific 08x numbers to specific operators leads to fragmentation and inefficient use of numbering resources.

56. ComReg additionally undertook to:

- Regularly meet with the mobile operators to ensure continued support for the conservation measures;

- Set a number utilisation threshold: ComReg to only assign mobile numbers to operators who demonstrate that they have exceeded a number use threshold and now require new numbers;

- Introduce more effective monitoring and auditing processes; and

- Consider the introduction of fees for granting rights of use of numbers if conservation measures prove ineffective.

57. The above measures and further specific measures were agreed with individual MNOs in mid 2016, given that each MNO had different systems and processes.

58. The ICC study reviewed the Analysys Mason Reports and ComReg's agreed measures and recommended in its report (Rec. 5.1.1) that ComReg should continue to require service providers to efficiently manage their assignment of numbers to ensure they maximise utilisation. The ICC analysis validated the Analysys Mason study on the opportunities for service providers to act to better utilise the resources that they have been assigned. The report concludes that the agreed measures should ensure that the future requirement for existing mobile numbers, based on the current assignment trend, can be met from the current mobile numbering ranges beyond 2022. ICC also note that extending the lifetime for the use of current mobile number ranges will benefit all stakeholders. In turn, this will minimise the need for new number ranges for consumer mobile communications, number changes, and the costs that these would incur.

3.4 Fees for P2P Numbers

59. The Analysys Mason/Antelope report for ComReg on M2M (document 13/110) proposed charging fees for numbers as a measure to ensure better efficiency of number use by operators. However the report also said that such a measure should only be introduced if alternative means of conserving numbers failed. Similarly Analysys Mason in its 2016 conservation report[19] concluded that ComReg should consider applying fees for numbers as a conservation measure in the future should the immediate conservation measures prove insufficient to prevent number exhaustion. In addition the conservation report provided options for charging structures in this event.

60. In its report, ICC agrees with the Analysys Mason position by recommending that charging for numbers could be introduced in order to ensure number ranges are used as efficiently as possible. ICC see this as a worthwhile alternative to introducing a new 08x consumer mobile range which would impact consumers and service providers. While these proposals had mainly the conservation of existing mobile numbering ranges in mind, they apply equally to the proposed M2M range.

61. In its rationale for this recommendation, ICC highlight that EU NRAs currently appear to only apply two types of charging for numbers:

    1) Administrative charges in order to finance the activities of the NRA for the granting of rights of use. However, such charges should be limited to cover the actual administrative costs for those activities; and

    2) Usage fees levied as an instrument to ensure the optimal use of numbers.

[19] ComReg 16/20a Analysys Mason report – conservation measures to meet future demand for mobile numbers

62. With regard to the CEPT WG NaN questionnaire (see Section 2.4), 14 of the 22 countries who responded indicated they charged fees for the assignment of E.164 numbers while 12 indicated they charged for E.212 numbers. This shows that charging for fees is common in CEPT countries.

63. In conclusion, ComReg will retain the option of introducing fees for numbers in the event that the conservation measures currently agreed with operators are insufficient and do not result in an efficient use of numbers.

3.5 Assessment of Demand for Numbers for Interpersonal Mobile Communication (P2P) services

64. As earlier outlined, assessment of demand for P2P connections are based primarily on population growth, mobile penetration rate, the expected number of devices per person and uptake of existing or new services.

65. Mobile subscriptions (excluding MBB and M2M) - which represents P2P communication - have been relatively static in Ireland in recent years, increasing from 4.6m in 2010 to 4.9m in 2017 (as represented by the blue line in figure 4).

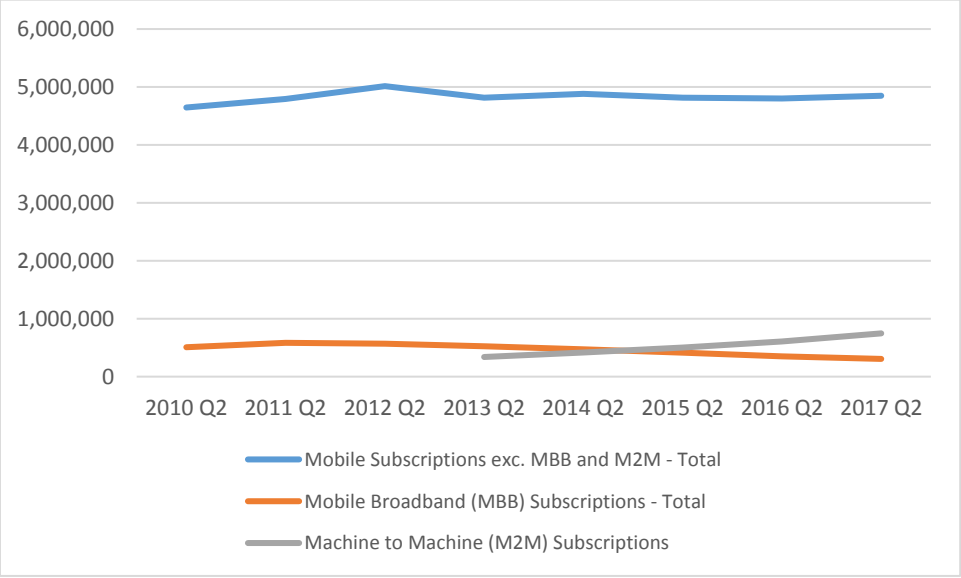

Figure 4 – Mobile Subscriptions in Ireland

66. Beyond current and next generation cellular P2P services, we need to factor other P2P services that may require separate numbers. Most OTT P2P services leverage end users' existing mobile numbers. To the extent that services use new numbers, this is probably because the OTT model is blended with an MVNO model and the end user is being offered an entirely new service subscription. The 'WiFi First'[20] model is a good example of this. However we do not consider that the demand for new numbers for such services will be significant relative to existing cellular P2P services.

67. In the absence of demand for dedicated numbers for OTT services, demand for numbers for P2P use has two main drivers: (a) mobile penetration rate; and (b) population growth.

    a) With a mobile penetration rate of 103%, there is limited potential for growth to arise from greater adoption of mobile phones. Potential sources of additional demand for P2P numbers have not materialised to any significant degree. According to ICC, few OTT services are likely to require telephone numbers, and potential demand for numbers from services (e.g. Wi-Fi First) has not, as yet, materialised.

    b) With population growth of less than 1% per annum, of itself this would not result in a significant demand for numbers for P2P use, particularly in the absence of demand for a second device that requires its own telephone number. However, ICC caution that changes in demographics, technologies, market offerings or other factors could significantly alter levels of uptake for services requiring number resources.

68. Another consideration is that operators will not achieve 100% efficiency in the use of their number assignments. This is despite the expected impact of number conservation measures already introduced, or proposed, as part of ComReg 2016 work discussed in Section 3.3. ComReg proposed, for example, to set a utilisation threshold which is now included in the current ComReg consultation on its Numbering Conditions[21] and the associated draft Numbering Conditions document[22]. However, while ComReg will continue to seek efficiency in the use of numbers by service providers, the volume of number assignments for P2P services is likely to exceed the forecasted number of P2P connections to some degree.

[20] WiFi First is a network service model that prioritises the use of WiFi over the cellular network for voice, SMS and data traffic. WiFi First was first introduced by Republic Wireless in 2012. Republic Wireless is an American MVNO whose mobile service defaults to Wi-Fi and falls back to an MNO's cellular network in the absence of a Wi-Fi connection. This operating model seeks to minimise the use of the host MNO's network, in order to reduce operating costs.

[21] ComReg 17/102 Numbering Conditions of Use and Application Process - Consultation

[22] ComReg 17/102a Draft Numbering Conditions of Use and Application Process

69. We must also caution that these projections are only based on assignment of mobile numbers in response to demand for traditional mobile phone services, and therefore exclude the potential demand for mobile numbers for extraterritorial M2M use, as we are now proposing a new range for M2M services (See Section 4).

70. MBB subscriptions have been declining steadily since 2011 (as per the orange line in figure 4) and are not expected to result in significant demand for mobile numbers over the coming years. Therefore, continued use of the mobile numbers ranges for MBB is unlikely to significantly affect the availability of numbers for P2P communication.

Q. 1 Do you agree with ComReg's assessment of demand for numbers for Interpersonal Mobile Communication (P2P) services? Please explain the basis of your response in full and provide any supporting information.

3.6 Options to use Additional 08X Ranges for Interpersonal Mobile Communication (P2P) Services

71. If operators fully implement the conservation measures and achieve sufficient utilisation, existing ranges should meet demand for numbers over the forecast period.

72. However, there may be new as yet unknown demands for new numbers for P2P communications, e.g. a strengthening of the trend to have more than one mobile subscription. It is therefore prudent to consider which of the spare 08X ranges should be brought into service next, if such a step proves necessary.

73. In its report, ICC highlights that 08 is recognised nationally and internationally as mobile in Ireland, with 080 and 081 being notable exceptions. ICC recommends (Rec. 5.3.1) that ComReg should only turn to the 081 and 080 numbering ranges -- for possible future use as mobile ranges - when there are no other 08X ranges available. ICC's rationale is that the current assignments in 081 and the potential confusion with the UK's 0800 range have the potential to cause confusion for consumers.

74. ICC further states that 080 should be avoided and should not be brought into service other than as a range of last resort for consumer mobile numbers. If it were, it would experience a potential clash with the UK's free phone numbers of 0800 and 0808, and cause potential confusion with Universal International Freephone numbers (00800). This potential for confusion with UK numbers has also been flagged by operators to ComReg in the past. ComReg additionally considers that the potential for confusion could extend internationally, such that international operators might also misinterpret the range as freephone, rather than mobile. To the extent that we might need to consider using 080 for mobile services in the future, ComReg could enlist the help of operators at that point, for example in analysing the current levels of misdials to UK freephone numbers and other potential issues.

75. ComReg notes that in addition to ICC recognising the use of 0818 as a legacy range originally for a 'Universal Access' service, 0818 has also been proposed by ComReg as part of its review of Non Geographic Numbers[23] to be retained alongside 1800 as the only 2 NGN ranges for the long term. This strengthens the argument not to use other parts of the 081 range for mobile P2P services, which would additionally mean mixed number lengths within the range. This would likely add to consumer confusion and make implementation more difficult.

76. In summary, ComReg's analysis and proposals for the current and future use of 08X is as follows:

Prefix	Status
080	Potential for misdialling. Only to be used as a last resort for P2P.
081	Not presently being considered for mobile use as 0818 has been proposed by ComReg to be retained alongside 1800 as the only 2 NGN ranges for the long term.
082	For future mobile P2P use.
083	In use, 55% assigned*.
084	For future mobile P2P use.
085	In use, 46.64% assigned*.
086	In use, 74.88% assigned*.
087	In use, 84.89% assigned*.
088	For M2M. (See Section 5)
089	In use, 36.25% assigned*.

Table 1 – 08X Range Status

[23] ComReg 17/70 - Review of Non-Geographic Numbers

* This is the % of the total numbers available in the 08X range that are assigned to mobile operators. The mobile operators will have allocated a proportion of these assignments to their subscribers.

77. Making 082 and 084 available for future P2P use offers a further 16M numbers (0825 and 0845 would be used as mailbox numbers and 0829 and 0849 are reserved for future expansion).

78. Based on the demand assessment above, this potentially provides sufficient numbers to defer exhaustion well into the future. Therefore, even taking into account the approach not to use the 080 and 081 number ranges, ComReg considers that sufficient numbering resources are available in the balance of the ranges to meet the foreseeable P2P demand for mobile numbers.

Q. 2 Do you agree with ComReg's proposals to use 082 and 084 for future P2P mobile services and not to use 080 and 081 for mobile services? Please explain the basis of your response in full and provide any supporting information.

3.7 Numbering for Over-the-Top (OTT) Interpersonal Mobile Services

79. Internet Protocol (IP) based communications services, referred herein as Over-The-Top ("OTT") services, can be described as, for example Voice Over Internet Protocol (VoIP) or messaging services that are provided to end users over the public Internet. ComReg's objective in this section is to validate our understanding of the current OTT market and technologies and their need or otherwise for mobile numbers. If our understanding is valid, then we consider we do not need to make any special arrangements for OTT services in the mobile numbering scheme at this time.

80. Many OTT services do not need to be assigned numbers. Services such as Skype and WhatsApp use either their own identifiers for on-net calling, or the user's existing mobile number. ComReg recognises that certain OTT services not needing to be assigned numbers are nevertheless using end users' existing numbers to provide similar services. With such OTT services, the role of an E.164 number in a network has evolved from being a physical address to a name identifying the end point of a communications session and an authentication key to verify an end-user. In principle, traditional communication services and OTT communication services that use numbers for end-to-end connectivity share many commonalities and therefore similar regulatory obligations should apply accordingly to ensure a level playing field and ensure consumer protection.

81. This section considers whether OTT services require assignments of Mobile Numbers from ComReg, which are in turn being provided to end users.

82. When it comes to potential future demand for new mobile numbers, one potential OTT contender is an MVNO that implements a connectivity model similar to the WiFi First model. Such service providers offer new subscriptions, either as SIM-only, or sometimes with a new mobile handset, so need new numbers for customers who choose not to port their existing mobile number. They may also need a MNC, depending on the MVNO arrangement they have with a host network.

83. Wi-Fi enabled calling is offered by existing operators (e.g. Eir[24]) to their customers. This offering works seamlessly for their customers, using the customer's existing number, so has no need for a new number to be assigned.

84. As ICC concludes in Section 3.3 of its report, demand for mobile numbers from OTT Services is not expected to be significant so that these services can be accommodated in existing number ranges without affecting the forecast exhaustion date for these ranges.

3.8 OTT Service Provider Eligibility and Conditions of Use for E.164 Mobile Numbers and E.212 MNCs

3.8.1 ICC's Recommendations

85. ICC recommends (Rec. 5.7.1) that OTT Service Providers should be eligible to apply for E.164 mobile numbers for services that qualify as an ECS and have a contract with an Irish MNO to access their network, provided they can justify the requirement.

86. ICC also recommends (Rec. 5.8.1) that OTT Service Providers should be eligible to apply for E. 212 MNCs for services that qualify as an ECS and have a contract with an Irish MNO to access their network, provided such a requirement can be justified.

87. In addition ICC recommends (Rec. 5.5.1) that:

a) OTT Service Providers that use telephone numbering resources from overseas and International administrations to provide M2M services and OTT services in Ireland, should conform to the conditions for the provision of Electronic Communications Networks and Services as set out in the General Authorisation regime in Ireland, as well as complying with consumer protection legislation: and

b) If OTT Service Providers are eligible to apply for Mobile Numbering resources, then existing regulatory obligations (e.g. CLI, Number portability, access to emergency services, etc.) should apply.

[24] https://www.eir.ie/wificalling/

3.8.2 ComReg Proposal

88. ComReg concurs with these ICC recommendations and is therefore proposing that:

OTT Service Providers should be eligible to apply for E.164 mobile numbers and E.212 MNC for services that qualify as an ECS and have a contract with an Irish MNO to access their network, provided they can justify the requirement (see Section 6.3 of ComReg's Numbering Conditions[25]). If ComReg's proposal is adopted then such OTT SPs shall be subject to all regulatory obligations that apply to authorised undertakings including conditions attached to RoU for numbers including number portability, access to emergency services, etc.

Q. 3 Do you agree with ComReg's proposal to expand eligibility for E.164 mobile numbers and E.212 MNCs to OTT Service Providers that qualify as an ECS, provided they can justify the requirement and have a contract with an Irish MNO to access their network? Please explain the basis of your response in full and provide any supporting information.

[25] ComReg 15/136 - Numbering Conditions of Use and Application Process

4 Draft Regulatory Impact Assessment on the Introduction of a New M2M Number Range

4.1 Introduction

89. As part of this review of mobile numbering a key question concerns the future of numbering for non-interpersonal mobile communications services also known as numbering for M2M and referred to hereinafter. A key demand is for numbers for M2M communications (data sent/received from one machine to another) on mobile networks.

90. As mentioned in Section 3, a key constraint on any future mobile numbering scheme is that there should be no need to change existing P2P users' mobile numbers, because the disruption and costs of any such change would be prohibitive and disproportionate. This section therefore makes proposals for a new number range for M2M communications.

4.2 ComReg's 2013 Consultation

91. ComReg previously consulted in 2013[26] on the introduction of a new number range specifically for M2M services. ComReg proposed that it would be prudent to use an M2M range of numbers that deploys the maximum possible number of digits[27] to ensure it can meet all future needs. This approach was also recommended by CEPT[28] and ComReg's Numbering Advisory Panel (since replaced by the Numbering Forum). Having taking into account the views of respondents, bilateral discussions with the various parties and the Consultants' report[29], ComReg decided in 2013 not to introduce a dedicated M2M number range. ComReg's expert consultants outlined a number of practical number conservation measures that could be implemented to make more telephone numbers available from the mobile ranges and further recommended that ComReg should monitor developments in the M2M area and only release a dedicated M2M number range if prevailing circumstances determine that one is required. In light of ongoing numbering requests to ComReg and the potential for extraterritorial use to become a feature of the market going forward, it seems prudent to now put in place measures that provide a long term numbering resource designed specifically for M2M purposes.

[26] ComReg 13/33- Numbering for M2M Communications - consultation
[27] ITU rec E.164 - establishes a maximum of 15 digits (including country code)
[28] ECC Recommendation (11)03 – Numbering and Addressing for M2M Communications
[29] ComReg 13/110 Analysys Mason/Antelope – numbering for M2M communications

4.3 RIA Framework

92. In general terms, a RIA is an analysis of the likely effect of a proposed new regulation or regulatory change, and, indeed, of whether regulation is necessary at all. A RIA should help identify the most effective and least burdensome regulatory option and should seek to establish whether a proposed regulation or regulatory change is likely to achieve the desired objectives, having considered relevant alternatives and the impacts on stakeholders. In conducting a RIA, the aim is to ensure that all proposed measures are appropriate, effective, proportionate and justified.

93. This RIA has been prepared in accordance with ComReg's RIA Guidelines (Doc 07/56a) and having regard to the RIA Guidelines issued by the Department of An Taoiseach in June 2009 ("the Department's RIA Guidelines") and relevant Policy Directions issued to ComReg by the Minister for Communications, Climate Action and Environment under Section 13 of the 2002 Act (the "Policy Directions"). ComReg's RIA Guidelines set out the circumstances in which a RIA might be appropriate. In summary, ComReg will generally conduct a RIA in any process that might result in the imposition of a regulatory obligation (or the amendment of an existing regulatory obligation to a significant degree), or which might otherwise significantly impact on any relevant market or on any stakeholders or consumers.

Structure of a RIA

94. As set out in ComReg's RIA Guidelines,[30] there are five steps in a RIA. These are:

    Step 1: Identify the policy issues and identify the objectives.

    Step 2: Identify and describe the regulatory options.

    Step 3: Determine the impacts on stakeholders.

    Step 4: Determine the impact on competition.

    Step 5: Assess the impacts and choose the best option.

95. In the following sections ComReg identifies the relevant stakeholder groups, specific policy issues to be addressed and relevant objectives (i.e. Step 1 of the RIA process). This is followed by the identification of fundamental policy issues.

96. ComReg then considers these policy issues in accordance with the four remaining steps of ComReg's RIA process.

[30] ComReg (07/56a) - Guidelines on ComReg's approach to Regulatory Impact Assessment - August 2007.

Identification of Stakeholders

97. The focus of Step 3 is to assess the impact of the proposed regulatory options available to ComReg on stakeholders. A precursor to the subsequent steps in the RIA, therefore, is to identify the relevant stakeholders.

98. Figure 5 provides an overview the M2M value chain and the relevant stakeholders.

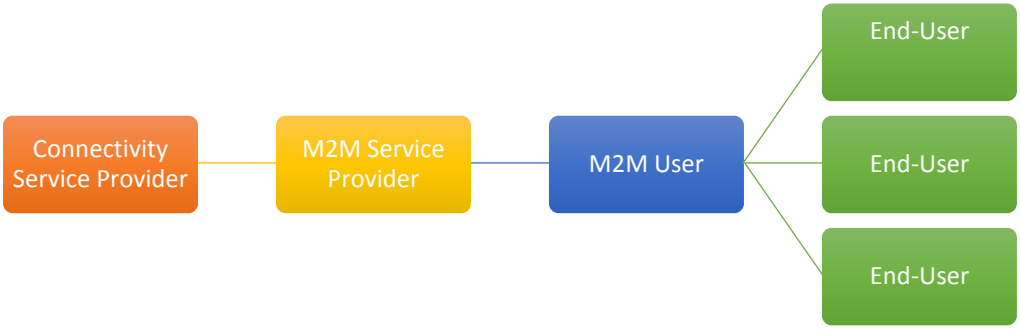

Figure 5 – M2M Value Chain

99. In practice, the value chain[31] can have a number of different configurations. For example, an M2M user may contract with the Connectivity Service Provider (CSP), which in turn purchases the M2M service. Or the M2M Service Provider service may be vertically integrated within the CSP offering, or indeed within the M2M User. Furthermore, there is potential for overlap between the stakeholder groups; e.g. the M2M SP may also be defined as a provider of an ECS and therefore a CSP. For the purposes of this chapter, the value chain as set out in figure 5 above is used as it represents the general case.[32]

100. In light of the above, the RIA breaks stakeholders into two main groups:

1. Industry stakeholders which consist primarily of

   i. Connectivity Service Provider (CSP): Provider of an electronic communication service pursuant to Art. 2 of the Framework Directive, i.e. a service normally provided for remuneration which consists wholly or mainly in the conveyance of signals on electronic communication networks. These entities include MNOs and MVNOs.

[31] In the above, relatively simplified, value chain the customer relationship runs from left to right: M2M SPs being customers of CSPs, M2M Users being customers of M2M SPs, and End Users being customers of M2M Users.

[32] Neither the M2M SP nor the M2M User is present in the traditional P2P value chain. This broader set of actors can have implications for: the type of entities requesting numbers from ComReg; the quantity of numbers demanded for M2M communication, particularly when required for extraterritorial use; and the concept of switching service provider in an M2M context.

ii. M2M Service Providers - Provider of M2M platform and/or related IT services and solutions that are often deployed on a cross-border (extraterritorial) basis.; and
iii. M2M User - Purchaser of an M2M service and incorporated within their products (e.g. car manufacturer or electricity providers).

2. Users of the service platform namely end user/consumers. (The impact on consumers is assessed under "Impact on Consumers");

101. ComReg has, in the following analysis, taken account of relevant information to consider the likely impact of each option on the various stakeholders including:

- A report prepared by InterConnect Communication Ltd (ICC) in November 2017, commissioned by ComReg and published alongside this consultation paper;
- Interviews conducted by ComReg and ICC in late 2016/early 2017 with national and international MNOs and with specialist M2M providers; and
- ComReg's 2016 review of the numbering resource which resulted in a series of number conservation measures.

102. The focus of Step 4 of this Regulatory Impact Assessment is to assess the impact on competition of the proposed regulatory options available to ComReg. In that regard, ComReg notes that it has various statutory objectives, regulatory principles and duties which are relevant to the issue of competition.

103. The RIA Guidelines and the RIA Policy Direction do not specify how much weight to place on stakeholders' submissions (Step 3) or on the impact on competition (Step 4). Accordingly, ComReg will be guided by its statutory objectives in the exercise of its function to manage the national numbering resource (see Appendix: 2) which include the following objectives:

- to ensure the efficient use of numbers;
- to promote competition;
- to contribute to the development of the internal market; and
- to promote the interest of users within the Community.

104. In this document, ComReg has adopted the following structure in relation to Step 3 and Step 4 – the impact on industry stakeholders is considered first, followed by the impact on competition, followed by the impact on consumers. The order of this assessment does not reflect any assessment of the relative importance of these issues but rather reflects a logical progression. For example, a measure which safeguards and promotes competition should also, in turn, impact positively on consumers. In that regard, the assessment of the impact on consumers draws substantially upon the assessment carried out in respect of the impact on competition.

Identify the policy issues and identify the objectives (Step 1)

Policy Issues

105. In its ECS Strategy Statement 2017 – 2019, ComReg noted that the advent of M2M will yield particular challenges for ComReg. In particular, the connectivity requirements for M2M devices are wide and the rollout of M2M devices may require significant numbering resources. Numbering resources will continue to be required because machines need to be uniquely identified and addressed in order to communicate with each other. In that regard, a number of important issues arise in light of the requirement for connectivity for M2M devices and the numbering resources that may be required.

106. Currently, numbers assigned by ComReg from the five existing mobile number ranges[33] are used for:

a) Person-to-Person (P2P) or mobile services and Mobile Broadband (MBB) services by MNOs and MVNOs; and

b) Machine to Machine communications by MNOs;

107. In relation to (a) ComReg is of the preliminary view that demand for mobile numbers for P2P and MBB is unlikely to dramatically increase. Firstly, mobile subscriptions and penetration have stayed relatively stable at 4.8 million subscriptions in the five year period to 2016. Secondly, MBB subscriptions have declined from 590k to 350k over the same period. Substantial[34] growth in P2P and MBB would require more than one mobile device, and an associated telephone number per person. However, experience to date suggests that additional services required by consumers are provided through their existing mobile device and number.[35]

[33] 083, 085, 086, 087 and 089.

[34] Certain growth in line with increases in the population may occur but this will be marginal relative to available numbers.

[35] Currently the only typical requirement for separate devices is for personal and business use.

108. In relation to (b) M2M subscriptions have increased from 340k in 2013 to around 800k in 2017. However, unlike P2P and M2M a sharp increase in demand for mobile numbers for M2M use could arise as the number of machines that require a number could increase exponentially[36] with the expansion of M2M as the current electronic communications eco-system expands from connecting people to connecting machines. In that regard, ComReg notes two main factors since the 2013 consultation which suggests that M2M connections are likely to increase significantly, namely the growth in extraterritorial use of numbers and the introduction of eCall.

Extraterritorial numbers

109. In particular, the growth in the extraterritorial use of E.164 numbers is likely to place increased demands on the national numbering resource. Extraterritorial use means the use of Irish numbering resources in other countries on a permanent basis (please see Section 5.7.1 for full definition). Extraterritorial use is now happening on a widespread basis in the marketplace, with Irish numbers and SIMs already being used abroad permanently and overseas numbers and SIMs (both EU and non-EU) being used in Ireland.

110. ComReg has also been approached by several specialist M2M SPs based in Ireland that have requirements for large quantities of numbers that cannot be met in the long-term from existing mobile ranges. These SPs have already partnered, or intend to partner with existing MNOs in Ireland to provide network access.

eCall Regulation

111. The eCall Regulation[37] requires all newly registered motor vehicles in the European Union to be equipped with an eCall emergency call system from April 2018. This service will require a telephone number identifier as the emergency services must be able to return a call to the car and attempt to speak with the driver, i.e. voice capability must be ensured. ICC forecast 1.2M connected vehicles in Ireland by 2022, but whether these will use Irish or international numbers is not clear at this point.

Other available alternatives to provide for growth of M2M

112. ComReg is of the view that there are four main alternatives available in order to provide connectivity or addressing solutions for M2M communications.

[36] See Section 5.4 (Forecasts for National and Extraterritorial M2M Connections)

[37] Regulation (EU) 2015/758 of the European Parliament and of the Council of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in-vehicle system based on the 112. Service, see https://ec.europa.eu/transport/themes/its/road/action_plan/ecall_en

1. Use of MNC's (E.212) (See Figure 7)

113. ComReg administers the E.212 Mobile Network Codes (MNCs), associated with the geographic mobile country code ("MCC") 272, on behalf of the International Telecommunications Union (ITU). MNCs are 2 or 3 digit codes that form part of the unique identifier stored on each SIM called the International Mobile Subscriber Identity (IMSI). The IMSI is used internally in mobile networks and has a number of functions such as identifying the subscriber, determining network routing and establishing roaming status.

114. Some operators may be able to use IMSI only solutions for M2M communication but this is not universal. In cases where the primary service being provided is M2M, but there is need for limited voice (P2P) communication (e.g. eCall), operators will require a normal numbering solution (E.164 numbers). In addition, legacy arrangements in place for customer identification, billing and routing will likely continue to rely on E.164 numbers for the time being. As discussed in Section 5.10 of the consultation paper, ComReg proposes that providers of M2M services should be eligible to apply for E.212 resources.

2. Use of ITU numbers (including shared MCC 901).

115. An alternative to using E.164 national numbers are ITU E.164 Global numbering resources to provide international M2M services. For CSPs, [38] this means that they need to be either a Sector Member of the ITU or an Associate of the appropriate ITU-T study group and pay associated fees. While E.164 Global numbers provide an alternative to E.164 national numbers, a common issue cited by operators is that it can be difficult to get national and international carriers to open access to E.164 Global numbers on their networks. Therefore, E.164 national numbers will likely be the first and most effective means of providing an addressing mechanism for M2M.

3. Use of national numbers in other countries.

116. Operators could apply for national numbers in the countries where they provide (or intend to provide) service. Operators applying for numbering resources in other countries would be subject to the national regulatory obligations in those countries. However, this is a matter for other NRAs, and there is no certainty that requests for numbers would be met or that extraterritorial use of numbers would be permitted.

[38] For example, large international operators, such as Vodafone Group, are using E.164 Global numbers for international M2M services.

4. IPv6

117. In the long term there remains the likelihood that IP addresses (specifically IPv6)[39] will be used for the vast majority of M2M communication. However, it is expected that while the network itself could potentially function using only IP addresses, operators' OSS and BSS, including billing systems, will continue to rely on numbers for some time. Also, where connections are primarily for M2M communications, but have a requirement for occasional P2P communications (e.g. eCall) a telephone number would be required for that purpose. In any case, there would likely be a substantial overlap period where both IPv6 and E.164 numbers are in use. Therefore, the use of numbers for M2M communication will remain relevant for the forecast period.

Primary Policy Issue

118. Mobile numbers will continue to be required in order to provide for M2M connections because E.164 numbers are easily utilised through existing networks. Potential exhaustion of any of the existing five mobile number ranges requires ComReg to take appropriate measures in order to ensure that sufficient quantities of numbers remain available for assignment for P2P, MBB and M2M use.

119. Therefore, ComReg is of the view that the primary policy issue to be considered in this draft RIA is to ensure that the there are enough numbers, with appropriate conditions of use, to promote competition and innovation in the M2M market.[40]

Objectives

120. The focus of this draft RIA is to assess the impact of the proposed measure(s) (see regulatory options below) on industry stakeholders, competition and consumers. ComReg can then identify and take the most appropriate and effective course of action that considers the interests of all sets of stakeholders, while also protecting and promoting competition.

121. In this regard, ComReg would highlight:

- its objectives as set out in Section 12 of the 2002 Act, as amended, and Regulation 16(1) of the European. Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 ("Framework Regulations") including:
    - to promote competition; and

[39] Internet protocol version 6 (IPv6) is developed by the Internet Engineering Task Force (IETF) for use in packet switched networks

[40] The current conditions of use that attach to numbers may not be appropriate in an M2M context. Issues such as switching service provider in an M2M context and the extraterritorial use of numbers need to be specifically considered.

- to ensure the efficient management and use of the national numbering resource in accordance with Ministerial Policy Directions issued under Section 13 of the 2002 Act;

- the regulatory principles which it is obliged to apply in pursuit of the objectives set out in Regulation 16(2) of the Framework Regulations, including:
  - safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure based competition; and
  - promoting efficient investment and innovation in new and enhanced infrastructures;
- its obligation to ensure that numbers are efficiently and effectively used having regard to Section 12(2)(a) of the 2002 Act, as amended, and Regulations 16(1) and 17(1) of the Framework Regulations (Regulation 9(1) of the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 ("Authorisation Regulations").

122. Finally, the EC's draft European Electronic Communications Code (EECC) proposes that "each Member State shall determine a range of its non-geographic numbering resources which may be used for the provision of electronic communications services other than interpersonal communications services[41]". The draft RIA considers the possible implementation of such a requirement in forming a view on its preferred option.

Identify and describe the regulatory options (Step 2)

123. One potential option to cater for increased demand for numbers would involve adding an additional digit or digits for all existing mobile ranges. An increase of one digit, from seven to eight digits, would increase the availability of numbers in each of the five ranges from 10m to 100m each, which would accommodate projected demand for M2M over the forecast period. However, in order to provide for efficient routing of numbers, increasing the length of the mobile numbering ranges would equate to a number change for all mobile subscribers. Number changes are costly and disruptive for operators and end users. Extension of existing mobile ranges would require a number change for all mobile users and would not be proportionate with respect to the objectives outlined above.

[41]Draft EECC - Article 87(4) http://eur-lex.europa.eu/resource.html?uri=cellar:c5ee8d55-7a56-11e6-b076-01aa75ed71a1.0001.02/DOC_3&format=PDF

124. In relation to introducing an entirely new range, ITU recommendation E.164[42] allows for a maximum number length (including country code and subscriber prefix) of 15 digits. Given that Ireland has a three digit country code, this translates into a maximum subscriber number length of 10 digits (353-83-1234567890), which would provide 10bn numbers. Therefore, a new number range could have 7, 8, 9 or 10 digits.

New 7 digit range

125. Extending into one of the available 08X or 07X ranges with 7 digit subscriber numbers would increase the supply of numbers to 10m (for each range). However, this would not meet the projected demand for numbers in the longer term, given the ICC forecast of 38.4m additional numbers required by M2M SPs by 2022 (mainly for extraterritorial use). In addition this imposes certain costs for CSPs and M2M SPs associated with the introduction on a new number range of equal length to the existing mobile ranges (i.e. 7 subscriber digits).[43]Therefore, ComReg does not consider this a valid regulatory Option.

New 8 digit range

126. A new 8-digit number can already be accommodated by the network and support systems because 8-digit mobile mailbox numbers are created by placing the digit '5' in front of the 7-digit subscriber number. Therefore, costs of providing for an 8 digit M2M range may be no greater than the costs of providing for a 7 digit range. However, an 8-digit range would increase the supply of numbers to 100m and is therefore considered as a separate regulatory option below.

New 10 digit range

127. The introduction of a 9-digit number would increase the supply of numbers by 1 billion and satisfy any expected future M2M requirements. However, it offers no advantages over a 10-digit range and may involve the same costs of implementation as the ten digit range. As such, the consideration of a 9-digit range as a separate regulatory option is not necessary in this draft RIA as all the benefits provided by such an option would be taken account of by opening a 10-digit range.

128. In that regard, ComReg considers that the three regulatory options now available to it are:

[42] ITU rec E.164 - establishes a maximum of 15 digits (including country code)

[43] These could include (a) Implementing Operations Support Systems (OSS) changes such as for billing and account management systems (b) Advance publicity and support to customers to announce the change, notification of new range to international carriers and (c) Developing appropriate commercial models to support the M2M services using the numbers.

Option 1: Assign numbers from the existing mobile ranges to meet demand for P2P, MBB and M2M communications

129. This option represents a continuation of the current process for assigning the numbering resource whereby operators continue to be assigned numbers from the existing mobile ranges for mobile services. No additional measures would be taken at this point to provide for the potential of the mobile numbering resource becoming exhausted.

Option 2: Open a new number range of 8 digits in length dedicated to M2M communications, ('07X' or '08X').

130. This option would involve opening of a new '07X' or '08X' range dedicated to M2M communication, with subscriber numbers of 8 digits in length, as compared with 7 digits in the existing mobile ranges. Numbers assigned from the existing mobile ranges would consequently no longer be used for M2M.

131. In its report to ComReg, ICC considered both the 07X and 08X number ranges as possibly suitable for M2M services. The 077 range was considered as it was previously proposed by ComReg in its 2013 M2M consultation (ComReg 13/33). However ICC now recommend (Rec. 5.10.1) an 08X range, as opposed to an 07X range, arguing that M2M services are increasingly mobile-like (i.e. require mobile connectivity) and that 07X should be avoided due to its similarity with geographic numbers. An assessment of the regulatory impact of both the 07X and 08X number ranges for M2M is carried out before the preferred option is determined.

Option 3: Open a new number range of 10 digits in length dedicated to M2M communications, ('07X' or '08X').

132. This option would involve opening a new '07X' or '08X' range dedicated to M2M communication, with subscriber numbers of 10 digits in length, as compared with 7 digits in the existing mobile ranges. Numbers assigned from the existing mobile ranges would consequently no longer be used for M2M.

Preferred range

133. The decision on whether any new dedicated range for M2M communication should be a 07(x) or 08(x) range, and also what specific third digit should be used is assessed at the end of each impact section below.

Impact on industry stakeholders (Step 3)

Option 1

134. In the short run, CSPs may prefer Option 1 as numbers could continue to be assigned from the mobile ranges for M2M. CSPs would require no additional investment or resources in order to plan, implement and operate a new numbering range. However, as outlined in the Section 5.4 (Forecasts for National and Extraterritorial M2M Connections), there is a significant risk that using the existing five mobile ranges to meet forecasted demand would result in exhaustion of these ranges. Therefore, CSPs are unlikely to prefer Option 1 for a number of reasons including that:

- the extent to which M2M services can be provided for using E.164 numbers in the future would be limited;
- CSPs would be unable to facilitate further growth of M2M services using appropriate number ranges, and would instead have to rely on alternative means which may not provide the service as efficiently;
- administrative fees for numbers may have to be introduced by ComReg as a conservation measure in order to avoid number exhaustion; and
- the conditions of use attached to the existing mobile number ranges do not explicitly support the extraterritorial use of those numbers.

135. This could negatively impact on the ability of all stakeholders to provide for both P2P and M2M services. Therefore, industry stakeholders are likely to prefer Options 2 or 3 over Option 1 as these Options would:

- substantially expand the supply of numbers available to deliver M2M services;
- allow ComReg to include a specific condition of use supporting the extraterritorial use of numbers from this specific range enabling industry stakeholders to develop appropriate M2M business models; and
- allow ComReg to attach separate specific Conditions of Use for M2M which support service provider switching and are more aligned to the needs of the M2M sector.

Option 2 v Option 3

136. Under Option 2 a new M2M range of 8 digits would create an additional supply of 100m numbers. This supply of numbers would satisfy short term demand for numbers as identified by the ICC upper-bound forecast of 71m numbers by 2022. As noted above, an 8 digit range potentially can already be accommodated by the CSPs as these may be open on national and international networks because of existing mailbox numbers, therefore CSPs could leverage existing technical and commercial arrangements (at least in the short term). To the extent that such ranges can already be accommodated, Option 2 would be unlikely to impose additional upfront costs related to the length of the number range. Therefore, Option 2 can provide for an increased supply of numbers to meet short term demand and potentially avoids upfront costs for certain CSPs. However, Option 2 could result in the exhaustion of numbers in the long run (beyond 2022). In particular, given the growth in M2M connections likely to arise in the period beyond 2022, Option 2 could result in a requirement for additional numbers to be provided for even sooner.

137. Under Option 3 a new M2M range of 10 digits would create an additional supply of 10bn numbers. This supply of numbers would satisfy short term demand for numbers as identified by the ICC upper-bound forecast of 71m numbers by 2022. Further, Option 3 would cater for M2M requirements in the long run (beyond 2022) and limit the extent to which further number changes are required in the future. However, unlike Option 2, Option 3 could have additional costs associated with the length of the number range.[44]

138. Notwithstanding, ICC's interaction with the MNOs suggested that certain operators can now cater for longer numbers in their networks and systems, which would not have been possible in 2013. As such, the cost of building out longer numbers on networks and systems may not be significant for certain operators. In that regard, such CSPs would likely prefer Option 3 as this option provides for the greatest increase in the supply of numbers and the costs associated with providing for this increase may not be significant relative to Option 2.

[44] Such costs include (a) numbering implementation change: deeper digit analysis for longer numbers; capacity on OSS platforms to be able to use longer numbers and the requirements for greater switch capacity for longer numbers (b) numbering administration change: notifications and supports for M2M customers; and (c) costs for CSP and M2M SPs arising from any new systems changes required to support service provider switching e.g. capabilities for Over-the-Air provisioning) and/or demonstrating capability to manage the numbering resource in line with potential new assignment rules.

139. To the extent that certain CSPs have not updated their systems to cater for a 10 digit number range, such CSPs may prefer Option 2 as it addresses M2M numbering requirements in the short term and could reduce the costs associated with the introduction of a new number range. Alternatively, such CSPs may prefer Option 3 if they are of the view that M2M numbering will continue to grow substantially in the period after 2022 whereby additional numbers will be required beyond what is provided under Option 2. In this way, CSPs would be incurring up-front costs over the implementation period and would avoid any future number change and associated costs in the future.

140. M2M users and M2M Service Providers are likely to prefer Option 3. In particular M2M Service providers are likely to prefer Option 3 as it would provide the greatest supply of numbers and reduce the possibility of the numbering resource becoming exhausted in the long run.

Use 07(x) or 08(x) range

141. Firstly, M2M users and M2M Service Providers are likely to be indifferent between the use 07(x) or 08(x) range under Option 3 as issues around memorability and misdialling should not arise in M2M communications.

142. CSPs however, may have a preference for the use of the 08X range and in particular the 088 range. In particular, ICC states that whilst 082, 084 and 088 may be considered equally as potential number ranges for M2M, 088 was used for a previous mobile offering (based on TACS) and this may make it easier for M2M SPs to get their assigned numbers open on international networks because the 088 range may still be recognised by international service providers.

143. Therefore, industry stakeholders are likely to prefer the use of 088 above the alternative prefixes.

Impact on competition (Step 4)

Option 1

144. In an M2M context, the main competition issues related to numbering involve (a) the availability of numbers and (b) switching, which are discussed in turn below.

Availability of Numbers

145. Under Option 1, ComReg would be unable to satisfy existing and future requests for numbers from M2M SPs, which may negatively impact on their ability to provide M2M services in Ireland and internationally. Option 1 would likely lead to number scarcity which can reduce competition because (a) new entrants to a particular service and/or (b) existing competitors wishing to expand, are prevented if they are unable to have access to appropriate numbers, and alternative addressing resources (ITU Range, IP etc.) are less efficient at delivering those services or may not be available. This may inhibit competition in the M2M market.

Switching

146. In a P2P context, mobile customers can switch supplier by simply swapping their SIM, and CSPs are required to ensure that end users can keep their existing mobile telephone number after switching. In an M2M context, the end user (e.g. electricity customer with smart meter) is generally not aware of who provides the connectivity or the underlying telephone number used. However, the M2M User (e.g. electricity supplier) would have an interest in switching CSP supplier, and by default switching their customers (potentially thousands or even millions of end users) at the same time. However, SP switching by M2M Users is problematic for two main reasons:

1. The cost of physically swapping out SIMs in each M2M device may outweigh the expected gains of a switch. A potential solution is remote over-the-air (OTA) SIM provisioning, which would enable an MNO to re-programme a SIM of a customer of another MNO. However, while this technology exists, it could take some time before it is widely used.
2. Regulation 25(1) of the Universal Service Regulations requires undertakings to ensure that subscribers can, upon request, retain their numbers independently of the undertaking providing the service, at a specific location in the case of Geographic Numbers and at any location in the case of Non-Geographic Numbers. This will also apply in an M2M context where an M2M user wishes to switch their connectivity provider.

147. Therefore, under Option 1, a barrier to switching exists whereby M2M users could become ‘locked-in’ to their CSP. This could be detrimental to the competitive functioning of the M2M market. Opening a new dedicated M2M numbering range would encourage CSPs to develop switching solutions, such as OTA provisioning.

Option 2 v Option 3

148. Alternatively under Option 2 and 3 ComReg could ensure that appropriate conditions of use are attached to the new number range which facilitate M2M users to switch CSP upon request. Such M2M centric user conditions would overcome competitive distortions arising under Option 1 and could encourage CSPs to develop the technological solutions required for switching a large quantity of end users within a short time period. Therefore, Options 2 and 3 would appear preferable to Option 1 in terms of supporting competition in the M2M market. However, in choosing between Options 2 and 3, they would appear equally beneficial in a switching context as conditions of use would not be affected by number length.

149. In relation to availability of numbers, Option 3 increases the supply of numbers by more than Option 2 and is therefore less likely to create any competition concerns in the period beyond 2022. Therefore, overall Option 3 is likely to have the most positive impact on competition as it facilitates switching and increases the supply of numbers more than Option 2.

Use 07(x) or 08(x) range

150. The consideration of using either the 07(x) or 08(x) range should not create any specific competition concerns. However, the use of the 088 range should make it easier for M2M SPs to get their assigned numbers open on international networks. This should allow M2M services to reach market more efficiently allowing the benefits of competition to occur sooner.

151. Therefore, ComReg is of the preliminary view that Option 3 (088) is the most beneficial in terms of the impact on competition.

Impact on Consumers

Option 1

152. M2M communications do not (normally) directly affect consumers and it will usually be the case that consumers – even for calls to machines within the home – will remain unaware of the telephone numbers set up during the installation phase to receive those M2M calls. However, to the extent that the underlying resource (i.e. E.164 numbers) is exhausted, new and innovative services provided through that resource could be restricted or provided at a higher cost.

153. If mobile numbers continue to be assigned to service M2M this could place unprecedented pressure on existing mobile number ranges in the future and on the ability of M2M SPs to bring new innovations to market using the national numbering resource.

154. Therefore, ComReg is of the preliminary view that consumers are unlikely to prefer Option 1 as demand for numbers is likely to exceed supply reducing the extent to which M2M services can be provided to end-users in the most efficient manner.

Option 2 v Option 3

155. Numbers are necessary to facilitate the development of new products and services for consumers because they are central to the design of communications networks and provide information that enables machines, and the services they provide, to connect. In that regard, the primary concern for consumers is that an adequate supply of numbers is needed for the development and expansion of networks, applications and services.

156. Option 2 increases the supply of numbers to 100 million which should satisfy demand in the short run, however, this option is unlikely to be able to keep pace with the rate of innovation for new M2M services significantly beyond 2022. In this regard, Option 3 increases the supply of numbers to 10 billion numbers and allows for a wide range of M2M services to be provided through E.164 numbers as opposed to more costly and less efficient alternatives.

157. Therefore, ComReg is of the preliminary view that consumers would prefer Option 3.

ComReg's Preferred Option (step 5)

158. The above assessment has considered the impact of the various options from the perspective of industry stakeholders, as well as the impact on competition and consumers. For the reasons identified above, ComReg considers that, on balance, Option 3 (088) would be the more appropriate regulatory option to adopt in the context of the RIA analytical framework.

159. In particular, ComReg is of the preliminary view that Option 3 (088) would be justified, reasonable and proportionate, because, amongst other things Option 3:

- encourages efficient use and ensures effective management of the numbering resource by opening a dedicated M2M number range to provide for increasing demand of M2M services requiring E.164 numbers;
- is in line with an CEPT[45] Electronic Communications Committee (ECC) recommendation[46] that the number length in the new number range(s) accommodating future mass M2M applications should be as long as possible (in case of E.164 numbers maximum of 15 digits according to ITU-T Rec. E.164);
- contributes to the development of the internal market by providing for extraterritorial use of M2M numbers;
- provides CSPs with 12 months to update relevant networks and systems to implement the preferred option (See Section 5.6);
- ensures that there is no distortion or restriction of competition in the electronic communications sector by introducing appropriate conditions that facilitate service provider switching; and
- would appear to be least onerous means by which the policy issues and objectives as stated could be achieved.

[45] CEPT – European Conference of Postal and Telecommunications Administrations
[46] ECC Recommendation (11)03 – Numbering and Addressing for M2M Communications

5 Numbering for Non-Interpersonal Mobile Communications Services

5.1 Introduction

160. This section provides a detailed analysis of issues related to the preferred option of an 088 M2M number range and its implementation in practice. The mobile numbering and MNC needs of M2M services are considered in terms of, for example, the clear requirement for extraterritorial use of numbers, draft EECC proposals and the introduction by other Member States of the European Union (MS) of dedicated M2M number ranges. The section also considers eCall as a specific usage case and outlines ComReg's interim and long-term proposals for numbering for eCall.

161. Based on ICC's report recommendations and our analysis, ComReg proposes eligibility criteria for M2M numbers and MNCs and also proposes draft conditions of use that might attach to those numbers.

5.2 International M2M Using Irish Numbers and MNCs (Extraterritorial Use)

162. The ECC defines the extraterritorial use of E.164 numbers as "Use of E.164 numbers of one country in another country on a permanent basis"[47]. The ITU-T recommendation E.212 [48] uses the term extra-territorial use of MCC+MNC to describe the situation where an MCC+MNC assigned to an operator in one country ("Country A") is used in another country ("Country B") through a base station established in Country B.

163. In responses to ComReg's 2013 consultation, operators did not see a significant demand for such extraterritorial use. However ICC's report establishes that extraterritorial use is now happening on a widespread basis in the marketplace, with Irish numbers and SIMs already being used abroad permanently and overseas numbers and SIMs (both EU and non-EU) being used in Ireland. ITU Global numbering resources are also being used to provide international M2M services.

[47] ECC report 194 – Extra-Territorial Use of E.164 Numbers
[48] ITU rec E.212 (9/16)

164. As mentioned, ComReg has also been approached by several specialist M2M SPs based in Ireland that have requirements for large quantities of numbers that cannot be met in the long-term from existing mobile ranges (e.g. as previously mentioned, ComReg has received requests from a small number of established M2M SPs, with forecasts that indicate they will need at least 38.4M numbers by 2022). ComReg considers that these requirements for numbers should be met, as there are clear benefits for both the Irish communications sector and for the broader national economy (See the Regulatory Impact Assessment in Section 4). These SPs have already partnered, or intend to partner with existing MNOs in Ireland to provide network access in Ireland and interconnection to networks overseas.

165. In its report, ICC recommends that ComReg should explicitly permit numbers and MNCs, assigned to undertakings for M2M services, to be used outside of its jurisdiction. ICC states that because of their nature, M2M services can be provided across different territories from the provider's 'home country'. Therefore in order to facilitate M2M services, ComReg should explicitly permit numbers and MNCs, assigned for M2M services, to be used outside of its jurisdiction.

166. ICC also notes that, in order to address competition issues in the M2M market, the EC in its draft EECC proposal has also put forward that national regulators allow the extraterritorial use of certain national numbers within the EU for M2M services. This would allow the extraterritorial use of these numbering resources within the EU, subject to appropriate safeguards to protect end-users in all Member States where the numbers are used. ICC states that where national numbers are used extraterritorially, the use should be in a manner that does not undermine the public policy concerns of the country in which they are being used. This is in line with a BEREC Report[49] which states that, with extraterritorial use, public policy objectives (such as public security, national sovereignty etc.) should not be compromised.

167. ICC further recommends notification to the ITU of any specific number range for M2M services that may be assigned from the Irish national numbering resources for extraterritorial use. This will facilitate the use of such numbering resources outside of Ireland and potentially beyond the EU. The notification, which is voluntary, should be sent to the TSB[50] of both the opening of the range and of the assignees of resources from that range. This will allow overseas operators to route and charge for use of those numbering resources overseas. Extraterritorial use of E.212 MNCs should similarly be notified.

[49] BoR (16)39 BEREC report: Enabling the Internet of Things (BoR (16) 39) February 2016

[50] The Telecommunication Standardization Bureau (TSB) provides secretarial support for the work of the ITU-T Sector

168. ComReg accords with the views contained in the ICC report that assigned numbers from any new Irish M2M number range and MNCs can be used extraterritorially. ComReg notes that in future under the EECC, BEREC may have a role in keeping records of such extraterritorial use by MS and in resolving disputes that involve more than one NRA. The use of national numbers on an extraterritorial basis has also been considered by CEPT Working Group Numbering and Networks (WG NaN)[51] [52].

Q. 4 Do you agree with ComReg's position that new Irish E.164 numbers for non-interpersonal services and Irish E.212 MNCs should be made available to be used on an extraterritorial basis for international M2M services? Please explain the basis of your response in full and provide any supporting information.

5.3 National M2M

169. Whilst the potential level of future demand for numbers and MNCs for non-interpersonal communication services to be provided in Ireland is likely to be lower than future demand for numbers/MNCs for extraterritorial use, it is necessary to consider whether any new M2M range should also be used nationally.

170. At least one national operator can provide M2M connections that use the IMSI on the SIM. As highlighted in the response to consultation in 2013[53], some operators will move to Ipv6 addresses in due course. Nevertheless, E.164 numbers are required for M2M applications that may have an occasional need for a voice communication (e.g. automotive). Furthermore even if numbers are not needed for routing, numbers are also used by Irish MNOs as account identifiers in OSS and BSS including billing. For these reasons, it is prudent to plan for all M2M mobile connections to need mobile numbers up to and beyond ComReg's 10-15 year planning horizon.

171. Currently national M2M services use existing mobile numbers. This has the disadvantage that, unless discrete subranges are used, M2M connections are not distinguishable from P2P connections based on the mobile number. There are advantages for SPs in having discrete M2M ranges/sub-ranges. This includes ease of implementation for alternative routing and separate rating and billing. Also, having a new M2M range further conserves existing mobile numbers for P2P services.

[51] ECC Rec 16(02) - Extra-Territorial use of E.164 numbers – High level principles of assignment and use – April 2016
[52] ECC report 194 – Extra-Territorial Use of E.164 Numbers – April 2013
[53] ComReg 13/109 – Numbering for M2M Communications – Response to Consultation

172. ComReg therefore proposes that, in addition to international M2M services, future national M2M services should also use the proposed new M2M number range. Notwithstanding, any M2M services on existing mobile numbers should not be forced to migrate, although a SP may wish to do so.

Q. 5 Do you agree with ComReg's proposal that National M2M services should also use the proposed new number range introduced for M2M? Please explain the basis of your response in full and provide any supporting information.

5.4 Forecasts for National and Extraterritorial M2M Connections

5.4.1 Demand for mobile numbers for M2M communication

173. Whereas mobile subscriptions for Person-to-Person communication have stayed relatively stable over the five years to 2016, and MBB subscriptions are declining by about 10% per year M2M subscriptions are growing at +20% per annum, and currently represent 12% of total mobile subscriptions.

174. ICC undertook analysis of future demand for numbers for M2M communication on the basis of three forecasts which are detailed in the following sections.

5.4.2 Existing trends

175. ICC analysed historic M2M mobile subscriptions data in Ireland (as published by ComReg in its 'Quarterly Key Data' Reports) and trending this forward over time using a variety of annual growth scenarios, ranging from 21% (which aligns with the current trend) to 34% (based on CISCO global forecast of M2M growth). According to ICC, this approach should deliver an effective 'lower limit' prediction of demand for Irish mobile numbers from Irish mobile operators of between 2.1m and 3.9m numbers required for M2M communication by 2022.

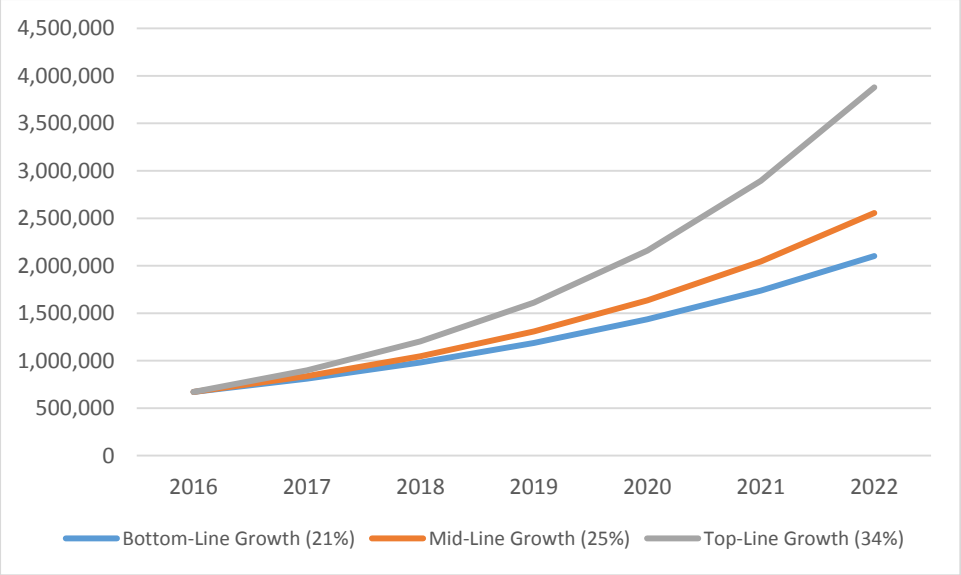

Figure 6 – Existing Trends Forecast

176. Given that ComReg has over 14m numbers available for assignment, this level of demand would not exhaust the mobile numbering ranges during this time period. However, this may represent a conservative estimate of demand for three main reasons:

- For a fast growing and dynamic sector like M2M, trends based on historic activity could greatly underestimate future activity;
- The forecast is based on the assumption that each M2M subscription requires one mobile number; and
- The forecast only reflects demand from Irish mobile operators that are currently assigned numbers, and therefore does not include potential demand from new players in the M2M market.

177. Should the higher scenario of 34% annual growth transpire, ICC's 'existing trends' forecast would infer exhaustion of the mobile numbering resource during 2027, based on M2M demand alone.

5.4.3 Demands from Industry for numbering resources

178. ICC also interviewed Irish and International M2M Service Providers currently not assigned (but have requested) Irish national number resources. This provided further information on the current and expected requirements for Irish mobile numbers to support their business plans at both the National and International level. In the interests of confidentiality, the responses of the individual interviewees were consolidated to provide a year-by-year assessment of demand for Irish mobile numbers.

	2018	2019	2020	2021	2022
Total	1,566,000	5,598,000	16,024,000	27,398,000	38,400,000

Table 2 – Predicted cumulative demand for Irish M2M mobile numbers

179. According to ICC, the sharp increase in predicted annual demand for Irish mobile numbers for M2M services over and above the historic trends recorded by ComReg is likely attributable to the intended deployment by the service providers of such numbers in extraterritorial use outside Ireland. Based on the above forecast, this level of demand would exhaust existing mobile ranges during 2020.

180. One particular driver of demand in this regard is the automotive market, the extraterritorial use of Irish national numbers overseas being regarded as desirable in terms of aspects such as reducing the complexity of carrier relations and the type of services being offered. Section 5.13 discusses the ICC forecast of 1.2M eCall equipped vehicles in Ireland by 2022, which could place additional pressure on existing mobile number ranges in Ireland. However, it is unclear whether the numbers used for eCall numbers would be Irish or international, underlying the extraterritorial dimension of M2M communication.

181. ComReg has received requests for mobile numbers from M2M Service Providers who require Irish numbers for the extraterritorial deployment of their products and services. One of these SPs already provides global connectivity solutions for the automotive sector from their Irish operation, using telephone numbers from other countries. The requests for numbers received by ComReg accord with table 2 above.

5.4.4 Upper limit forecast

182. ICC developed predictions for a potential 'upper limit' of demand for Irish mobile numbering resources, based on assessed levels of M2M market activity at pan-European and global levels, the likely accessibility to such activities by overseas numbers used on an extraterritorial basis, and the assumed degree to which Irish numbering resources might fill the resulting demand. The result of that analysis suggests that total 'global' demand for Irish M2M numbers will likely range from 20m to 71m by 2022 and while the range of this forecast is quite broad, the magnitude of the number requirements, even at the lower end, is substantial.

Q. 6 Do you agree with ComReg's forecasts for National and extraterritorial M2M connections? Please explain the basis of your response in full and provide any supporting information.

5.5 Implementation of the Proposed New M2M Range

183. Discussions with M2M SPs identified the following implementation steps that could be adopted should ComReg decide on a new M2M number range:

1. ComReg would notify the ITU of the new number range for M2M. ComReg notes that it would likely also need to notify BEREC of the new range in the future, given the content of the draft EECC;

2. An Irish M2M SP would request and be granted, subject to it being eligible and having submitted a satisfactory application, a block or sub-range of numbers from the new M2M range. In addition, ICC recommends that assignees of numbers from this new range be advised to the ITU to assist overseas operators in implementing the new numbers;

3. The Irish M2M SP would request its international signaling provider[54] to notify the international carrier community that its sub-range is routable via the international signaling provider;

4. For any limited international voice services, international gateway providers would need to put the M2M SP's sub-range into their routing tables or, if the M2M SP has an MVNO agreement, then the host MNO would need to agree a signaling relationship so that any calls to the M2M SPs sub-range would be forwarded to them;

SMS Traffic

5. For international SMS and regardless of the range and number length chosen, the M2M SP and/or their host MNO would have to make clear to all international MNOs and large SMS hubs how to route SMS traffic destined for the M2M SP; and

6. Each operator would also be required to put these new numbers in their routing tables.

Arising from these discussions with M2M SPs, this consultation now seeks further information on any potential technical, commercial or operational difficulties with such international SMS services.

[54] International service providers such as iBasis

184. ComReg notes that ICC recommends that the proposed new number range 088 be implemented within 12 months. The basis for this proposed timeline for the introduction of a new number range (as opposed to numbering resources from an existing range) is based on best practice of introducing numbering ranges garnered from informal discussions with regulators who have knowledge and experience of this situation.

185. ComReg concurs with ICC's timeline for national implementation of the preferred option, especially since two of the MNOs can handle flexible number lengths. Twelve months may also be a reasonable timeline for full international implementation. This may be possible with ComReg undertaking to carry out the notification steps above and with the active cooperation of operators, together with facilitation by international bodies such GSMA.

5.6 ComReg Proposal

186. Having considered all the options and recommendations in the ICC report, ComReg proposes to make the 088 range available for M2M services. In addition, ComReg proposes to allow numbers in the 088 range to have the maximum permissible number length of 15 digits, notwithstanding that routing for existing 12 and 13 digit mobile/mailbox numbers must clearly also remain in place.

187. These proposals are based on our best information on how international carriers currently analyse and route Irish numbers. However given the scale of information, our knowledge in this area remains incomplete. We are therefore especially keen to hear from respondents on their knowledge of how their international carrier and roaming partners would cater for the proposals we have set out, and how quickly any changes could be made (ComReg appreciates that there are both technical and commercial issues to resolve in some cases). Respondents may need to confer both with their international partner(s) and with network experts in their own organisation in order to fully answer the consultation questions below.

188. If this proposal is adopted, ComReg would propose to make numbers available to eligible MNOs and M2M SPs (See Section 5.9) in blocks of 100,000 numbers.

Q. 7 Beyond notification to ITU, what other processes could be followed to expedite the opening up of numbers internationally. Based on your experiences to date, what timescales might apply? Please highlight any actions that ComReg can take to assist with any additional processes identified. Please explain the basis of your responses in full and provide any supporting information.

Q. 8 How quickly do you consider the required international routing could be in place for any new numbers? What notifications, testing mechanisms or other measures could be used to quickly ascertain and progress the status of routing of international traffic for Ireland? Please explain the basis of your responses in full and provide any supporting information.

Q. 9 Is 12 months a reasonable timeline for implementing the new M2M number range on national and international networks? If not, please provide an alternative timeline. Please explain the basis of your response in full and provide any supporting information.

5.7 Proposed Conditions of Use for New M2M Range

189. The ICC report explores the M2M value chain and establishes that sufficient differences exist between it and traditional P2P services to warrant the introduction of specific conditions of use for the M2M number range. This section considers the ICC recommendations for such conditions of use and proposes draft conditions for consideration by respondents.

190. Extraterritorial use of numbers was considered in Section 5.2. Taking account of ICC's[55] recommendation, and also noting the draft requirement for exterritorial use of any new M2M range contained in the draft EECC, ComReg proposes to include explicit permission for extraterritorial use of the new 088 M2M number range. In addition ComReg also notes the draft proposal in the EECC which states that a condition of extraterritorial use must be that SPs adhere to legislation/rules in the country where the numbers are in use. Notwithstanding that the EECC is still draft, this also seems to be a reasonable principle to adopt. ComReg proposes a draft RoU condition to address this issue, together with a draft definition of an 'Extraterritorial use '.

191. ICC also recommend that numbers from the 088 M2M range should be allowed to have limited voice capabilities for access to emergency services for services such as eCall. ICC recommends that any M2M service that includes emergency calling as part of the service should be permitted to have limited voice capabilities. Section 5.13 addresses numbering for eCall.

[55] ICC report – Rec. 5.4.1

5.7.1 Proposed Conditions of Use

192. In response to ICC's[56] recommendations, ComReg proposes the following RoU conditions for the proposed 088 M2M range and definitions.

RoU conditions:

"M2M Numbers shall have the digit structure "network access code (088) + 10-digit subscriber number".

"M2M Numbers shall only be used for the provision of an M2M Service"

"The number holder shall ensure that M2M Numbers used Extraterritorially are used in compliance with consumer protection and other national rules in the country in which they are used".

Definitions:

" "M2M service" means a service consisting of the exchange of information between machines, through a mobile or fixed network, with limited or no human intervention".

""Extraterritorial use" means the use of Irish numbering resources in other countries on a permanent basis by way of (i) activation of the Irish numbering resources in a telecommunications network in another country; or (ii) by way of permanent international roaming. The use of Irish numbering resources for temporary roaming is not considered as Extraterritorial use."

[56] ICC report – Rec 5.11.1 and 5.4.1

193. ComReg notes that the EECC proposes a draft Article that BEREC shall establish a central registry of number assignments intended for extraterritorial use. This requirement to notify BEREC may emerge in the future. In the meantime, the RoU Conditions, Section 3.2 paragraph 9 (ComReg 15/136), which specifies that number holders must maintain accurate and current records in respect of rights of use of numbers assigned to them, will be amended to include records of numbers used extraterritorially.

194. As highlighted by ICC in their report, M2M services are constantly evolving. The needs of these services will need to be monitored to ensure the continued availability of numbers for M2M into the future. ComReg will consider and propose further conditions in the future as the need arises.

Q. 10 Do you agree with the proposed definitions and RoU conditions for the proposed 088 M2M range? Please explain the basis of your responses in full and provide any supporting information.

5.8 Other Operating Principles for M2M

5.8.1 Emergency Calling

195. Regulation 20 of S.I. 337[57] of 2011 the Universal Service Regulations requires that authorised undertakings providing an ECS ensure that calling the emergency call number (112 or 999) is provided for. ICC recommends that the provision of emergency calls for M2M services should be determined by the nature of the service that is being implemented i.e. if the emergency service is part of the offered service, e.g. eCall, then an emergency service shall be provided. eCall emergency calling is addressed in Section 5.13.

5.8.2 Calling Line Identification (CLI)

196. CLI is a GA condition as set out in Section 3 of ComReg's Numbering Conditions[58]. In the case of eCall , CLI is required to enable the PSAP to re-establish a call to the vehicle in the case the initial call from the vehicle breaks down. eCall emergency calling is addressed in Section 5.13.

[57] SI 337 (2011) - Universal Service and Users' Rights Regulations
[58] ComReg 15/136 - Numbering Conditions of Use and Application Process

5.9 Proposed Eligibility Criteria for E.164 M2M Numbers

5.9.1 Introduction

197. ComReg only assigns numbering resources to those SPs authorised in Ireland[59]. In addition, ComReg currently only assigns E.164 mobile numbers and MNCs to MNOs and MVNOs. An MVNO is defined as an authorised undertaking that, through a contractual agreement with an Irish MNO, has access to a mobile network to provide a mobile service.

198. One of ComReg's objectives is the support of innovation and competition in the marketplace and, to that end, it ensures the continued availability of numbers for existing and emerging services. In seeking to understand the potential sources of demand for numbers, ICC has highlighted that M2M has a different value chain to that of traditional P2P services and has a wider set of stakeholders. The eligibility criteria for these stakeholders needs to be reviewed.

199. There are service providers in the M2M market that may be customers of MNOs and offer integration services to large M2M users. Such users might be the car manufacturers in the example of the connected car. These large M2M users will, in turn, supply services to end customers. The presence of this wider range of stakeholders compared to P2P suggests that alternative eligibility criteria are necessary for M2M numbers.

5.9.2 Benchmarking

200. In response to the CEPT questionnaire (see Section 2.4), ComReg sought eligibility criteria for assigning E.164 numbers in each country. All 22 responses to the questionnaire indicated that the responding country allowed E.164 numbers and E.212 MNCs to be used for M2M and of these, eight countries indicated that they assigned E.164 numbers to entities other than MNOs and MVNOs.

5.9.3 ICC Recommendation

201. ICC outlines that it is important that the assignment of national resources for the provision of M2M services include a degree of flexibility necessary to support innovative services and future emerging requirements. SPs who are granted rights of use of numbers and MNCs have more flexibility in negotiating roaming agreements. Also authorised large M2M users with their own assignment of numbers would have more options in negotiating with SPs/Operators to meet its needs.

[59] ComReg 15/136 - Numbering Conditions of Use and Application Process

202. In support of innovation, ICC recommends the widening of the eligibility criteria for mobile resources in support of existing and emerging M2M services. ICC recommends[60] that providers of M2M services should be eligible to apply for E.164 numbers designated for M2M services provided they can both justify[61] the requirement and can manage[62] the resources.

203. Under this recommendation authorised undertakings other than mobile operators, such as specialist M2M SPs, may apply for mobile resources if they meet the criteria set out in the recommendation. In practice, as highlighted in the Identification of Stakeholders (Section 4.3), the M2M value chain can have a number of different configurations. For example the M2M SP service may be vertically integrated within the M2M User. In the case of the connected car or smart metering these M2M users would be, respectively, the car manufacturer and the utility companies supplying services to end users. In each case the applicant for M2M mobile resources, in addition to being authorised in Ireland, needs to ensure that they justify the requirement and can manage the resources.

204. Large M2M users who do not provide an ECS/N and who are not authorised in Ireland are therefore ineligible for Irish E.164 numbers. ComReg nevertheless understands that a key concern of such M2M users is being locked in to a single Service Provider. ComReg notes however that such users have the right[63] to switch SP on request. ICC has recommended that the mechanism for these large M2M users to switch service provider should be technology-neutral, although the use of Over-The-Air systems is likely to feature as an option. Such systems enable the re-programming of eSIM cards that nullifies the need to physically switch SIM cards when switching SP. Service Provider switching is considered in more depth in Section 6.

205. In conclusion, to increase the needed flexibility in the assignment criteria for M2M resources as described, ComReg concurs with the ICC recommendation that providers of M2M services should be eligible to apply for E.164 numbers designated for M2M services provided they can both justify the requirement and can manage the resources.

206. ComReg would specify criteria that include the new stakeholders by proposing the following eligibility criteria in Section 6.2 of the Numbering Conditions:

> *"Rights of use for E.164 M2M numbers shall be granted to MNOs, MVNOs and only to M2M Service Providers that can both justify the requirement and can manage the resources"*.

[60] ICC report – Rec. 5.9.1
[61] Section 6.3 of ComReg 15/136 (Numbering Conditions of Use and Applications Process) sets out the supporting information to be supplied by the first time applicant to justify its need for numbers.
[62] Being able to manage numbers means the applicant must comply with the Numbering Conditions - ComReg 15/136.
[63] "Regulation 25 of S.I. No. 337 of 2011, the Universal Service Regulations".

Q. 11 Do you agree with the eligibility criteria that E.164 M2M numbers can be assigned to MNOs, MVNOs and only to M2M Service Providers that can both justify the requirement and can manage the resources? Please explain the basis of your response in full and provide any supporting information.

5.10 E.212 Mobile Network Codes for M2M Providers

5.10.1 Background

207. ComReg manages Mobile Network Codes on behalf of ITU. These identify each individual national mobile network, as part of the unique identifier on a SIM, which is called an IMSI (International Mobile Subscriber Identity),as shown in figure 7:

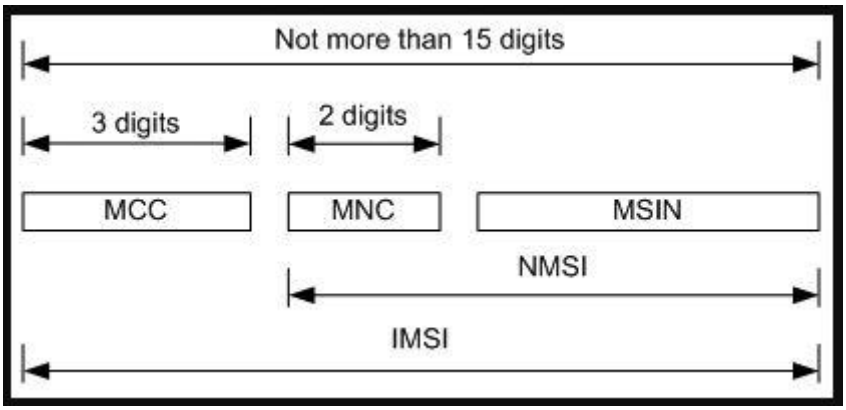

Figure 7 – The IMSI Structure

208. The IMSI for Ireland is made up of a Mobile Country Code (272 for Ireland), a 2 digit Mobile Network Code (e.g. 01 for Vodafone) and a globally unique Mobile Subscription Identification Number. The IMSI is used in cellular networks for a number of functions e.g. to identify if the subscriber is local or roaming. It is not dialable. The ITU administers MCC and MNCs at the Global level.

209. Ireland has a total of 100 MNCs available of which 11 are assigned. It is possible that the new M2M value chain with multiple new service providers will put new demands on MNCs. ITU-T SG2 is exploring the means to increase the number of available MNCs per country to meet possible demand from new use cases such as M2M. However ITU-T SG2 also notes that based on current trends, exhaustion of available MNCs is not likely to happen in the near future. Nevertheless any proposed change in eligibility for the assignment of MNCs in Ireland would need to factor in the likelihood of increased demand for this resource.

5.10.2 Benchmarking – Approach to Use of E.212 MNCs in other countries

Introduction

210. Of the 22 countries that responded to the CEPT questionnaire (see Section 2.4), 8 countries indicated they assigned E.164 mobile numbers and/or E.212 MNCs to undertakings other than MNOs or MVNOs. The approaches adopted by the Netherlands, Belgium and Denmark in assigning MNCs to undertakings other than MNOs or MVNOs, are described in the following sub-sections.

Netherlands

211. ICC refers to the approach taken by the Netherlands to support its recommendation that Ireland widens the eligibility for MNCs. The Netherlands make MNCs available to non-MNOs with connectivity requirements for services such as connected cars, smart metering, etc. In an explanatory note to a Ministerial Decree[64], concerning large scale commercial use and M2M communication, it was noted that the linking of SIM cards to public wireless networks was increasingly acting as an obstacle to switching between service providers by users of large-scale applications. The Decree quoted various studies of the emerging M2M market identifying this problem as an obstacle to a positive roaming services market. This obstacle had an estimated cost to the Dutch economy of between €50 million and €70million to facilitate some 5% of M2M users switching service providers in one year. The Decree also noted that the distance programming of SIM cards (e.g. OTA) could go some way to alleviating this situation.

212. However the Decree also stated that, cost issues aside, heightened demands relating to the quality, reliability and continuity of M2M communication were felt to make rapid and reliable network switching increasingly important to both M2M service providers and the public sector. By decoupling the use of SIM cards from the use of public network elements, and so allowing end-users or their chosen intermediaries to administer the necessary MNCs (and thus their SIM cards) themselves, it was considered that present restrictions to efficient switching could be removed without creating an enhanced risk of exhausting the supply of MNCs.

[64] Decree of the Minister of Economic Affairs of 3rd March 2014 See s3 of Decree of the Minister of Economic Affairs of 3rd March 2014

Belgium

213. BIPT, the Belgian communications regulator, in a consultation on its numbering plan in 2015[65], considered that its eligibility criteria were too restrictive. It wished to widen the criteria for eligibility to take into account new stakeholders such as M2M enablers who require MNCs, rather than restricting the assignment of these codes to those who own networks or network elements. BIPT considered that the requirement for the applicant for MNC to have a network unjustifiably slows down the market. With the introduction of new services, the extension of eligibility to non-network owners would allow the new stakeholders to extend their roaming agreement and thereby extend coverage. BIPT refers to the example of the deployment of large numbers of M2M-connected smart meters by public utilities providers, each with their own distinct SIM card. Services such as these will use MNCs. BIPT is currently awaiting the possible adoption of the proposed EECC before implementing any of its own proposals.

Denmark

214. In Denmark, numbering resources may be assigned to any party deemed by the regulator to be a legitimate provider of telecommunications networks or services. There is no specific differentiation in terms of eligibility between MNOs, MVNOs, resellers, etc. Numbers within the dedicated M2M range, however, are available only to entities offering M2M services.

Additional MCC/MNC Resources

215. ICC notes the limited resource of 100 MNCs currently available behind Ireland's MCC of 272. However ICC also advises that, should there be sufficient demand to exhaust this MCC, procedures exist in the ITU-T rec E.212[66] for the assignment of an additional Mobile Country Code. In such cases the applicant must demonstrate that the existing MCC is being used in an efficient and effective manner and that it is approaching exhaustion.

216. The sharing of E.212 MNCs is a means of increasing the efficient use of the MNC resource. Of the 22 respondents to the CEPT questionnaire, 6 countries allow sharing of E.212 MNCs. ECC (17)02 recommendation[67] considers that the shared use of MNCs, via the allocation of different MSIN blocks to multiple entities under a single assigned MNC, is technically feasible. ComReg does not propose to introduce MNC sharing at this time but may consider doing so in the future.

[65] BIPT numbering consultation – in French - See s8
[66] ITU-T - rec E.212 (09/2016) Annex C
[67] ECC rec (17)02 - Harmonised European Management and Assignment Principles for Geographic E.212 (MNCs)

217. In addition, the ITU assigns and manages MNCs behind the shared country (or global) code (901). The use of a global MNC has the benefit of reducing the risk of exhausting Ireland's 100 MNCs. One of the criteria for assignment is that the applicant intends to use the global MNC in more than one country[68]. Also, the applicant must also affirm that all national, regulatory, and legal requirements of the countries in which the applicant's network will operate and provide service are met at the time of network implementation.

Summary

218. The benchmarking exercise demonstrates that other EU Member States have investigated the demands of new M2M services and generally concluded that they should assign MNCs to undertakings other than MNOs or MVNOs. ICC recommends that, in support of innovation and competition in the new M2M services market, ComReg should do likewise. The eligibility criteria for the assignment of MNCs is addressed in the next section.

5.10.3 Proposed Eligibility Criteria and Conditions of Use for E.212 MNC

219. ComReg only assigns numbering resources to those SPs authorised in Ireland and only assigns mobile numbers and MNCs to MNOs and MVNOs. To meet ComReg's objective to support innovation and competition, ICC observes that these assignment criteria might be restrictive for M2M services where there is a wider set of stakeholders who can use such mobile resources compared with stakeholders within traditional P2P.

220. ICC therefore recommends that Providers of M2M services should be eligible to apply for E.164 numbers designated for M2M services and E.212 resources provided such Providers can both justify the requirement and can manage the resources.

221. In the case of M2M services, ComReg would specify criteria that include the new stakeholders by proposing the following eligibility criteria in Section 6.2 of the Numbering Conditions:

> *"Rights of use for MNCs shall only be granted to MNOs, MVNOs and M2M Service Providers. A right of use for one MNC shall be granted upon first application and the basis for any request for an additional right of use for an MNC must be fully set out"*.

[68] ITU-T - rec E.212 (09/2016) Annex A

Q. 12 Do you agree with the eligibility criteria that E.212 MNC can be assigned to M2M Service Providers? Please explain the basis of your response in full and provide any supporting information.

5.11 The Use of ITU Numbers and MNCs in Ireland

222. ICC considers that permitting global numbers and MNCs assigned by the ITU is a useful mechanism to meet different requirements of stakeholders as follows:

a) For national regulatory authorities, it allows an alternative resource, other than national numbers, and therefore avoids a potential drain on national resources.

b) For Service Providers, it permits a single resource to be deployed in support of a global product which minimises the overhead of managing multiple national numbering resources. Furthermore, the use of these global codes allows for innovative commercial arrangements to be developed, and deployed, in the use of M2M services. These commercial arrangements may not be possible with national resources. ICC points out that, although the emerging acceptance by countries of the extraterritorial use of numbers and MNCs will provide an alternative to global resources, the use of the latter resources will remain an option until extraterritorial use is adopted universally.

5.11.1 Proposed Conditions of Use

223. The ITU assigns global numbers and MNCs under the criteria and conditions of use specified in E.212. One of the criteria of assignment is that an applicant must affirm that all national, regulatory, and legal requirements of the countries in which the applicant's network will operate and provide service, are met at the time of network implementation. ComReg's Numbering Conditions specify the conditions of use that attach to General Authorisation. This condition of use applies to any number, global or otherwise, used by an Authorised Undertaking in Ireland. However, ICC recommends[69] that permission to use such global numbers assigned by the ITU for the purposes of M2M should be explicit in the Numbering Conditions. ComReg concurs with this view, and therefore would propose to add the condition detailed in Section 5.12.3.

[69] ICC report – Rec. 5.6.1

5.12 The use of Overseas (EU & Non-EU) Numbers and MNCs in Ireland

5.12.1 Background

224. Emerging global services such as the connected car, will result in increased demand for numbers and MNCs to be used extraterritorially. This emerging demand is recognised by the draft proposals in the EECC. Bearing this in mind, ICC investigated and made recommendations to ComReg in respect of the extraterritorial use of Irish numbering resources and also overseas numbers used in Ireland.

225. In response to the CEPT questionnaire (see Section 2.4), seven of the 22 countries who responded indicated that they allowed E.164 numbers and/or E.212 MNCs from another country to be used in their country on an extraterritorial basis. This is likely to increase if the EECC proposal on the extraterritorial use of numbers is adopted.

5.12.2 ICC Recommendation

226. In view of this, ICC recommends[70] that Service Providers that use telephone numbering resources from overseas and international administrations to provide M2M services and OTT services in Ireland, should conform to the conditions for the provision of Electronic Communications Networks and Services as set out in the General Authorisation regime in Ireland, as well as complying with consumer protection legislation.

227. ICC's rationale for this recommendation is based on the following:

a) Providers of electronic communication services in Ireland are required to be authorised and to comply with all applicable legislation and laws, regardless of the numbers they are using. In ICC's view this should continue to be a requirement for providers of M2M and OTT services using numbering resources from overseas and international administrations.

[70] ICC report – Re. 5.5.1

b) The proposed requirement in the EECC to support extraterritorial use of numbers does not deal in detail with the differing regulatory environments but sets out the principle that these numbers shall comply with the rules in the environments in which they operate. The need for Irish numbers used extraterritorially to comply with the regulatory rules of the country in which they operate is addressed in an earlier section. Correspondingly, ComReg should ensure that the use of global or overseas resources deployed in Ireland comply with the Conditions of Use that apply to Irish national numbers.

c) In addition, the EECC proposes a condition that a request from an EU national regulatory authority, which demonstrates a breach of relevant consumer protection and other national rules of the Member State in which the numbers are being used, can withdraw the right of extra-territorial use. Additionally, NRAs can seek to block access to numbers where fraud or misuse is occurring. ICC point out that the application of this recommendation will ensure that there is a consistent approach to the use of resources that are deployed in the provision of M2M services.

5.12.3 Proposed Conditions of Use

228. As the proposed requirement in the EECC to support extraterritorial use of numbers does not deal in detail with the differing regulatory environments in each country, it is necessary for ComReg to ensure that there is explicit permission for the use of overseas numbers in Ireland. These numbers will be subject to the GA conditions as set out in ComReg 15/136. ComReg's proposed condition is as follows:

> "*For the avoidance of doubt, the regulatory obligations attached to the General Authorisation and the conditions set out in Section 3.1 of this document shall apply to the use by undertakings, for M2M services in the State, of numbers assigned by the ITU, or overseas numbers*".

Q. 13 Do you agree that ComReg should, for the avoidance of doubt, make clear in the Numbering Conditions that the regulatory obligations attached to the General Authorisation, and the conditions set out in Section 3.1 of the Numbering Conditions, apply to the use by undertakings, for M2M services in the State, of numbers assigned by the ITU, or overseas numbers?

5.13 Numbering for eCall

5.13.1 Introduction

229. From 31 March 2018 all new vehicles sold in the European Union will be required to have a 112-based eCall in-vehicle system[71] ("eCall")[72]. The purpose of eCall is that where a vehicle is involved in a road accident, a voice channel will be established (either automatically or manually) between the vehicle and the nearest Public Safety Answering Point ("PSAP"). A Minimum Set of Data ("MSD")[73] will also be sent to the PSAP operator.

230. Regarding eCall, all Member States Public Safety Answering Points (PSAP) will be required to have completed the necessary upgrade and conformity assessment by 1 October 2017. After 31 March 2018, all new types of cars and light vans sold in the European Union must have eCall based on 112 installed.

5.13.2 Forecast of Demand for eCall

231. ICC's predictions of sales in Ireland of new vehicles equipped with eCall (private car, LCV and HGV) amount to 1.2M from 2018 to 2022. This is equivalent to 1.2M additional numbers needed to satisfy the demand for eCall-equipped vehicles in Ireland in this period. As already noted, however, extraterritorial use of numbers makes it by no means a certainty that all eCall-equipped vehicles sold in Ireland will be serviced by Irish national number resources whilst, conversely, there may be significant demand for Irish numbers to service eCall-equipped vehicles sold overseas.

5.13.3 Why are numbers needed for eCall

232. eCall is similar to a mobile service because when activated, eCall devices connect to a mobile cellular network to establish a voice channel and sends data within the voice channel. Because eCall is designated to be an interoperable EU-wide service, each eCall device will require a SIM card with an IMSI for identification and to enable it to roam between networks and across borders.

[71] '112-based eCall in-vehicle system' means an emergency system, comprising in-vehicle equipment and the means to trigger, manage and enact the eCall transmission, that is activated either automatically via in-vehicle sensors or manually, which carries, by means of public mobile wireless communications networks, a minimum set of data and establishes a 112-based audio channel between the occupants of the vehicle and an eCall PSAP.

[72] https://ec.europa.eu/transport/themes/its/road/action_plan/ecall_en

[73] EN 15722:2015: Intelligent transport systems - ESafety – ECall minimum set of data.

233. While calls can be made to a PSAP without an E.164 number, a number is required for the PSAP to call back in the event of a dropped call. Therefore an E.164 number would be required as CLI when an emergency call is made to a PSAP.

5.13.4 Types of numbers

234. Several numbering options are available to facilitate the functioning of eCall, including national mobile numbers, national dedicated M2M numbers and ITU global numbers. There is currently no harmonised approach as to the types of numbers that should be used for eCall and that decision is currently being made by the vehicle manufacturers and their eCall device suppliers.

5.13.5 ICC's recommendations

235. In its report, ICC[74] believes that ComReg should designate a sub-range of a proposed new M2M numbering range exclusively for the eCall service. ICC is of the view that there is a need for an E.164 number to be associated with a vehicle to allow the PSAP to call back in the event of a dropped call, and to ensure the proper functioning of eCall at the national level.

236. ICC also recommends that flexibility should be allowed in the types of numbers that can be used for eCall. ICC believes that ComReg should not restrict the use in Ireland of national numbers from other EU countries or Global ITU numbers. Such an approach would give vehicle manufacturers and their eCall device suppliers access to the widest possible source of numbers and allow them to choose the number type(s) that most suits their commercial needs while meeting the needs of the eCall service.

5.13.6 ComReg's proposal

237. Having considered ICC's recommendations on eCall, ComReg is of the preliminary view that designating a sub-range of the proposed new M2M numbering range is not required. Rather, ComReg proposes to allow numbers from the proposed new M2M numbering range to be used for eCall in Ireland. Note that numbers from existing mobile ranges, Global ITU numbers and national numbers from other EU countries may also be used for eCall.

[74] ICC rec 5.17.1

238. ComReg has also discussed with ECAS[75] the need for a sub-range of the proposed new M2M numbering range for eCall. ECAS's initial view is that a sub-range is not required.

239. ComReg's proposal is also in line with the ECC's recent Recommendation on numbering for eCall[76] in which the ECC recommends that:

- NRAs make available national numbering resources for eCall;
- NRAs permit the extra-territorial use of their respective assigned national numbering resources for eCall;
- NRAs permit the use of global numbering resources (assigned by ITU TSB) or national numbering resources from another country (extra-territorial use or roaming) within the national territory for addressing eCall devices;
- where there is a risk of exhaustion in national mobile numbering ranges, NRAs consider the use of existing E.164 national M2M numbering ranges or introduce a new eCall numbering range; and
- in considering numbering resources for eCall, where E.164 numbering resources for global services (assigned by ITU TSB) or national numbering resources from another country are used, assignees should be aware that they are responsible for ensuring that the numbers are diallable Europe-wide.

Q. 14 Do you agree with ComReg's proposal to allow numbers from the proposed new M2M numbering range to be used for eCall in Ireland? Note that numbers from existing mobile ranges, Global ITU numbers and national numbers from other EU countries may also be used for eCall. Please explain the basis of your response in full and provide any supporting information.

5.14 Fees for M2M Numbers

240. As already highlighted in Section 3.4, ICC recommends that ComReg should also consider charging for the proposed new M2M numbers, to ensure they are used as efficiently as possible. ICC also highlights that some NRAs apply administrative charges for E.164 numbers in general, and ComReg notes that 14 of 22 respondents to the CEPT questionnaire currently charge for numbers.

[75] the Emergency Call Answering Service (ECAS) is the centre that initially answers emergency 112 and 999 calls in Ireland.

[76] ECC Recommendation (17)04 – Numbering for eCall.

241. ComReg is not proposing to introduce fees for M2M numbers at this time. This may be reviewed in the future, once ComReg has some experience of the administrative overhead and the levels of efficiency being achieved in practice by M2M SPs.

6 Switching Between Service Providers

6.1 Introduction

242. Along with the numbering aspects, consideration needs to be given to the competition side of M2M deployments. NRAs promote competition and encourage the removal of barriers to competition in order to enable consumers and end users to make telecoms choices. One mechanism for enabling competition is to ensure that end users are easily able to switch between service providers. This prevents service provider 'lock-in' whereby an end user is unable to switch service provider without disruption.

243. Switching in an M2M scenario is typically more complex than switching in a Person-to-Person (P2P) scenario. For mobile end users (in P2P communications), changing service provider typically involves swapping the end user's existing SIM card with a new SIM card from the new service provider. Such switching is facilitated by the Mobile Number Portability (MNP) process which is well established in Ireland and allows the end user to retain their E.164 telephone number following the switch. Retaining their telephone number is typically important to P2P end users.

244. Whether the E.164 telephone number needs to be retained after switching and the extent to which the SIM cards can be physically swapped out have a bearing on the most appropriate switching method for M2M scenarios. Many M2M communications are automated and the E.164 number is not visible to the end user, in which case E.164 number retention seems less likely to be an important factor.

245. As described in the RIA (Section 4) the value chain for M2M services is also more complex, given that connectivity services are provided by MNOs/MNVOs and there may also be a separate M2M Service Provider. The M2M SP may be providing services directly to end users, or alternatively to an M2M User (e.g. a car manufacturer). The MNO and M2M SPs are typically ECS and the M2M user typically is not, which is a factor in considering where an obligation to provide service provider switching might apply. However, there are several combinations of packaging the services and business models are only beginning to evolve, so a case-by case approach may initially be necessary.

246. MNP may be appropriate for switching in certain M2M setups, where the switching devices are low in volume and the M2M service is being provided directly to end users by the connectivity provider (i.e. an existing Irish MNO/MVNO). However, this is likely to currently only work for M2M services that are national in scope, as the MNP processes are not designed to cater for end-users outside Ireland (i.e. for extraterritorial use of numbers), or for intermediaries in a complex M2M value chain.

247. Switching large-scale M2M deployments is more complicated as many M2M devices are embedded in networks and systems. For multiple M2M devices in widespread locations it may be impossible or economically unviable to physically replace SIM cards. In addition, M2M devices with embedded SIMs pose a switching problem as embedded SIMs are not easily replaceable.

248. ComReg now considers the recommendations made by ICC in relation to number portability and service provider switching, factoring the context provided above. We also describe the different switching options that may be appropriate for M2M in some more detail, revisiting the results of the ComReg consultation on M2M in 2013, where appropriate.

6.2 ICC Recommendations

249. In its report, ICC recommends (Rec. 5.16.1) that M2M Service Providers utilising national numbers for M2M resources should be required to allow subscribers to switch suppliers (ICC refer to this as Service Provider portability) and that, as far as possible and where appropriate, such provision should use existing number portability processes.

250. The overarching rationale for this recommendation is that the ability to switch Service Providers underpins the concept of competition and of consumer choice and applies equally to the M2M context as it does to traditional telecommunications. ICC correctly highlights that the ability to switch must be independent of the technology that supports the service. However, the focus of this consultation is M2M services provided on mobile networks that need E.164 numbers and/or use SIMs, either physical or embedded.

251. ICC highlights that the current MNC processes are currently focussed on end users initiating the process. ICC concludes that where appropriate, re-use of existing MNP processes for national numbering resources should be considered to ensure the benefits that accrue from allowing subscribers the ability to choose their M2M service provider. The impact of such a choice would be different for M2M services compared to traditional telecommunications because of the different value chain that exists in M2M. However, the competition and economic benefits are perceived to be similar.

252. ICC notes that there are two main methods to support the implementation of M2M, namely physical SIM cards or embedded SIM Cards. Each has advantages and disadvantages. Service provider switching is a requirement of either and is independent of such technology. ICC considers that the mechanism to support service provider switching is a matter of choice for the service provider to meet its commercial requirements. ICC highlights that Over the Air (OTA) mechanism is cited in the draft European Electronic Communications Code, and therefore might be seen as the preferred option for this function, as opposed to physical change of equipment to support a change of provider.

253. Overall ICC's recommendation on service provider switching takes a technology neutral approach to supporting the ability of M2M users to leverage competition and the focus is on the capability of a subscriber to be able to switch between M2M Service Providers regardless of the technology that they are using. This is so that M2M subscribers have the service and/or connectivity of their choice, and so avoid service provider lock in. ComReg concurs with this view.

6.3 Previous Consideration by ComReg of MNP and Block Reassignment

254. In its 2013 Consultation on Numbering for Machine-to-Machine communications[77] ('2013 Consultation') ComReg raised the issues of number portability (NP) for M2M (noting that the proposal was for a new range for M2M, not the use of mobile numbers) and also asked if a block reassignment process would be sufficient for M2M users wishing to switch service provider.

255. Block reassignment entails transferring the rights of use of numbers within a given number block from one service provider to another. At the time, ComReg highlighted that this may be useful in cases of mass switching in business-to-business (B2B) communications. It may also be of relevance nationally and possibly internationally if Irish numbers are used extraterritorially with a single MNC on Irish SIMs e.g. large scale consumer electronic application. In this case, having all of the SIMs with the same unique Mobile Network Code would be useful. However there are limitations to this in that there are only 100 MNCs available for use in Ireland.

[77] ComReg 13/33 Consultation Document on Numbering for Machine-to-Machine Communications

256. During the 2013 Consultation two respondents[78] were of the view that block reassignment would be appropriate for M2M switching and preferred this option for M2M to number portability. One respondent[79] was opposed to the proposal, being against the use of numbers for M2M as a principle. Another respondent[80] was of the view that there are additional costs with block reassignment and considered that a full impact assessment was needed. A further respondent[81] was of the view that both block reassignment (with a formal process for same) and NP are needed for M2M switching.

257. Having considered the responses ComReg's position in 2013 was that

- Number Portability is an entitlement of M2M number holders
- Existing mobile NP should apply
- Existing NP process should be supplemented by a block-reassignment process where appropriate.

258. Related to the block reassignment process, ComReg also considered the assignment of MNCs to large M2M service providers in its 2013 Consultation.

259. ComReg sought views on the appropriate threshold of M2M applications that an M2M service provider should have before it should be allocated MNCs. One respondent[82] considered a threshold of 1 million appropriate whereas other respondents[83] opposed or urged caution in allocating MNCs to non-mobile operators.

260. The issue of Shared Mobile Country Codes (MCC) and national roaming was also considered in the 2013 Consultation. The ITU has designated MCC 901 as a shared MCC, allowing for the provision of shared MNCs that are not country specific. Using a shared, or global, MNC would allow SIM functionality at the point of manufacture and could enable SPs to negotiate roaming agreements nationally and internationally.

261. ComReg asked interested parties if they agreed that a shared MCC and MNC provides a practical solution to operator tie-in whilst also meeting the needs for economies of scale in the manufacture and distribution of M2M devices.

262. Two respondents[84] agreed that a shared MCC and MNC provides benefits while another two[85] disagreed. ComReg indicated that it would monitor international developments.

[78] Telefonica and H3GI
[79] Silver Spring Networks
[80] Eircom Group
[81] BT
[82] H3GI
[83] Eircom Group, Telefonica
[84] Telefonica and H3GI
[85] Eircom Group and Silver Springs Networks

6.4 The Role of OTA Remote Provisioning in Switching

263. Over-The-Air (OTA) switching involves the remote provisioning and management of the embedded Universal Integrated Circuit Card (eUICC) in SIMs. It allows for the retention of the E.164 number after switching from one service provider to another. In 2013 GSMA released a specification for the non-P2P market and in 2017 a specification for the P2P market. ETSI and 3G PP are developing standards for the process.

264. While not all SIMs are currently OTA capable, some 'high-tech' applications (e.g. in the automotive sector) use it. Industry developments in OTA are ongoing.

265. The OTA switching process should be transparent and non-discriminatory – it should facilitate competition yet safeguard security. In time, an independent third party entity may be required to oversee the OTA switching process and ensure that switching is synchronised and seamless. However, given the global demand for M2M solutions, such an entity would need to operate internationally (and independently) so that users could switch service providers in one or more countries should they wish.[86] ComReg will keep watch on the OTA discussions and developments in Europe so as to ensure that the Irish telecoms market is competitive and flexible to new technologies and services.

266. It should be also noted that the current European Electronic Communications Code (EECC) proposes that Member States promote OTA provisioning where technically feasible in order to facilitate switching of providers of ECS/ECNs by end users other than consumers, in particular users and providers of M2M services.

6.5 ComReg Position

267. ComReg's position on M2M switching is that it must be provided for, since it is both a pro-competition measure and a legislative requirement. However, ComReg is hesitant to propose specific national regulatory requirements for M2M switching at this stage as, given the global nature of the M2M market, it is important not to hinder innovation and competition.

[86] From Vodafone presentation to BEREC M2M workshop, Brussels, February 2016 http://berec.europa.eu/files/document_register_store/2017/2/BoR_(17)_20_Vodafone_presentation.pdf

268. Whilst the number portability obligation may not be entirely appropriate in the case where the E.164 number of a device is not known by the M2M user (and/or the M2M end-user), it is clear from our previous consultation on M2M and from ICC's work that MNP may have some role to play. This will need further consideration by both ComReg and the industry MNP Committee to e.g. identify those circumstances and to consider the extent to which the existing inter-operator processes and network routing solutions might be need to be adapted to cater for B2B or B2B2C business models and any additional M2M number range.

269. It is also clear that in certain circumstances, the assignment of MNCs to M2M Service Providers and the availability of a block reassignment process may facilitate switching. ComReg has already set out its position (Section 5.10.3) in relation to making MNCs available to M2M SPs. Further study is required to consider the functional requirements of any such switching process. In the meantime, a case by case approach might initially be required.

270. Over-the Air provisioning is an appealing solution, provided that it is designed in an open, transparent and non-discriminatory matter. This is an area that is being considered further by CEPT and BEREC and ComReg will continue to monitor and participate in international discussions. ComReg also notes that GSMA and certain mobile operators are actively considering solutions. If the facility is not introduced in a timely manner, then NRAs may need to consider the need to become active in the work, or to introduce regulatory mechanisms or incentives to foster OTA provisioning. It may even require the consideration of a statutory obligation to introduce OTA provisioning within a certain time period.

271. To the extent that OTA provisioning is already available in certain sectors (e.g. automotive), ComReg is of the view that M2M service providers should ensure that contracts with large M2M users allow them to use OTA to switch provider should they wish to do so.

272. ComReg will continue to keep abreast of European and international developments in this area and may issue a further consultation on this in due course.

Q. 15 Do you agree with ComReg's analysis of the options for switching M2M service provider and the broad requirement for further study in this area? Please explain the basis of your response in full and provide any information in support of your response or may be relevant to further study

Q. 16 Do you have any observations on any other related issues of relevance to the subject matter of this consultation? Please explain the basis of your response in full and provide any information in support of your response.

7 Next Steps

273. ComReg invites and welcomes the views of all interested parties and will consider all information submitted to it on foot of this consultation. As stated in Section 2, we are particularly interested in learning more about the international implementation of any new number range and also on respondents' views on the issues set out in Section 5. Multinational operators and service providers may therefore wish to consult within their own organisations to fully inform their organisations' viewpoints prior to responding.

274. ComReg will publish a response to this consultation which may include Decisions on a new number range, eligibility criteria for numbers and MNCs and conditions of use. The Response to Consultation will also outline ComReg's position in relation to the matters raised in Section 6.

Submitting comments

275. The period for submitting responses to this consultation will run until 5pm on 7 March 2018.

276. ComReg requests that all responses reference the relevant question numbers and/or paragraph numbers from this document. ComReg also requests that respondents set out the rationale for their submitted views, to include any supporting information.

277. ComReg will publish all responses to this consultation in due course in accordance with its policy. Respondents are therefore asked to provide confidential and non-confidential versions of any document in respect of which any confidentiality is claimed (e.g. commercially sensitive information). In this respect, please see ComReg's *Consultation Procedures* (ComReg 11/34) and *Guidelines on the Treatment of Confidential Information* (ComReg 05/24).

278. ComReg requests that electronic responses to this consultation be submitted in an unprotected format in order that they can be appended into ComReg's submissions document for electronic publication.

279. All responses to this consultation should be clearly marked:- "Reference: Consultation 18/03 - Review of Mobile Numbering", and sent by post, facsimile or e-mail to arrive on or before 5pm, on 7 March 2018, to:

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Appendix: 1 Consultation Questions

Section **Page**

Appendix: 2 Legal Framework and Statutory Objectives

A 2.1 ComReg's functions, objectives, duties and powers in relation to management of the national numbering resource are set out in the Communications Regulation Act2002as amended ("2002 Act") and in the Common Regulatory Framework (including the Framework Directive 2002/21/EC and the Authorisation Directive 2002/20/EC, as amended and transposed into Irish law by the corresponding Framework Regulations and Authorisation Regulations).

A 2.2 This section is intended as a general guide to ComReg's role in the area of number management and not as a definitive or exhaustive legal exposition of that role. Further, this section restricts itself to consideration of those powers, functions, duties and objectives of ComReg that appear most relevant to the creation and imposition of numbering conditions and it generally excludes those that are not considered relevant to this issue.

A 2.3 ComReg's overarching function to manage the national numbering resource must be exercised having regard to ComReg's objectives as set out in Section 12 of the 2002 Act and Regulation 16 of the Framework Regulations, and in accordance with any applicable ministerial Policy Directions issued under Section 13 of the 2002 Act.

A 2.4 ComReg's primary objectives in carrying out its statutory functions in the context of electronic communications are to:

- promote competition;
- contribute to the development of the internal market;
- promote the interests of users within the Community;
- ensure the efficient management and use of the radio frequency spectrum and national numbering resource in accordance with any ministerial directions issued under Section 13 of the 2002 Act; and
- unless otherwise provided for in Regulation 17 of the Framework Regulations, take the utmost account of the desirability of technological neutrality in complying with the requirements of the Specific Regulations in particular those designed to ensure effective competition

Promotion of competition

A 2.5 Section 12(2)(a) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at the promotion of competition, including:

- ensuring that users, including disabled users, derive maximum benefit in terms of choice, price and quality;
- ensuring that there is no distortion or restriction of competition in the electronic communications sector; and
- encouraging efficient use and ensuring the effective management of radio frequencies and numbering resources.

A 2.6 In so far as the promotion of competition is concerned, Regulation 16(1)(b) of the Framework Regulations also requires ComReg to:

- ensure that elderly users and users with special social needs derive maximum benefit in terms of choice, price and quality; and
- ensure that, in the transmission of content, there is no distortion or restriction of competition in the electronic communications sector.

Contributing to the Development of the Internal Market

A 2.7 Section 12(2)(b) of the 2002 Act requires ComReg to take all reasonable measures which are aimed at contributing to the development of the internal market, including:

- removing remaining obstacles to the provision of electronic communications networks, electronic communications services and associated facilities at Community level;
- encouraging the establishment and development of trans-European networks and the interoperability of transnational services and end to-end connectivity; and
- co-operating with electronic communications national regulatory authorities in other Member States of the Community and with the Commission of the Community in a transparent manner to ensure the development of consistent regulatory practice and the consistent application of Community law in this field.

Promotion of Interests of Users

A 2.8 Section 12(2)(c) of the 2002 Act requires ComReg, when exercising its functions in relation to the provision of electronic communications networks and services, to take all reasonable measures which are aimed at the promotion of the interests of users within the Community, including:

- ensuring that all users have access to a universal service;
- ensuring a high level of protection for consumers in their dealings with suppliers, in particular by ensuring the availability of simple and inexpensive dispute resolution procedures carried out by a body that is independent of the parties involved;
- contributing to ensuring a high level of protection of personal data and privacy;
- promoting the provision of clear information, in particular requiring transparency of tariffs and conditions for using publicly available electronic communications services;
- encouraging access to the internet at reasonable cost to users;
- addressing the needs of specific social groups, in particular disabled users; and
- ensuring that the integrity and security of public communications networks are maintained.

A 2.9 In so far as promotion of the interests of users within the EU is concerned, Regulation 16(1)(d) of the Framework Regulations also requires ComReg to:

- address the needs of specific social groups, in particular, elderly users and users with special social needs, and
- promote the ability of end-users to access and distribute information or use applications and services of their choice.

Regulatory Principles

A 2.10 In pursuit of its objectives under Regulation 16(1) of the Framework Regulations and Section 12 of the 2002 Act, ComReg must apply objective, transparent, non-discriminatory and proportionate regulatory principles by, amongst other things:

- promoting regulatory predictability by ensuring a consistent regulatory approach over appropriate review periods;
- ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services;
- safeguarding competition to the benefit of consumers and promoting, where appropriate, infrastructure-based competition;
- promoting efficient investment and innovation in new and enhanced infrastructures, including by ensuring that any access obligation takes appropriate account of the risk incurred by the investing undertakings and by permitting various cooperative arrangements between investors and parties seeking access to diversify the risk of investment, while ensuring that competition in the market and the principle of non-discrimination are preserved;
- taking due account of the variety of conditions relating to competition and consumers that exist in the various geographic areas within the State; and
- imposing ex-ante regulatory obligations only where there is no effective and sustainable competition and relaxing or lifting such obligations as soon as that condition is fulfilled.

BEREC

A 2.11 Under Regulation 16(1)(3) of the Framework Regulations, ComReg must:

- having regard to its objectives under Section 12 of the 2002 Act and its functions under the Specific Regulations, actively support the goals of BEREC of promoting greater regulatory co-ordination and coherence; and
- take the utmost account of opinions and common positions adopted by BEREC when adopting decisions for the national market.

Other Obligations under the 2002 Act

A 2.12 In carrying out its functions, ComReg is required amongst other things to:

- seek to ensure that any measures taken by it are proportionate having regard to the objectives set out in Section 12 of the 2002 Act;

- have regard to international developments with regard to electronic communications networks and electronic communications services, associated facilities, postal services, the radio frequency spectrum and numbering; and

- take the utmost account of the desirability that the exercise of its functions aimed at achieving its radio frequency management objectives does not result in discrimination in favour of or against particular types of technology for the provision of ECS.

Policy Directions

A 2.13 Section 12(4) of the 2002 Act provides that, in carrying out its functions, ComReg must have appropriate regard to policy statements, published by or on behalf of the Government or a Minister of the Government and notified to the Commission, in relation to the economic and social development of the State. Section 13(1) of the 2002 Act requires ComReg to comply with any policy direction given to ComReg by the Minister for Communications, Energy and Natural Resources ("the Minister") as he or she considers appropriate, in the interests of the proper and effective regulation of the electronic communications market and the formulation of policy applicable to such proper and effective regulation and management, to be followed by ComReg in the exercise of its functions. Section 10(1)(b) of the 2002 Act also requires ComReg, in managing the national numbering resource, to do so in accordance with a direction of the Minister under Section 13 of the 2002 Act, while Section 12(1)(b) requires ComReg to ensure the efficient management and use of the national numbering resource in accordance with a direction under Section 13.

A 2.14 The Policy Directions which are most relevant in regard to this consultation include the following:

- *Policy Direction No.4* - ComReg shall ensure that in making regulatory decisions in relation to the electronic communications market, it takes account of the state of the industry and in particular the industry's position in the business cycle and the impact of such decisions on the sustainability of the business of undertakings affected.

- *Policy Direction No.5* - Where ComReg has discretion as to whether to impose regulatory obligations, it shall, before deciding to impose such regulatory obligations on undertakings, examine whether the objectives of such regulatory obligations would be better achieved by forbearance from imposition of such obligations and reliance instead on market forces.

- *Policy Direction No.6* - ComReg, before deciding to impose regulatory obligations on undertakings in the market for electronic communications, shall conduct a Regulatory Impact Assessment in accordance with European and International best practice and otherwise in accordance with measures that may be adopted under the Government's Better Regulation programme.

- *Policy Direction No.7* - ComReg shall ensure that, where market circumstances are equivalent, the regulatory obligations imposed on undertakings in the electronic communications market in Ireland should be equivalent to those imposed on undertakings in equivalent positions in other Member States of the European Community.

- *General Policy Direction No.1 on Competition* - ComReg shall focus on the promotion of competition as a key objective. Where necessary, ComReg shall implement remedies which counteract or remove barriers to market entry and shall support entry by new players to the market and entry into new sectors by existing players. ComReg shall have a particular focus on:

    - market share of new entrants;
    - ensuring that the applicable margin attributable to a product at the wholesale level is sufficient to promote and sustain competition;
    - price level to the end user;
    - competition in the fixed and mobile markets;
    - the potential of alternative technology delivery platforms to support competition.

The Common Regulatory Framework

A 2.15 There is a distinction between (a) statutory obligations relating to numbers which exist under primary or secondary legislation and (b) conditions attached to numbers which are imposed by ComReg pursuant to regulation 8 or 14 of the Authorisation Regulations.

A 2.16 The numbering conditions set out in Sections 4 and 5 fall into two broad categories in that they are either "GA Conditions" or "Rights of Use Conditions".

1. *GA Conditions*

A 2.17 Most of the numbering conditions are attached to the General Authorisation. These conditions are created and imposed pursuant to Regulation 8 and Part A of the Schedule to the Authorisation Regulations. This category of condition has universal effect in that applies equally to all authorised undertakings or to such categories of authorised undertaking as may be specified. An authorised undertaking which uses a number, to which one more conditions under the General Authorisation have been attached, is required to comply with those conditions.

2. *Rights of Use Conditions*

A 2.18 Some of the numbering conditions are attached to "rights of use for numbers" which ComReg has granted to individual undertakings. These conditions are created and imposed pursuant to Regulations 13 & 14 and Part C of the Schedule to the Authorisation Regulations. This category of condition does not have universal effect in that it applies only to the individual authorised undertaking which applied for and was granted the right of use to which the condition is attached. Only the individual authorised undertaking which applied for and was granted the right of use for a number is required to comply with the conditions attached to that right of use.

A 2.19 The key statutory provisions relevant to the above two categories of conditions are outlined in more detail below:

Regulation 20 of the Framework Regulations

A 2.20 Regulation 20 of the Framework Regulations provides that ComReg:

- shall grant rights of use for numbers for all publicly available ECS in a manner that gives fair and equitable treatment to all undertakings and by application of procedures which are open, objective, transparent, non-discriminatory and proportionate;

- may attach conditions to rights of use for numbers, to ensure their efficient and effective management and use and to ensure that undertakings do not discriminate against one another as regards the number sequences used to give access to their respective services; and

- shall, from time to time, publish details of the "National Numbering Scheme" and that ComReg shall publish details of any significant additions or amendments to the scheme and, in so far as is practicable, support the harmonisation of specific numbers or numbering ranges within the European Union.

A 2.21 Regulation 20(4) of the Framework Regulations states that an "undertaking commits an offence if the undertaking assigns to locations, terminals, persons or functions on public communications networks numbers from the National Numbering Scheme that the regulator has not specifically allocated to the undertaking in connection with the provision of publicly available electronic communications services".

GA Conditions - regulations 4 and 8 of the Authorisation Regulations

A 2.22 Regulation 4 of the Authorisation Regulations requires that any undertaking that intends to provide an electronic communications network or service shall notify ComReg, before doing so. The notification shall be in such form as ComReg may determine and shall contain the information specified in regulation 4. Upon receipt by ComReg of such a notification, the undertaking concerned is deemed to be authorised to provide an electronic communications network or service or, as appropriate, both, subject to such conditions as may be specified by ComReg under Regulation 8.

A 2.23 Regulation 8 of the Authorisation Regulations mandates ComReg "*shall … specify conditions to be attached to a general authorisation only as are listed in Part A of the Schedule*." Such conditions must be non-discriminatory, proportionate and transparent.

RoU Conditions - regulations 13, 14 and 15 of the Authorisation Regulations

A 2.24 Regulations 13(1) and (2) of the Authorisation Regulations together provide that ComReg may, on receipt of an application in such form as it may from time to time determine, grant a right of use for any class or description of number to any undertaking as ComReg considers appropriate and that ComReg shall establish open, objective, transparent, non-discriminatory and proportionate procedures for granting rights of use for numbers and make such procedures publicly available.

A 2.25 Regulations 13(3) and (4) of the Authorisation Regulations together provide that ComReg shall make any decision on the grant of a right to use a class or description of number as soon as possible after it has received a complete application and in the case of a number that has been allocated for a specific purpose within the National Numbering Scheme, within 3 weeks after such receipt. ComReg shall communicate its decision to the applicant as soon as is reasonably practicable and, subject to any restrictions which ComReg considers appropriate in order to protect the confidentiality of any information, ComReg shall make such a decision public as soon as is reasonably practicable, after it has informed the applicant.

A 2.26 Regulation 13(6) of the Authorisation Regulations provides that ComReg shall specify whether rights of use for numbers may be transferred by the holder and under what conditions such a transfer may take place.

A 2.27 Only "undertakings" as defined may be granted rights of use for numbers, meaning any undertaking that has made a valid notification to ComReg pursuant to regulation 4(1) of the Authorisation Regulations and is thereby deemed to be authorised to provide the electronic communications network(s) (ECN) and/or service(s) (ECS) described in the notification, subject to compliance with the General Authorisation (ComReg Doc 03/81R4).

A 2.28 Regulations 14(1)-(3) of the Authorisation Regulations together provide that ComReg shall specify conditions to be attached to rights of use for numbers though only as are listed in Part C of the Schedule to the Authorisation Regulations. Such conditions must also be non-discriminatory, proportionate and transparent while ComReg may decide that certain conditions shall not apply to certain classes or types of undertakings. In addition, a condition attaching to a right of use for a number may not also be a condition of the General Authorisation, or vice versa.

A 2.29 Regulations 14(4) and (5) of the Authorisation Regulations provide that an undertaking commits an offence if it fails to comply with a condition of its right of use for numbers. In proceedings for such an offence it is a defence to establish that (a) reasonable steps were taken to comply with the relevant condition, or (b) it was not possible to comply with the relevant condition. The specific provisions relating to prosecutions of offences, including procedures and penalties, are set out in Regulations (23) – (25) incl. of the Authorisation Regulations.

A 2.30 Conditions attaching to rights of use for numbers fall into two categories - the general conditions in Section 3 apply to all classes of numbers and the specific conditions in Section 4 apply to particular classes of numbers.

A 2.31 Regulation 15 of the Authorisation Regulations provides that ComReg may amend the rights, conditions and procedures concerning rights of use for numbers, in an objectively justified and proportionate manner. Except where such an amendment is minor in nature and agreed to, ComReg shall give notice of its intention to make any amendment and shall invite interested parties to make representation.

3. *Enforcement – compliance with GA Conditions and RoU Conditions*

A 2.32 The statutory provisions for enforcing the GA Conditions and the RoU Conditions are the same.

A 2.33 Regulation 16(1) of the Authorisation Regulations provides that ComReg shall monitor and supervise compliance with conditions of the general authorisation and of rights of use for numbers, in accordance with Regulation 18. Regulation 16(2) provides that ComReg may require an undertaking covered by the general authorisation or enjoying rights of use for numbers to provide all information that ComReg considers necessary to verify compliance with those conditions.

A 2.34 Regulation 16(3) provides that where ComReg finds that an undertaking has not complied with a condition of the general authorisation or of a right of use for numbers, ComReg shall notify the undertaking of its findings and give the undertaking an opportunity to state its views or, if the non-compliance can be remedied, to remedy the non-compliance within a reasonable time limit as specified by ComReg. Regulation 16(4) provides that where at the end of such a specified period ComReg is of the opinion that the undertaking has not complied with one or more condition, ComReg may apply to the High Court for such order as it considers appropriate. Such orders may include — (i) a declaration of non-compliance, (ii) an order directing compliance, (iii) an order directing the remedy of any non-compliance, or (iv) an order to pay a financial penalty pursuant to Regulation 16(10).

A 2.35 Regulation 17 of the Authorisation Regulations provides that where ComReg considers that there is or has been serious or repeated breaches by an undertaking of the conditions attached to its general authorisation, or its rights of use for numbers, ComReg shall first notify the undertaking and allow the undertaking 28 days to make representations. ComReg, having considered such representations, may decide that the undertaking is no longer authorised under Regulation 4 and ComReg may suspend or withdraw any rights of use for numbers granted to the undertaking. In making any such decision, ComReg may also apply to the High Court for an order to pay a financial penalty to ComReg, in such amount as ComReg proposes as appropriate.

A 2.36 Regulation 18 of the Authorisation Regulations provides that ComReg may require an undertaking to provide information to it in respect of the general authorisation or of a right of use for numbers, where such a requirement is proportionate and objectively justified and only for the specific purposes set out therein.[87]

A 2.37 Regulation 19 of the Authorisation Regulations provides that ComReg may impose fees for rights of use for numbers which reflect the need to ensure the optimal use of the National Numbering Scheme. No such fees are imposed at present though ComReg reserves the right to review and amend this policy as it sees fit.

The Universal Service Regulations

A 2.38 Regulation 20 of the Universal Service Regulations requires that an undertaking providing end-users with an electronic communications service for originating national calls to a number or numbers in the National Numbering Scheme (including public pay telephones) shall ensure that such end-users are able to call the emergency services free of charge and without having to use any means of payment by using the single European emergency call number "112" and any national emergency call number that may be specified by ComReg (i.e. the "999" number).

A 2.39 Regulation 21(3) of the Universal Service Regulations requires that an undertaking providing publicly available telephone services (PATS) allowing International calls shall handle all calls to and from the European Telephony Numbering Space[88] at rates similar to those applied for calls to and from other Member States.

A 2.40 Regulation 23(1) of the Universal Service Regulation provides that ComReg may, where technically and economically feasible and except where a called subscriber has chosen for commercial reasons to limit access by calling parties located in specific geographical areas, specify requirements for compliance by an undertaking operating a public telephone network or providing publicly available telephone services for the purpose of ensuring that end-users are able to—

(a) access and use services using Non-Geographic Numbers within the European Union; and

[87] Information provided to ComReg may be published, normally in summary form and after it has been aggregated with similar and/or related information from other sources. Undertakings may identify any confidential or commercially sensitive information and ComReg shall treat all such information in accordance with its published *Guidelines on treatment of confidential information* (Doc 05/24).

[88] ComReg notes that ETNS is suspended and the ITU has withdrawn the shared code for Europe that was due to be used.

(b) access all numbers provided in the European Union, regardless of the technology and devices used by the operator, including those in the national numbering plans of Member States, those from the European Telephony Numbering Space (ETNS) and Universal International Freephone Numbers (UFIN).

A 2.41 Regulation 23(2) of the Universal Service Regulation provides that ComReg may require undertakings providing public communications networks or publicly available networks or publicly available electronic communications services to block, on a case by case basis, access to numbers or services where this is justified by reason of fraud or misuse and to require undertakings to withhold relevant interconnection or other service revenues.

A 2.42 Regulation 25 of the Universal Service Regulations requires that undertakings shall ensure that a subscriber with a number from the National Numbering Scheme can, upon request, retain his or her number independently of the undertaking providing the service— (a) in the case of Geographic Numbers, at a specific location, and (b) in the case of Non-Geographic Numbers, at any location.

A 2.43 Consumer protection rules specific to the electronic communications sector including conditions in conformity with the Universal Service Regulations and conditions on accessibility for users with disabilities in accordance with Regulation 6 of those Regulations.

Appendix: 3 Glossary of Frequently Used Terms

BEREC	Body of European Regulators for Electronic Communications
BSS	Business Support Systems
B2B	Business-to-Business communications
B2B2C	Business-to-Business-to-Consumer communications
CEPT	European Conference of Postal and Telecommunications Administrations
CLI	Calling Line Identification
CSP	Connectivity Service Provider
EC	European Commission
eCall	Automatic dialling of 112 (Europe's single emergency number) in the event of a serious accident
ECC	Electronic Communications Committee
EC-GSM	Extended Coverage GSM
ECN	Electronic Communications Network
ECS	Electronic Communications Service
EECC	European Electronic Communications Code
eSIM	Embedded SIM
EU	European Union
eUICC	Embedded Universal Integrated Circuit Card
E.164	The international public telecommunication numbering plan
E.212	The international identification plan for public networks and subscriptions
GA	General Authorisation
GSM	Global System for Mobile communication
GSMA	GSM Association
HGV	Heavy Goods Vehicle
ICC	InterConnect Communications

IMSI	International Mobile Subscriber Identity
IoT	Internet of Things
IP	Internet Protocol
IPv6	Internet Protocol Version 6
ITU	International Telecommunications Union
ITU-T SG2	ITU-T Study Group 2 - Operational aspects of service provision and telecommunications management
ITU TSB	ITU Telecommunication Standardization Bureau
LCV	Light Commercial Vehicle
LPWA	Low-Power Wide-Area
LTE	Long Term Evolution
LTE-M	LTE for machine-to-machine connectivity
MBB	Mobile Broadband
MCC	Mobile Country Code
MNC	Mobile Network Code
MNO	Mobile Network Operator
MNP	Mobile Number Portability
MS	Member States (of the European Union)
MSD	Minimum Set of Data
MVNO	Mobile Virtual Network Operator
M2M	Machine-to-Machine communications
M2P	Machine-to-Person communications
NB-IoT	NarrowBand IoT
NGN	Non-Geographic Number
NP	Number Portability
NRA	National Regulatory Authority
OSS	Operational Support Systems
OTA	Over-the-Air technology
OTT	Over-the-Top service
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network
P2P	Person-to-Person communications

RIA	Regulatory Impact Assessment
RoU	Rights of Use
SIM	Subscriber Identity Module
SMS	Short Message Service
SP	Service Provider
VoIP	Voice over IP
WG NaN	Working Group Numbering and Networks