An Coimisiún um
Rialáil Cumarsáide
Commission for
Communications Regulation

Review of Mobile Numbering

Promoting Innovation and Facilitating New Services

Response to Consultation and Decision

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Content

Section Page

Appendix

1 Executive Summary

1. The objective of this consultation was to inform ComReg's development of a long-term numbering scheme for *all* mobile communications services. This must factor both interpersonal person-to-person ('P2P') and Machine-to-Machine ('M2M') communications.

2. It was prompted by forecasts for exponential growth of M2M connections on mobile networks and a clear trend for the 'extraterritorial' use of national numbers across the EU and internationally by M2M Service Providers. ComReg also noted that the draft European Electronic Communications Code[1] requires each Member State to have a dedicated number range for M2M services that explicitly permits extraterritorial use.

3. Although mobile networks are evolving to all-IP networks, respondents broadly agreed with ComReg that many M2M connections will continue to need numbers for a variety of technical and operational reasons. A detailed response on this point from AT&T indicates that numbers will be required for at least the next 30 years.

4. Respondents also broadly agreed that while numbers need to be made available for these innovative new M2M services, this must not require any number changes for existing Irish mobile users.

Numbering for P2P

5. The primary use of the existing mobile number ranges (083, 085, 086, 087 and 089) is for P2P communications. Respondents agreed with ComReg's assessment that there will be relatively low growth of new P2P connections in the coming years, and that Over-The-Top ('OTT') mobile services will not have a significant requirement for new mobile numbers, as most OTT services use the subscriber's existing number.

6. To cater for all anticipated future P2P growth, ComReg will adopt its proposals to reserve the 082 and 084 ranges for future P2P services, but not to use 080 or 081 ranges, due to the risk of misdials and other issues. These proposals were agreed by most respondents.

7. Respondents indicated that mobile number conservation measures agreed with industry in 2016 are being implemented and these measures should also greatly assist in ensuring sufficient supply of numbers for anticipated P2P growth.

[1] The draft EECC (a single Directive for regulation of the electronic communications sector) is at the final stages of agreement and may be finalised in June '18. The requirement for a new M2M number range is almost certain to be retained.

8. To the extent that OTT providers may need new numbers, ComReg is also expanding eligibility for such numbers, and also eligibility for E.212[2] Mobile Network Codes (MNCs), to OTT Service Providers that qualify as an ECS, provided they can justify the requirement and have a contract with an Irish mobile network operator to access their network.

Numbering for M2M

9. ComReg's draft Regulatory Impact Assessment provided forecasts of demand for M2M numbers and analysed numbering options to address the forecasted demand. Whilst most respondents broadly agreed with ComReg's forecasts, a noteworthy response from Cubic Telecom indicates that the forecasted demand from a single existing automotive client could effectively require a similar order of magnitude numbers to ComReg's forecast for all M2M SPs by 2022. If this single operator secures further automotive clients or expands to other sectors (which it plans), then demand could exceed forecasts by at least one order of magnitude. Given that other operators and M2M SPs have also expressed their interest in numbers for extraterritorial use, the use of existing mobile number ranges or a new range with 8 subscriber digits for M2M services cannot cater for such anticipated growth.

10. ComReg will therefore adopt its preferred proposals for M2M numbers with 10 subscriber digits, using the 088 prefix. This is a maximum number length of 15 digits allowed in international format (i.e. +353 88 + 10 digits) and is in line with the CEPT recommendation to have M2M numbers as long as possible. This will remove pressure on the existing mobile ranges and create a sufficient supply of numbers (10 billion) to cater for projected growth in the M2M market over the long term. These options were supported by most respondents who expressed a view. No concerns were raised by any of the respondents about any potential costs associated with the introduction of a 15 digit number range. ComReg also notes that several other Member States have similarly introduced 15 digit M2M ranges.

11. Both M2M numbers and MNCs will be made available to eligible M2M SPs to promote competition and support innovation in the M2M market.

12. These numbering resources shall be for both national and extraterritorial use for M2M services, noting that all respondents agreed with ComReg's proposal to explicitly permit extraterritorial use.

1 [2] In addition to E.164 telephone 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.

13. ComReg is also adopting its proposal that the new M2M range may be used for eCall (an automatic emergency calling capability being fitted in all new cars sold in the EU from 31 March 2018), again noting that all who responded on this point agreed with this proposal. ComReg also notes Member States appear to be adopting a flexible approach to numbering for eCall, and Car manufacturers and eCall device providers are already making decisions on what numbers and SIMs suit their needs best.

Scope of M2M Services and Conditions of Use for M2M Numbers

14. ComReg proposed a definition for 'M2M Service' and proposed a condition of use that M2M numbers shall only be used for the provision of an M2M service. This proposal raised a concern from some respondents that such a condition of use as proposed by ComReg was too restrictive, as it does not allow for a bundled services scenario.

15. ComReg recognises that a single communications module might be used for several functions (e.g. in a connected car). These may include a limited form of P2P communications (e.g. to facilitate eCall, where a call-back to the vehicle occupant may be required). ComReg has therefore modified the condition of use to also allow use of M2M numbers for "a bundle of services in which an M2M service is a predominant component".

16. ComReg has also adopted both its proposed definition for 'Extraterritorial Use' and its proposed condition of use that such extraterritorial use must be in compliance with consumer protection and other national rules in the country in which the numbers are used, noting also that no respondents had objected to these proposals.

17. ComReg will continue to monitor the evolution of the M2M marketplace and operator business models and any further development of the European regulatory framework, and may revisit these conditions of use in the future.

Switching between Service Providers

18. ComReg maintains its position that service provider switching mechanisms are required, since this is both a pro-competition measure and a legislative requirement. However, ComReg is not introducing regulatory requirements for specific service provider switching mechanisms at this point.

19. ComReg notes respondents' views that number portability may not be relevant to switching service provider in an M2M context and respondents' broad agreement that over the air (OTA) provisioning has a role to play in many cases. Given the international nature of M2M services and the ongoing work by GSMA and multinational operators in this area, operators and M2M providers are well placed to consider the optimum technological solutions for switching. ComReg will also continue to monitor international developments in this area, and may consult further, if industry-led solutions are not forthcoming in a timely manner.

Next Steps

20. In the coming quarter, ComReg will update its Numbering Conditions of Use and Application Process, make 088 numbers available for assignment, and notify ITU and other NRAs of the new range. ComReg will also meet with operators and any new 088 number assignees to agree further detailed implementation steps.

21. Mobile operators, OpenEir and other affected parties need to plan and commence testing on their networks and systems, with a target of having 088 numbers operational by the end of 2018, but in any case, no later than 12 months from the date of this Decision.

22. ComReg looks forward to working with operators and M2M SPs to ensure that any new 088 number assignments are opened promptly, both on their networks and those of their roaming partners and international carrier networks, and remains available to assist, as necessary.

2 Introduction

2.1 Background

23. This is a response to the public consultation titled "Review of Mobile Numbering – Promoting Innovation and Facilitating New Services" ("Consultation 18/03") which was published by the Commission for Communications Regulation ("ComReg") on 24 January 2018. An associated consultants' report "Review of Mobile Numbering Resources" ("ComReg 18/03a") by InterConnect Communications (ICC) was also published at this time. This report informed ComReg's proposals in Consultation 18/03.

24. The objective of Consultation 18/03 is to inform ComReg's development of a long-term numbering scheme to meet the existing and future needs of mobile communications services for E.164[3] numbers and for E.212 Mobile Network Codes (MNCs)[4].

25. ComReg has conducted this consultation pursuant to its function to manage the national numbering scheme and also to meet its overarching statutory objectives to promote competition in the internal market and to protect consumers. Under Section 10 of the Communications Regulation Act 2002, as amended ("2002 Act")[5] the Commission for Communications Regulation ("ComReg") has the statutory function to manage 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.[6]

26. This Response to Consultation takes into account the views of the seven respondents to Consultation 18/03. These respondents were:

- ALTO
- AT&T
- Cubic Telecom ("Cubic")
- Eir Group ("Eir")
- Three

[3] 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).
[4] 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.
[5] Communications Regulation Act, 2002, as amended - http://revisedacts.lawreform.ie/eli/2002/act/20/revised/en/html
[6] S.I. No. 333 of 2011 - http://www.irishstatutebook.ie/2011/en/si/0333.html

- Verizon Ireland (“Verizon”)
- Vodafone

27. The balance of this response to consultation document is structured as follows:

- **Section 3** addresses numbering for interpersonal mobile communication services (P2P) in Ireland.
- **Section 4** deals with the response to the draft Regulatory Impact Assessment (RIA) on the proposed introduction of a new number range for M2M communication.
- **Section 5** addresses numbering for non-interpersonal mobile communications services (M2M).
- **Section 6** considers views on Service Provider Switching in an M2M environment.
- **Section 7** considers further observations from respondents.
- **Section 8** sets out the steps to implement the adopted proposals.
- **Appendix 1** sets out the final RIA based on the output from Section 4.
- **Appendix 2** sets out ComReg’s Decision Instrument.
- **Appendix 3** sets out a glossary of frequently used terms.

3 Numbering for Interpersonal (P2P) Mobile Communications Services

3.1 Status of P2P Numbering

28. ComReg set out in Consultation 18/03 how P2P mobile communications services are currently serviced by the 083, 085, 086, 087 and 089 number ranges with 7 digit subscriber or 8 digit voice mailbox numbers.

29. For the many reasons identified in Consultation 18/03, 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. Any exhaustion of these P2P number ranges will involve number changes for existing users. Number changes are costly and disruptive for operators, end-users and the economy at large. Therefore ComReg's consultation sought views on the use of the remaining 080, 081, 082 and 084 number ranges in pursuit of its objective of a long term numbering scheme solution for P2P mobile services (the proposal for 088 is addressed in Section 5 on numbering for M2M services). Such a solution would seek to reduce the risk of number changes for existing end users into the future.

30. In 2013, as a result of its assessment of responses to its M2M consultation[7], ComReg decided that, in addition to monitoring the potential demand for numbers for M2M services, it would also engage with operators to discuss and agree on conservation measures for mobile numbers.

31. Following this decision, ComReg engaged Analysys Mason who recommended[8] proportionate and low-cost measures to improve the efficiency of mobile number utilisation and so avoid exhaustion of the current mobile number ranges. Specific conservation measures were agreed and adopted afterwards by ComReg and the main mobile operators in mid-2016.

32. The following Sections 3.2, 3.3 and 3.4 address respondents' views, and sets out ComReg's position, on numbering for P2P in Ireland in terms of the following:

    - ComReg's assessment of current forecasts of demand;
    - ComReg's proposals for the use of remaining 08X ranges; and
    - ComReg's proposed expansion of eligibility for E.164 mobile numbers and E.212 MNCs to OTT Service Providers that meet certain requirements.

[7] ComReg13/109 Numbering for M2M Communications - Response to Consultation

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

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

33. In Consultation 18/03, ComReg assessed the likely demand for mobile numbers for P2P services in the future, taking into account the continued implementation of number conservation measures previously agreed with mobile operators. This assessment of demand was based primarily on population growth, mobile penetration rate, the expected number of devices per person and uptake of existing or new services.

34. Another consideration in assessing demand for P2P numbers was that operators were unlikely to achieve 100% efficiency in the use of their number assignments. This means that the volume of number assignments for P2P services is likely to exceed the forecasted number of P2P connections to some degree.

35. In addition to the demand from current and next generation cellular P2P services, Consultation 18/03 also investigated demand from OTT services, concluding that there was unlikely to be significant demand for mobile numbers from such services as they largely leverage existing mobile numbers.

36. ComReg put the following question to interested parties:

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.

3.2.1 Responses to Question 1

37. Four responses were received to this question.

38. Three agrees with the assessment stating that demand has largely stabilised. Three also highlights that the recent adoption of mobile number conservation measures, as detailed in Consultation 18/03, and also the availability of additional 08X ranges for P2P, as proposed in Consultation 18/03, should provide enough spare capacity within the existing numbering scheme to provide for P2P services for a number of years to come.

39. Vodafone maintains that demand for numbers for Interpersonal Mobile Communications is not likely to exceed the capacity created by ComReg's current proposals. Vodafone supports this view by highlighting that developments in the Mobile Number Portability Forum, such as the new technical solution for number repatriation, will drive increased efficiency in number use. Vodafone also suggests that operational efficiencies identified in the Fixed Number Portability Forum could be replicated in the Mobile Industry Group.

40. Eir also agrees with the assessment that little growth in demand for P2P numbers is expected.

41. Verizon sees an increasing demand for mobile numbering resources in general driven by a variety of services provided to end-customers both interpersonal and M2M/IoT.

3.2.2 ComReg's Position

42. ComReg notes and welcomes the comments by Three and Vodafone concerning increased efficiencies in number management. Three refers to the successful adoption by the main operators of specific conservation measures in mid-2016. Furthermore, in its 2016 report to ComReg[9], Analysis Mason proposed an additional conservation measure whereby operators should meet a minimum number utilisation level before being assigning numbers. Consequently ComReg's Numbering Conditions and Application Process[10] specifies that no new rights of use for mobile numbers shall be granted to any undertaking unless ComReg is first satisfied the undertaking is utilising, at a minimum, 45% of its currently assigned stock of Mobile Numbers. ComReg sees these conservation measures as important in ensuring the long term availability of numbers and so will continue to monitor the implementation of such measures

43. In addition, ComReg notes Vodafone's suggestion that operational efficiencies identified in the Fixed Number Portability Forum could be replicated in the Mobile Industry Group. ComReg looks forward to more detailed discussions with industry on these developments.

44. On the basis of its analysis, and also taking into account the broad support from respondents, ComReg considers that low growth in demand for numbers for P2P services seems likely. Therefore, given the continued implementation of conservation measures, ComReg considers that the existing P2P number ranges, together with the additionally proposed P2P number ranges discussed in Section 3.3, are not at risk of number exhaustion for such P2P services. Nevertheless ComReg will continue to monitor such demand in the practice of good number management.

[9] ComReg 16/20a Analysys Mason report – conservation measures to meet future demand for mobile numbers
[10] ComReg 15/136R1 - Numbering Conditions and Application Process

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

45. With regard to the future use of number ranges, Consultation 18/03 assessed the options of using additional 08X ranges for P2P services. ComReg noted that current assignments in 081 and the potential confusion with the UK's 0800 range, if 080 were to be used, have the potential to cause confusion for consumers and so are considered unsuitable. However the 082 and 084 ranges are proposed as suitable and would provide an additional 16 million numbers for P2P services. Based on the assessment of demand for numbers for P2P services addressed in Section 3.2 above, the availability of the 082 and 084 ranges should, in ComReg's view, provide sufficient numbers to defer exhaustion of P2P number ranges well into the future.

46. ComReg put the following question to interested parties:

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.

3.3.1 Responses to Question 2

47. Five responses were received to this question.

48. Cubic and Vodafone agree with ComReg's proposal. Vodafone recognised that 080 and 081 ranges have the potential to cause confusion for consumers but added that consideration could be given to using 081 in the future if needed to meet demand.

49. Eir agrees with the proposal and the potential of the 082 and 084 ranges. It did not express any disagreement with the proposal not to use 080 and 081 for future services.

50. Verizon does not disagree with the proposal but comments that it does not see a demand for mobile numbering resources in Ireland that shall exclusively support only P2P or only M2M services.

51. Three agrees with the proposal and ComReg's rationale for not using 080 and 081 for mobile services. In the case of the proposal to use 082 and 084 for future P2P mobile services, Three agrees with the use of 084 but disagrees with a similar use for 082. It suggested that this 082 range be dedicated to M2M, rather than the 088 range proposed by ComReg in Consultation 18/03. Three contends that grouping P2P numbers of similar length in consecutive number ranges (083 to 089) would offer some advantage when configuring switches. However Three do not offer information in support of its contention.

3.3.2 ComReg's Position

52. On the basis of its analysis, and also taking into account the broad support from respondents, ComReg will adopt the proposal to use the 084 range, and not to use the 080 and 081 ranges, for P2P mobile services.

53. Three disagrees with the proposed use of 082 for P2P services, suggesting that it be used for M2M services instead. However, there is an absence of sufficient detail of the benefits, as viewed by Three, in support of its suggestion. In the absence of such detail, ComReg considers that any benefit operators might have in configuring switches under Three's suggestion, would not be significant enough to warrant rejection of the proposed 082 in favour of 088 for use by P2P services. Therefore given the level of support from respondents, and bearing in mind its own assessment, ComReg will adopt the proposal to use 082 for future P2P mobile services.

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

54. ComReg's Consultation 18/03, further to the consultants' report 18/03a, reviewed OTT Service Provider eligibility criteria and conditions of use for E.164 mobile numbers and E.212 MNCs. In the consultation ComReg proposed that OTT Service Providers should be eligible to apply for E.164 mobile numbers and E.212 MNC for services that qualify as an Electronic Communications Service ("ECS") and have a contract with an Irish Mobile Network Operator ("MNO") to access their network, provided they can justify the requirement. ComReg considered that such material should be included by the Applicant when addressing Section 6.3 of ComReg's Numbering Conditions[11]. 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, encompassing, among other things, number portability and access to emergency services.

55. ComReg put the following question to interested parties:

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.

[11] ComReg 15/136R1 - Numbering Conditions and Application Process – Section 6.3 specifies the information to be supplied to ComReg by first time applicants for numbers.

3.4.1 Responses to Question 3

56. Five responses were received to this question.

57. Cubic, and Eir agree, while Three expressed a qualified agreement with ComReg's proposal.

58. Three considered that a cautious approach should be taken in widening the eligibility criteria for E.164 and E.212 numbers, highlighting that E.164 numbers, for example, have uses beyond call routing.

59. Furthermore, Three expressed a view that the eligibility criteria in the Numbering Conditions[12] should also require applicants to have a physical presence in Ireland to be eligible for mobile numbering resources. Otherwise, in Three's view, there is no need for the applicant to use Irish numbers and there is no benefit to Ireland in such numbers being granted, although, there would be a cost.

60. Verizon argued that Irish E.164 numbers and E.212 MNCs should only be provided to entities registered as providers of electronic communications services.

61. Vodafone contended that this proposal may require further study to examine the implications, highlighting restrictions on the allocation of mobile resources to OTTs in some other countries.

3.4.2 ComReg's Position

62. ComReg notes the support from Cubic and Eir for its proposal. It also notes Three's qualified support. ComReg addresses the comments from Three, Verizon and Vodafone below.

63. ComReg disagrees with Three's view that the eligibility criteria in the Numbering Conditions should also require that the recipient has a physical presence in Ireland. ComReg notes that an applicant for numbers must be authorised as a provider of an electronic communications network or service in accordance with regulation 4 of the Authorisation Regulations (S.I. No 335 of 2011, as amended). Such authorisation does not require ECS applicants to have infrastructure in Ireland. Furthermore ComReg sees the proposed eligibility criteria as adequate in that the criteria specifies that the applicant must justify the requirement and also have a contract with an Irish MNO to access their network.

64. Verizon stated that only ECS providers should be assigned mobile numbering resources. In response, ComReg confirms that, as specified in the Numbering Conditions Section 6, numbering resources may only be assigned to electronic communications network ("ECN") or services ("ECS") authorised in Ireland.

65. Vodafone suggested that further study of ComReg's proposal may be required. In response, ComReg recognises the need for ongoing monitoring of developing markets for new and innovative services and the potential impact of such services on demand for numbers. Therefore further study in this area may be undertaken in the future. However, Vodafone has not submitted sufficient evidence supporting a delay in ComReg's adoption of its current proposal. In addition ComReg sees any delay in adopting the proposal as undermining its need to support new services in a timely manner.

66. On the basis of its analysis, and taking into account respondent's views, ComReg will adopt the 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.

4 Response to Draft RIA

4.1 Introduction

67. In Chapter 4 of Document 18/03, ComReg provided its draft Regulatory Impact Assessment ("RIA") on the introduction of a new M2M number range, having regard to, among other things, its statutory remit in managing the numbering resource (see Appendix 2 of Consultation 18/03).

68. Demand for numbers for Machine to Machine (M2M) communications is forecast to increase substantially on mobile networks (See Section 4.3.1). Therefore, ComReg considers it prudent to now put in place measures that provide a long term numbering resource designed specifically for M2M purposes. In providing for this there should be no need to change existing P2P users' mobile numbers, because the disruption and costs of any such change are avoidable.

4.2 ComReg's position in Consultation 18/03

69. ComReg outlined the following three options in the Draft RIA:

- Option 1: Assign numbers from the existing mobile ranges to meet demand from Person to Person (P2P), Mobile Broadband (MBB) and M2M communications;
- Option 2: Open a number range of 8 digits in length dedicated to M2M communications, ('07X' or '08X');
- Option 3: Open a new number range of 10 digits in length dedicated to M2M communications, ('07X' or '08X').

70. ComReg considered, on balance, that Option 3 would be the preferred option because, among other reasons it encourages the most efficient use and effective management of the numbering resource by opening a dedicated M2M range with 10 billion numbers to provide for increasing demand of M2M services requiring E.164 numbers. The 088 range was the preferred new number range as this was previously used for a mobile offering and could make it easier for M2M SPs to get their assigned numbers open on international networks.

4.3 Views of respondents and ComReg assessment

71. ComReg received seven submissions to Document 18/03. These are summarised and assessed under the following headings:

- Demand for numbers for M2M communication
- Proposed length of M2M number range

- Switching of service providers in an M2M context
- Choice of 088 v 082 for the M2M number range

4.3.1 Demand for numbers for M2M communication

Views of respondents

72. Three agrees with the forecasts for numbers for M2M communication contained in ComReg's draft RIA.

73. Vodafone submits that the forecasts are reasonable but cautions that considerable uncertainty exists in relation to estimating the demand that will arise from various M2M users and applications.

74. Cubic foresees considerable demand for numbers in the IoT and M2M space and agrees that the forecasts are realistic. In that regard, Cubic outlined two examples of how demand for such numbers is likely to arise. For example:

    - a major automotive manufacturer will produce roughly 10 million cars per year for the global market, each of which could require a SIM for telemetry, infotainment, eCall, etc.
    - Cubic currently has one automotive customer[13] that has ambitions to provide services to several automotive companies, each demanding 10 million numbers per year.
    - Cubic also embeds a connectivity solution in a chip-set of its shareholder Qualcomm, which could result in annual demand of 87 million numbers.

75. AT&T do not provide any views in relation to the forecasts provided in 18/03. However, AT&T submits that:

    - it will take 5 – 10 years before such networks are sufficiently widespread to encourage the production of IPv6 only devices.
    - many devices and applications developed today use E.164 numbers and this will continue throughout the lifecycle of the product.
    - it is likely to be uneconomical to retrofit or upgrade such products to IPv6 only. Consequently, in AT&T's view, the time needed for networks to fully transition to IP, and an assumed field lifecycle of 20 years for a device, it is possible that mobile numbers will be needed for the next 30 years.

[13] Cubic Telecom has been selected by Volkswagen to supply connected car technology to its new Touareg SUV.

76. Eir submits that it is not in a position to offer a firm view on forecast requirements from the Irish numbering resource.

77. Verizon does not see an urgent need for E.164 number ranges exclusively for inter-personal services in Ireland and stated that a recent BEREC report finds that the expected growth of M2M and IoT devices will, in general, not exhaust numbering resources.

ComReg's assessment

78. In Document18/03, ComReg recognised that mobile networks are evolving to all-IP networks and considered whether services that currently require mobile numbers, would continue to do so into the future. ComReg was of the view that many M2M connections will continue to need (E.164) numbers for a variety of technical and operational reasons.

79. The responses show broad agreement with the forecasts of demand for numbers for M2M communication as set out in Document 18/03. Three, Vodafone and Cubic agree with the forecasts, Eir does not have a firm view on the forecasts and no respondent raised concerns about the forecasts.

80. ComReg notes that if Cubic provides connectivity solutions beyond existing users, or other use cases arise , then demand for numbers could exceed the upper-bound of the ICC upper-limit forecast of 71 million numbers by 2022. In this scenario, introducing a new number range of 8 subscriber digits (Option 2 in the Draft RIA) would provide 100 million numbers, which would only meet demand for numbers for M2M services in the short-term. In that regard, Option 3 provides provide for up to 10 billion numbers which should satisfy all short term requirements and future proof the numbering resource for any future numbering requirements as may arise.

81. ComReg notes that Verizon did not provide a source for the BEREC report that it appears to cite. A 2016 BEREC report[14] stated that "*at present and under the current numbering plans, the possible scarcity of E.164 resources does not appear to be the main obstacle to the development of IOT. However, this potential issue should be carefully analysed and solved by each NRA at national level, if needed (e.g. by opening up a dedicated M2M numbering range or otherwise increase the resources dedicated to E.164 mobile numbers)*". ComReg is of the view that the extent to which the expected growth in M2M and IoT devices will exhaust national number resources depend on country specific circumstances, such as: the numbering resources available and whether a dedicated range exists for M2M communication, the length of digits in the number ranges, the supply of numbers available relative to the demand for such numbers, and whether number conservation measures are in place. ComReg, has therefore adopted Berec's recommendations by considered these particulars when forming its views in this consultation and so is in line with Berec's suggested approach.

82. ComReg is of the view that the forecasts of demand for M2M numbers as set out in Document 18/03 remain reasonable and that no changes to its proposal are warranted. ComReg remains of the view that continuing to assign numbers for M2M communication from the existing mobile ranges would likely result in the premature exhaustion of these ranges, and that introducing a new number range of 10 subscriber digits will provide a sufficient quantity of number to meet growth in demand for M2M services.

4.3.2 Proposed length of M2M number range

Views of respondents

83. Three and AT&T support a 15 digit number length. Three submits that ComReg should confirm with connectivity service providers as to whether or not such providers can handle this number length or whether network modifications are required.

84. Cubic submits that international carriers who have to route a call to the proposed 088 number range will simply send it to the default operator in Ireland -Eir. Therefore, Cubic is of the view that it is important that Eir can handle the proposed 15-digit range.

[14] BEREC (2016) 'Enabling the Internet of Things' page 16 http://berec.europa.eu/eng/document_register/subject_matter/berec/reports/5755-berec-report-on-enabling-the-internet-of-things

85. Eir contends that it is sufficient to rely solely on the IMSI to authenticate and establish a data bearer with an IoT device, and that where voice capability is not required a MSISDN will not need to be assigned. Therefore, Eir does not see a clear case that the proposed 088 range should have the maximum permissible number length of 15 digits.

ComReg's assessment

86. ComReg notes the good support from Three, AT&T and Cubic for a 15 digit number range (which corresponds with a subscriber number length of 10 digits as per Option 3 in of the draft RIA).

87. Eir is of the view that there is not a clear case for a 15 digit number range. However eir has not proposed an alternative number length. Furthermore, ComReg notes that, as highlighted in Consultation 18/03, operators' Operational Support Systems (OSS i.e. network provisioning systems) and Business Support Systems (BSS) including billing systems nevertheless continue to rely on numbers. In addition, ComReg notes that, notwithstanding the availability of IMSI only services, ComReg forecasts are based on the demand highlighted by M2M SPs for mobile numbers. Consequently there is a need for the 15 digit M2M number length and only numbers of such a length can reasonably cater for likely demands in the short and longer term.

88. A fifteen digit number range provides for 10 billion numbers and should be more than sufficient to meet ComReg's objective of ensuring a sufficient supply of numbers for M2M communication in the future, and is in line with a CEPT Electronic Communications Committee (ECC) recommendation[15] that the number length should be as long as possible (in case of E.164 numbers maximum of 15 digits according to ITU-T Rec. E.164). Finally, no concerns have been raised by any of the respondents about any potential costs associated with the introduction of a 15 digit number range.

89. Therefore, ComReg remains of the view that 15 digits is the appropriate length for the proposed M2M number range.

[15] ECC Recommendation (11)03 – Numbering and Addressing for M2M Communications

4.3.3 Switching of service providers in an M2M context

Views of respondents

90. A number of respondents (Vodafone, Three, Cubic, ALTO and AT&T) submits that number portability is not relevant for switching in an M2M context. Cubic highlighted the importance of M2M customers being able to switch provider but is of the opinion that current national requirements for MNP should not apply to the M2M number range. Three submits that the need to change the IMSI is a more significant barrier to switching as it is more costly and difficult to do for a network of M2M devices.

91. Vodafone states that ComReg's consultation made no reference to the 'large M2M users' who have articulated concerns about switching.

92. Vodafone and Three see a role for OTA (Over the Air) in facilitating switching and Cubic submits that service provider portability is simpler for eSims, and that SMS is often used for OTA modification of the device and eSIM settings. However, Vodafone is of the view that ComReg should not propose national regulatory requirements for M2M switching, and AT&T cautions against adoption of a "one-size-fits-all" approach with regard to OTA.

ComReg's assessment

93. Number portability may not be relevant to switching service providers in an M2M context. This is partly due to the broader set of actors present in the M2M value chain as compared with P2P value chain, i.e. the existence of M2M service providers and M2M users (such as car manufacturers or electricity suppliers).

94. ComReg's primary concern is that IoT users are not restricted in switching connectivity service provider, as this would be detrimental to the competitive functioning of the M2M market. Therefore, ComReg would ensure that appropriate conditions of use are attached to the new number range which facilitate M2M users to switch service provider upon request. M2M centric user conditions could encourage Connectivity Service Providers ("CSP")[16] to develop the technological solutions required for switching a potentially large quantity of end uses within a short time period.

95. In relation to Vodafone's comment that ComReg made no reference to the 'large M2M users' who have articulated concerns about switching, ComReg responds that the concerns relating to switching relate to 'all' M2M users, and not just to specific entities. The ability of any M2M user to switch connectivity service provider is an industry wide concern and underpins the competitive functioning of the M2M

[16] 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.

market. In relation to Vodafone's concerns in relation to the specific regulatory requirements arising from switching, these are addressed separately in Chapter 6 below.

96. ComReg notes the broad agreement that over the air (OTA) provisioning is relevant, and remains of the view that industry is best placed to decide on the appropriate technological solution to develop for switching.

97. The final RIA has been updated to take account of the additional material provided by respondents[17].

4.3.4 Choice of 088 for the M2M number range

Views of respondents

98. Cubic submits that by choosing the 088 range ComReg has elected a former analogue range that likely will already be in the routing table of many international operators.

99. Three proposes that 082 is a better choice than 088 because it provides a more logical grouping together of relevant services, which it claims provides some usability benefits. More importantly (according to Three) using 082 for M2M communication would keep the ranges with similar number length in a consecutive order which is an advantage for setting number length on switches. Furthermore, Three submits that as it has been almost 18 years since 088 was previously used for mobile service, it is questionable as to whether any international switches have retained this range.

ComReg's assessment

100. ComReg agrees that there may be some marginal benefit to grouping P2P services together, such as a tidier ordering of the numbering resource. However, this must be balanced against the potential benefits of 088 being more readily accessible by international providers. ComReg notes the contrasting views from Cubic and Three on this issue and the lack of comments provided by the other respondents. ComReg also notes that the InterConnect Communications (ICC) consultant's report observes that 088 may still be recognised by international service providers. Given this possibility, ComReg remains of the view that, on balance, CSPs are likely to have a preference for 088 over 082.

[17] See analysis of responses to Consultation Question #16 (see Section 7.1.1)

101. Three submits that consecutive ordering of ranges of similar length is beneficial for setting number lengths on switches. However, there is an absence of sufficient detail of the benefits, as viewed by Three, in support of its suggestion. Therefore given the level of support from respondents, and bearing in mind its own assessment, ComReg will adopt the proposal to use 082 for future P2P mobile services.

102. Furthermore, given the level of support from Respondents for the 088 proposal (see Section 5.6), and bearing in mind its own assessment,ComReg remains of the view that, on balance, 088 is the preferred option as the new M2M number range.

103. The analysis in the Response to Draft RIA informs the final RIA. The final RIA is found in Appendix 2.

5 Numbering for Non-Interpersonal Mobile Communications Services

5.1 Introduction

104. In Consultation 18/03, ComReg sought the optimum solution for a long-term numbering scheme to meet the future and existing needs of M2M communications services for E.164 numbers and for E.212 MNC. ComReg's preliminary finding was that a dedicated 088 number range would cater for the forecasted demand for mobile numbers for M2M services, particularly for extraterritorial use (A definition of extraterritorial use is provided in Section 5.6). Such a solution also takes into account the key requirement that no existing mobile users would be impacted. ComReg's subsequent analysis of submissions to its consultation underpins the choice of 088 as the preferred M2M number range.

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

105. ComReg provisionally concluded that supporting the use of Irish numbers and MNC on an extraterritorial basis is valid for the following reasons:

- the extraterritorial use of numbers and MNC 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;
- there are clear benefits for both the Irish communications sector and for the broader national economy;
- the draft European Electronic Communications Code (EECC) proposal that national regulators allow the extraterritorial use of certain national numbers within the EU for M2M services. Such permission will require appropriate safeguards to protect end-users in all Member States where the numbers are used; and
- the introduction by other Member States of the European Union (MS) of dedicated M2M number ranges that are permitted for use extraterritorially.

106. As proposed in Consultation 18/03, the use of national numbers extraterritorially should be in a manner that does not undermine the public policy concerns of the country in which they are being used.

107. ComReg put the following question to interested parties:

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.

5.2.1 Responses to Question 4

108. Seven responses were received to this question.

109. Cubic, AT&T, ALTO and Verizon agree with the proposal.

110. Cubic contends that extraterritorial use avoids the complicated and costly production process associated with multiple SIM types and solutions. In addition, Cubic states that the expressed permission of extraterritorial use by the originating country facilitates the use of such numbers in other countries.

111. AT&T, while agreeing with the proposal, added its view that extraterritorial use should also apply to all Irish E.164 numbers used to provide M2M services. It also asked for clarification on the permitted use of overseas numbers in Ireland by way of international permanent roaming. Similarly, while Verizon welcomed ComReg's proposal, it went on to state that there should be no restrictions on the use of all Irish numbers abroad, or on the use of foreign numbers in Ireland.

112. Eir and Vodafone each stated that it did not have any objection to the proposal. Vodafone added that, in assigning M2M numbers to new groups, any requirements for number porting should be clear. It also maintains that there will be difficulty in determining the scale of the quantity of numbers these new service providers may require. Vodafone believes that this demand be monitored on an ongoing basis to ensure that services to Irish customers are not compromised by possible requests for very large number sets by new services using numbers extraterritorially.

113. Three agrees that extraterritorial use of numbers can be permitted in some circumstances. However, as highlighted in its response discussed in Section 3.4, Three expresses a view that such a recipient should have, what it describes as, a real and substantial link to Ireland. Three maintains that such a link should provide benefits to Irish citizens and the national economy.

5.2.2 ComReg's Position

114. In relation to Verizon's view on expanding extraterritorial use to all Irish numbers, ComReg disagrees and notes that M2M has a different set of services to that of P2P, with many M2M services operating on a global basis. In recognising such particular service types, ComReg's proposes that extraterritorial use be applicable only to numbers for M2M services. As described in Document 18/03, these numbers for M2M could use the dedicated 088 range.

115. ComReg similarly disagrees with AT&T's view that extraterritorial use should be permitted for all Irish E164 numbers used to provide M2M services. This is because operators currently use existing number ranges for P2P, as well as M2M and, as previously set out, Extraterritorial use is appropriate in the case of M2M only.

116. In response to Vodafone, ComReg notes that service switching, including number portability, is discussed in Section 6. In particular, services to Irish customers should not be compromised by a request for large number sets for extraterritorial use. An undertaking will only be assigned numbers from the new range where they can both justify the requirement and demonstrate that they can manage the resource. Furthermore, such a concern is mitigated by implementing the maximum 15 digit number range, which creates a supply of 10 billion numbers for M2M communication

117. Verizon also maintains that there should be no restrictions on the use of foreign numbers in Ireland. ComReg will address this view in Section 5.9.

118. Three gives its qualified agreement, maintaining that a recipient of M2M numbers should have a real and substantial link to Ireland and will be of benefit to Ireland given that there will a cost associated with the provisioning of numbering. ComReg has addressed this point in Section 3.4 above.

119. Given its own analysis and also in light of the strong support from respondents, ComReg is of the view 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.

5.3 National Machine–to-Machine (M2M) Services

120. Consultation 18/03 considered the demand for numbers from national M2M services. Currently national M2M services use existing mobile numbers. However 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. Given the proposed introduction of a dedicated M2M number range to cater for the forecasted demand for extraterritorial use, ComReg proposed that national M2M services also be supplied from this M2M range for the advantages mentioned.

121. ComReg put the following question to interested parties:

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.

5.3.1 Responses to Question 5

122. Five responses were received to this question.

123. Vodafone agrees with the proposal adding that the number of future required numbers for M2M may be large and is best catered for in the proposed dedicated M2M range.

124. Eir states that it has no objection while Three agrees with ComReg's proposal as it recognises that such a proposal allows for the most efficient use of numbers. In support of its view, Three notes that M2M services do not need a separate number for voicemail access, so it would be inefficient to continue to assign numbers from the P2P numbering resource for M2M use. In addition, Three also highlights that the switching/porting process for M2M services is different to that of P2P so a dedicated range for all M2M services is required to allow efficient management of such numbers. Three agrees that the efficient use of numbers is required to avoid unnecessary number changes.

125. Cubic does not agree with the proposal, instead proposing that the operator should be free to use whatever number it wants rather than be restricted to the new number range. However it does recognise that existing number ranges should be protected. Cubic therefore suggests that incentives, such as a pricing mechanism which would make M2M numbers more cost effective than existing number ranges, would be more appropriate[18].

126. Verizon put forward a view that M2M services should not use specific identifiers. Instead, Verizon maintains that service providers should have the flexibility to choose the appropriate identifier for the service requirements of M2M users.

5.3.2 ComReg's Position

127. ComReg, having carried out its analysis while bearing in mind the views of respondents, will adopt the proposal that National M2M services should also use the proposed new number range introduced for M2M.

[18] Cubic's suggestion would entail the introduction of pricing for P2P numbers

128. ComReg has noted Cubic and Verizon's comments that the number applicant should be free to choose any number for its M2M services. This is in keeping with Verizon's view that it does not see a demand for numbers that exclusively support M2M or P2P numbers.

129. In response to these comments, ComReg notes that Consultation 18/03 demonstrated the need for a dedicated M2M range to cater for forecast demand from M2M services. ComReg therefore sees the introduction of this dedicated M2M range as a key action in ensuring efficient number management and ensuring sufficient numbering resources going forward for different users.

130. Consultation 18/03 indicated that a dedicated M2M range would enable easier implementation of alternative routing and separate rating and billing for M2M services. In this way the dedicated range would support the M2M services market.

131. While disagreeing with ComReg's proposal, Cubic notes the need to avoid the risk of number exhaustion within existing ranges and so suggests that the choice of the dedicated range be incentivised using a pricing mechanism. In response, ComReg would highlight its view as set out in Consultation 18/03[19] that it does not intend introducing fees for M2M numbers, or indeed any numbers, at this time. ComReg may however review the introduction of fees.

5.4 Forecasts for National and Extraterritorial M2M Connections

5.4.1 Demand for mobile numbers for M2M communication

132. In Consultation 18/03, ComReg analysed existing trends, demands from industry and upper limits.

133. ComReg analysed existing trends by studying 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. This resulted in an effective 'lower limit' prediction of demand for Irish mobile numbers from Irish mobile operators of between 2.1 million and 3.9 million numbers required for M2M communication by 2022. Consultation 18/03 indicated that this level of demand would not exhaust the existing mobile numbering ranges during this time period although, in addition, Consultation 18/03 explained that this forecast was conservative for several reasons as explained in that document.

[19] Consultation 18/03 Section 5.14

134. Interviews with Irish and International M2M Service Providers, that are currently not assigned (but have requested) Irish national number resources, indicated a demand that could reach up to 38.4 million numbers by 2022. This 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 for extraterritorial use outside Ireland.

135. Finally Consultation 18/03 forecasted and explained the factors behind a potential 'upper limit' of demand for Irish mobile numbering resources. This forecast suggests that total 'global' demand for Irish M2M numbers will likely range from 20 million to 71 million by 2022.

136. ComReg put the following question to interested parties:

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.

5.4.2 Views of Individual Respondents

137. Five responses were received to this question.

138. Cubic believes that the forecasts are realistic. In support of this view it indicates that it has one global customer[20] that plans to manufacture approximately 10 million cars over 3 years for the European market. Worldwide this customer produces approximately 10 million cars a year. Cubic sees the potential for it to have several of these customers. These estimates for this customer are the same order of magnitude as ComReg's forecasts for 38.4 million numbers by 2022. Cubic also highlights a connectivity solution it is working on with chip-set manufacturer, Qualcomm. If, as Cubic maintains, only 5% of chipsets were to have this connectivity, it would equate to a demand for 87 million numbers per year.

139. Three agrees with the forecasts. Also, Vodafone agrees that the forecasts are reasonable but adds that there is considerable uncertainty in the demand and in the numbers that various users and applications will use. Nevertheless, it concludes that the estimates reflect foreseen demand.

140. Verizon Ireland, as indicated in its response in Section 3.2, sees an increasing demand for mobile numbering resources in general driven by a variety of services provided to end-customers both interpersonal and M2M and IoT.

141. Eir indicates that it is not in a position to offer a view on the forecast requirements from Irish Numbering resources. Eir's comments on the availability of solutions that do not require E.164 numbers are addressed in Section 5.6.

[20] Cubic Telecom has been selected by Volkswagen to supply connected car technology to its new Touareg SUV.

5.4.3 ComReg's Position

142. ComReg's is of the view that, as detailed in Section 4.3.1 " Response to Draft RIA", the forecasts of demand for M2M numbers as set out in Document 18/03 remain valid and that no changes to these forecasts are required.

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5.5 Implementation of the Proposed New M2M Range

143. In Consultation 18/03, ComReg set out a number of implementation steps that could be adopted should ComReg decide on a new M2M number range. These steps include actions by ComReg and Industry which had been highlighted in discussions with M2M SPs.

144. ComReg proposed that this new M2M number range be implemented nationally and possibly internationally within 12 months. This timeline is based on the knowledge that two of the existing MNOs can handle flexible number lengths. In addition, information on best practice of introducing numbering ranges was garnered from informal discussions with regulators who have knowledge and experience of this situation.

145. ComReg also proposed that 088 should be the new M2M number range. In addition, it proposed that numbers in the 088 range 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.

146. ComReg emphasised that these proposals were based on the best information available to it on how international carriers currently analyse and route Irish numbers. However ComReg recognised that its knowledge in this area was incomplete and so was especially keen to hear from respondents on how their international carrier and roaming partners would cater for these proposals.

147. ComReg put the following three questions to interested parties:

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.

5.5.1 Responses to Question 7

148. Five responses were received to this question.

149. Cubic proposes that ComReg takes the additional implementation step of writing to all its European counterparts to notify them of the introduction of the new number range and ask them to email ComReg their operator list.

150. Cubic also suggests that ComReg notify the regulator in a country where an Irish licence holder of the 088 range has issues with reachability.

151. Furthermore, Cubic contends that operators outside Ireland often do not analyse a number beyond the country code and so will route all such calls to eir. Consequently Cubic maintains that it is particularly important that Eir opens up the new number range.

152. Three agrees with ComReg's suggested implementation steps but adds that, for opening the M2M range on international networks, service providers should request their international carriers, roaming partners, and partner networks to open access.

153. AT&T and Cubic both agree with the maximum 15 digit M2M number length while Three and Vodafone agree but provide comments on the use of use number lengths.

154. Three adds that it has found some networks have difficulty in analysing, routing and providing CLI to this length. Three also maintains that the use of the 15 digit number length would also, most likely, rule out the use of a 5-digit routing prefix with these numbers. It suggests that, following the consultation, ComReg confirm with all significant service providers that they can use this number length and whether network modifications are required.

155. Vodafone contends that some operators have limited the number of digits that can be processed by, for example, their billing systems. Consequently Vodafone has encountered delays in the IREG[21] testing and subsequent opening of the ranges where there is an association of partial IMSI and/or >12 digit MSISDNs[22].

156. Vodafone notes that the timescales for opening these numbers internationally varies greatly. For example, in Europe, with the right support, 75% could be opened in 12-18 months. For its part, Eir considers that a 12 month implementation to open numbers nationally and internationally is appropriate.

157. In addition, Eir comments that technically it is sufficient to rely solely on the IMSI to authenticate and establish a data bearer with an M2M device. Therefore where a voice capability is not required, particularly in use cases with significant volume, a MSISDN may not be required. Consequently Eir does not see a clear case for the use of the maximum 15 digit number length.

158. A detailed discussion on the responses on timescales for the opening of the new 088 range on national and international networks is contained in the responses to question nine is set out in Section 5.5.5.

5.5.2 ComReg's Position

159. ComReg welcomes the information provided by respondents in response to ComReg's request for information on its proposed steps to implement the new M2M number range. In carrying out its analysis, while also bearing in mind the strong support of respondents, ComReg will adopt its proposed steps to implement the new 088 range. It will also adopt specific steps suggested by respondents. These steps, which include actions by both ComReg and Industry, are listed in Section 8.

160. ComReg also notes that the forecast of significant demand for M2M numbers indicates a need for a 15 digit (including 10 digit subscriber number) M2M number length. This number length increases the amount of available subscriber numbers to 10 billion. Given this analysis, and in view of the support for such number length from respondents ComReg remains of the view that 15 digits is the appropriate length for the proposed M2M number range.

161. In response to Cubic's suggestion that ComReg contact its European counterparts to notify them of the introduction of the new number range, ComReg notes that the new number range must initially be advised to the ITU. However, in addition, ComReg will also write to its European counterparts to notify them of the new number range.

[21] The International Roaming Expert Group ("IREG") tests are set out by the GSM Association ("GSMA"). These tests are performed by operators when setting up roaming.
[22] 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).

162. Cubic also suggests that ComReg notify the regulator in a country where an Irish licence holder of the 088 range has issues with reachability. In response, ComReg notes that any assistance it might give in these situations will depend on the issue involved. For example ComReg will not have a role where it considers the issue to be a commercial one. Rather, such issues must be followed up by the M2M SP with the NRA of the country where the 088 M2M range is being used.

163. In response to Three's suggestion that ComReg seek confirmation from significant service providers on the proposal to use a 15 digit M2M number length, ComReg notes that views on this proposal have already been sought in Consultation 18/03. While ComReg notes the views of respondents, it does not see sufficient value in seeking further responses from industry on this proposal.

164. With regard to Three and Vodafone's comments on the use of 15 digit numbers, ComReg understands that nationally, as previously mentioned, two of the existing MNOs can handle flexible number lengths. Furthermore, the benchmarking exercise highlighted in consultation 18/03, and other information garnered by ComReg, highlights that other European countries, for example Belgium, Spain, Austria and Sweden, are already using 15 digit numbers. ComReg further notes that countries such as Denmark, Norway and Finland are using up to 14 digits for various services. Finally, some operators are using ITU global numbers to deliver, typically, global services. These numbers, such as +882, are 15 digits in length and are currently being implemented on networks.

165. In response to Eir's comments concerning IMSI only solutions, ComReg notes that, as highlighted in Consultation 18/03, operators' Operational Support Systems (OSS i.e. network provisioning systems) and Business Support Systems (BSS) including billing systems nevertheless continue to rely on numbers. In addition, ComReg notes that, notwithstanding the availability of IMSI only services, ComReg forecasts are based on the demand highlighted by M2M SPs for mobile numbers. Consequently there is a need for the 15 digit M2M number length.

166. The responses concerning the timescales that might apply in opening up numbers internationally are considered in response to question 9 in Section 5.5.5.

5.5.3 Responses to Question 8

167. Three responses were received to this question.

168. Cubic notes that it is particularly important that the vehicle can connect with the Public Safety Answering Point ("PSAP"), and vice versa, in the case of the 112-based eCall in-vehicle system[23] ("eCall")[24]. It also indicates that operators using the new 088 M2M range should notify and carry out tests with the carrier community and also operators with whom they have a roaming agreement or other wholesale contracts. It also notes that, while the IREG tests reachability in a roaming arrangement, the presence of multiple transit operators often makes achieving full reachability difficult.

169. Cubic also emphasises that the delivery of SMS messages is often crucial in the provision of M2M services so that an Irish operator of the new M2M range would have to propagate the number range through SMS hubs and by sending out notifications to all operators.

170. Three considers it reasonable to allow 6 months to complete the opening of numbers internationally. Vodafone notes the GSMA process whereby any changes to numbering ranges is communicated to the parties through the operator's International Roaming Database (IR.21)[25]. Vodafone suggest that these changes should be communicated three months before implementation.

5.5.4 ComReg's Position

171. The respondents provided detailed information on the processes involved in opening up new number ranges internationally. This information will be used in so far as applicable in setting out the implementation steps described in Section 8. The responses on timelines for opening up new number ranges both nationally and internationally are considered further in the responses to question nine in Section 5.5.5.

5.5.5 Responses to Question 9

172. Three responses to this question were received.

173. eir and Three consider 12 months to be sufficient to open numbers nationally and internationally. Three adds that, initially, the new block would be loaded and tested on the switch in Ireland and then opened on international switches. The latter process would take an estimated six months.

[23] '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.
[24] https://ec.europa.eu/transport/themes/its/road/action_plan/ecall_en
[25] This is in the GSMA Roaming Database holding information for for each operator

174. Cubic agrees that reasonable "reachability" can be achieved in 12 months in Europe for targeted operators i.e. MNOs and fixed line incumbent but not perhaps MVNOs.

5.5.6 ComReg's Position

175. ComReg, it its analysis and also having regard to the responses received, considers that there is sufficient support from the respondents to adopt the proposed 12 month timeline to implement the new 088 M2M number range on national networks. There is also strong support for this 12 month timeline to include opening the new number range on international networks. While Cubic and Vodafone have highlighted typical issues that can delay the opening numbers internationally, the same respondents have indicated that a significant amount of implementation work can be completed in this timeframe.

176. Furthermore, in respect of the these delays in opening numbers, ComReg notes that, while nationally it mandates access to numbers by users on national networks under Regulation 23(1) of the Universal Service Regulation, the international opening of mobile numbers is addressed by the GSMA under the IR.21 process.

5.6 Proposed Conditions of Use for New M2M Range

177. In Consultation 18/03 ComReg established that sufficient differences exist between the M2M value chain and traditional P2P services to warrant the introduction of specific conditions of use for the M2M number range.

178. One such condition is the explicit permission for extraterritorial use of the proposed 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. ComReg proposes a draft RoU condition to address this issue, together with a draft definition of 'Extraterritorial use '. The RoU conditions and definitions for the proposed 088 M2M range, including extraterritorial use, that were proposed In Consultation 18/03, are as follows:

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."

179. In Consultation 18/03 ComReg notes that a requirement to notify BEREC of the extraterritorial use of numbers may emerge in the future. However, in the meantime, the RoU Conditions, Section 3.2 paragraph 10 (ComReg 15/136R1), 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.

180. ComReg put the following question to interested parties:

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.

5.6.1 Responses to Question 10

181. Seven responses were received to this question.

Definitions

182. Two of the seven respondents provided views on the proposed definition of "M2M service". Both respondents (Eir and Vodafone) agree with ComReg's proposal, however Vodafone submits that the definition should be amended to include emergency calling and to be technology neutral.

183. Vodafone submits that the reference to "through a mobile or fixed network" be removed to ensure the definition is technology neutral because, in Vodafone's view, M2M devices connect through other types of networks, for example in unlicensed spectrum or via satellite.

184. Vodafone agrees with ICC's recommendation that any M2M service which includes emergency calling as part of the service should have limited voice capabilities. Vodafone submits that the M2M definition be amended as follows:

""*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. This includes emergency calling with limited voice capabilities*".

Rights of Use ("RoU") Conditions

185. There were seven responses to this question.

186. Vodafone and Eir agree with the proposed RoU conditions with the exception that Eir does not believe, as previously mentioned, that there is a basis for the 088 range to have a number length of 15 digits. AT&T and Cubic agree with the proposed rights of use condition in respect of the M2M digit structure.

187. Cubic also argues that the condition relating to use of an M2M Service as proposed by ComReg is too restrictive as it does not allow for a mixed bundle of services. Cubic therefore requests that ComReg make such bundles possible by amending its proposal as follows:

The condition *"M2M Numbers shall only be used for the provision of an M2M Service"* should have the following words added*: "or a bundle of services in which an M2M Service is a predominant component".*

188. Three disagrees with the proposed use of 088 for the new dedicated M2M range, suggesting that 082 would be a better range for the reasons outlined in Section 3.3 above. Three also comments on the potential advantage, raised in Consultation 18/03, that the range 088 might still be configured on some switches. Three maintains that, as over 18 years has elapsed since 088 ceased, this range is unlikely to be retained on international switches. It further adds that the 11 digit number lengths used at that time would be incompatible with the 15 digit number length currently proposed for the M2M range (the proposed M2M number length is addressed in Section 5.5.2). Consequently Three does not see any advantage in using 088 over 082 for the M2M range.

189. Furthermore Three questions the practicality of ComReg monitoring and enforcing compliance with consumer protection rules in other countries where numbers are used extraterritorially.

190. ALTO agrees that more mobile numbers are needed and that the new proposed ranges are good candidates.

191. The response from Verizon, maintaining that number rangers should not exclusively support P2P or M2M, has been addressed in Section 3.3.2 above.

5.6.2 ComReg's Position

RoU conditions

192. In Consultation 18/03, ComReg recognised that a single communications module might be used for several functions. Furthermore, the responses from industry to the consultation highlighted the possibility and benefits of using a single M2M number in the delivery of a bundle of services in, for example, the connected car. In addition, ComReg sees this suggested use of a single number for multiple services as also assisting in the efficient use of these numbers. Consequently, ComReg proposes to amend its proposal for the RoU condition for the new M2M range to include permission for the use of a service bundle. This is intended primarily to facilitate the delivery of M2M services which should be the predominant service type within the bundle. However, it also allows other services, such as WiFi for example, to be included in the bundle. An application for M2M numbers shall include details of these services in support of the requirement for the numbers requested, as set out for first time applications in Section 6.3 of ComReg's Numbering Conditions.

193. In Consultation 18/03, ComReg's forecast demand for numbers for M2M services concluded that a dedicated M2M range was required to meet such demand and so protect the availability of numbers in the existing P2P number ranges. Also, in exploring the M2M value chain, Consultation 18/03 established that there are sufficient differences between M2M and P2P services to warrant the introduction of specific conditions of use for the M2M number range. There is therefore a need to ensure sufficient differentiation exists between numbers used for M2M services and those used for P2P services. Consequently M2M numbers shall not be used to provide P2P type services such as the ability to dial any number that is available for dialling on public networks. However in Consultation 18/03, ComReg also recognised that certain, principally M2M, services might have a requirement for a limited form of P2P communications.

194. The eCall service is one example of where a limited form of P2P communications is required. In this service, the activated eCall device connects to a mobile cellular network to establish a voice channel and send data within the voice channel. 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. In recognition of this need, ComReg proposed that eCall be allowed use numbers from the new M2M range. Numbering for eCall is addressed in Section 5.10.

195. In addition to eCall, ComReg has also considered other examples of services which require a limited form of P2P service such as a concierge service in the connected car. Other examples include a safety device in an elevator, tracking devices, or other consumer products where the call is made to a pre-defined number(s) and is not intended to allow dialling of any number that is available for dialling on public networks.

196. In Consultation 18/03, ComReg notes that it will continue to monitor the evolving M2M products and services market. This monitoring is needed to ensure the continued availability of numbers for M2M into the future and also to ensure that appropriate regulatory rules are in place for such numbers.

197. Given its assessment , and noting the views of respondents, ComReg's final position is that, in recognition of the need to permit service bundles, it will include the following rights of use condition for M2M numbers in the Numbering Conditions:

"An M2M Number shall only be used for the provision of an M2M Service or a bundle of services in which an M2M service is a predominant component"

Definitions:

198. ComReg agrees with Vodafone that the proposed definition should be technology neutral and, to reflect this, will replace "through a mobile or fixed network" with "over a public electronic communications network". The definition of "Electronic communications network" in the Numbering Conditions[26] is technology neutral and not limited to fixed and mobile networks.

199. ComReg does not agree with Vodafone's view that a reference to emergency calling be included in the proposed definition. Rather, ComReg notes that Regulation 20 of the Universal Service Regulations[27] requires undertakings providing an electronic communications service for originating national calls to a number or numbers in the national numbering scheme to ensure that end-users are able to call the emergency services free of charge. In ComReg's view, this requirement also ought to apply to undertakings providing M2M services with limited voice capabilities to end-users and ComReg is of the view that the proposed definition does not therefore need to contain a reference to emergency calling.

200. Given its assessment , and noting the views of respondents, ComReg's final position is that it will include the following definition of 'M2M service' in the Numbering Conditions:

[26] "electronic communications network" (ECN) means transmission systems and, where applicable, switching or routing equipment and other resources, including network elements which are not active, which permit the conveyance of signals by wire, by radio, by optical or by other electromagnetic means, including satellite networks, fixed (circuit- and packet-switched, including Internet) and mobile terrestrial networks, electricity cable systems, to the extent that they are used for the purpose of transmitting signals, networks used for radio and television broadcasting, and cable television networks, irrespective of the type of information conveyed.

[27] S.I. No. 337 of 2011 – European Communities (electronic communications networks and services) (universal service and users' rights) regulations 2011.

"M2M service" means a service consisting of the exchange of data between devices, over a public electronic communications network, with limited or no human intervention.

5.7 Proposed Eligibility Criteria for E.164 M2M Numbers

201. Consultation 18/03 stated that ComReg only assigns numbering resources to those service providers authorised in Ireland[28] and currently only assigns E.164 mobile numbers and MNCs to MNOs and MVNOs. However the Consultation also highlights that M2M has a different value chain to that of traditional P2P services and has a wider set of stakeholders. Consequently ComReg decided that, given that one of its objectives is the support of innovation and competition in the marketplace, it would review the eligibility criteria for these stakeholders.

202. ComReg concluded that a degree of flexibility in the assignment of numbers and MNCs was necessary to support innovative services and future emerging requirements. Under the ComReg proposal authorised undertakings other than mobile operators, such as specialist M2M service providers, may apply for mobile resources if they meet the criteria as set out in the proposal. In each case the applicant for M2M mobile resources, in addition to being authorised in Ireland, needs to ensure that they can justify the requirement and can manage the resources.

203. In Consultation 18/03, ComReg stated that it 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".

204. ComReg put the following question to interested parties:

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.

[28] ComReg 15/136R1 - Numbering Conditions and Application Process

5.7.1 Responses to Question 11

205. Six responses were received to this question.

206. Cubic and Eir agree with ComReg's proposal.

207. ALTO and Verizon commented that eligibility for E.212 MNC and E.164 numbers should only be assigned to ECS providers. Similarly AT&T recommended that ComReg's proposed eligibility criteria be amended to refer explicitly to "authorised undertakings".

208. Three agrees with the proposal but believed there was an additional need to clarify what is necessary for the applicant to justify its requirement. Also, Three maintains that the applicant should actually provide an ECS in Ireland and should also be required to establish and maintain its own infrastructure in Ireland.

5.7.2 ComReg's Position

209. ComReg notes that Cubic and Eir agree with the proposal while ALTO, AT&T and Verizon did not disagree but sought clarification on certain aspects of the proposal. Three does not agree, expressing a view is that the applicant should be required to establish and maintain its own infrastructure in Ireland. In response to Three, ComReg notes its previous answer in Section 3.4.2 that it only assigns E.164 numbers to authorised ECN/ECSs and such authorisation does not require ECS applicants to have infrastructure in Ireland. Therefore, ComReg, having carried out its analysis while bearing in mind the views of respondents, will adopt the proposal 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.

210. In response to the concerns of ALTO, Verizon and AT&T, ComReg notes that it only assigns numbering resources to ECN and ECS providers that are authorised in Ireland (see Consultation 18/03 para 197 and ComReg's Numbering Conditions Section 6.1 (3)). ComReg is not proposing to expand eligibility beyond such authorised ECN/ECS providers.

211. Regarding any applicant justifying its requirement (for the E.164 numbers), ComReg notes that, as with any national number, an applicant will need to provide sufficient information in response to Section 6.3 of the Numbering Conditions to justify its need for, in this case, M2M numbers. The applicant should also supply all other information in support of its case[29].

[29] ComReg 15/136R1 - Numbering Conditions and Application Process

5.8 E.212 Mobile Network Codes (MNC) for M2M Providers

212. As previously stated, ComReg only assigns numbering resources to those SPs authorised in Ireland and only assigns mobile numbers and MNCs to MNOs and MVNOs. However, as previously highlighted, M2M has a different value chain compared with P2P. Therefore to meet its objective to support innovation and competition, ComReg considered that these criteria might be too restrictive for such M2M services.

213. In Consultation 18/03, ComReg proposed the following eligibility criteria in Section 6.2 of the Numbering Conditions to include the new stakeholders:

> *"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"*.

214. ComReg put the following question to interested parties:

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.

5.8.1 Responses to Question 12

215. Six responses were received to this question.

216. eir agrees that the eligibility criteria are appropriate and proportionate to promote the efficient use of numbering resources. Cubic also agrees and notes that, as an Irish company, it would welcome the ability to obtain an Irish MNC to establish its wholesale and roaming agreements

217. AT&T supports ComReg's proposal but suggests that an applicant for an MNC should not be required to own infrastructure elements in Ireland.

218. AT&T also comments that it has concerns regarding granting MNCs to parties other than authorised undertakings. ALTO comments that it does not agree that eligibility for E.212 and E.164 numbers should be expanded beyond ECS providers while Verizon contends that Irish E.212 MNCs should only be provided to entities registered as providers of electronic communications services.

219. Three does not agree with the proposal and contends that the applicant should, as a minimum, have a Home Location Register ("HLR") located in Ireland or have access to and control of infrastructure that will provide this function, which is located in Ireland.

5.8.2 ComReg's Position

220. ComReg notes that Cubic and Eir agree with the proposal while ALTO, AT&T and Verizon did not disagree but sought clarification on certain aspects of the proposal. Three's view is that the applicant should be required to establish and maintain its own infrastructure in Ireland. Nevertheless, ComReg, having carried out its analysis while bearing in mind the views of respondents, will adopt the proposal that E.212 MNC can be assigned to M2M Service Providers.

221. A number of respondents, namely ALTO, AT&T and Verizon stated concerns about the potential granting of numbering to non-authorised or non-ECS entities. AT&T supports ComReg's proposal but suggests that an applicant for an MNC should not be required to own infrastructure elements in Ireland.

222. In response to these concerns regarding the potential granting of numbering to non-authorised or non-ECS entities, and as previously outlined in Section 3.4.2, ComReg only assigns numbering resources to ECNs or ECSs authorised in Ireland. ComReg is not proposing to expand eligibility beyond such authorised ECN/ECS providers.

223. In response to AT&T's suggestion that an applicant for an MNC should not be required to own infrastructure elements in Ireland, ComReg notes that MNCs may be assigned to MNOs, MVNOs and, if the current proposal is adopted, M2M SPs. An M2M SP will not be required to have infrastructure in Ireland but will need to provide sufficient information in response to Section 6.3 of the Numbering Conditions to explain its need for resources.

224. As with ComReg's response in Section 5.7.2 to Three's view that the applicant should also be required to establish and maintain its own infrastructure in Ireland, ComReg notes that it only assigns E.164 numbers to authorised ECN/ECSs and such authorisation does not require ECS applicants to have infrastructure in Ireland.

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

225. In Consultation 18/03, ComReg provisionally concluded that permitting the use of global numbers and MNCs assigned by the ITU avoids a potential drain on national resources and the possible exhaustion of existing number ranges. Such use also facilitates Service Providers in deploying global products.

226. Also in Consultation 18/03, ComReg provisionally concluded that permission to use such global numbers assigned by the ITU for the purposes of M2M should be explicit in the Numbering Conditions. This Consultation also stated that, as with all providers of ECSs in Ireland, M2M and OTT services using numbering resources from overseas and international administrations are required to be authorised and to comply with all applicable legislation and laws, regardless of the numbers they are using.

227. ComReg outlines the need to ensure that there is a consistent approach to the use of resources that are deployed in the provision of M2M services.

228. Furthermore, in Consultation 18/03, ComReg stated that 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. Therefore 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 15/136R1. ComReg proposed the following condition:

> "*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*".

229. ComReg put the following question to interested parties:

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?

5.9.1 Responses to Question 13

230. Five responses were received to this question.

231. Cubic and Vodafone agree while Eir stated that it has no objection to the proposed clarification.

232. AT&T requested confirmation that ComReg's proposal includes the use in Ireland of overseas numbers on a permanent roaming basis. That being so, AT&T put forward the scenario of an overseas operator that has a contract with a customer outside of Ireland and where the contract is to deliver a global M2M solution with coverage in Ireland. In addition, that delivery of this service is through permanent roaming using the overseas service provider's international agreements with Irish MNOs. In such a scenario, AT&T maintains that these operators should not be required to notify ComReg and therefore the Numberings Conditions should not apply. In support of this view, AT&T further contends that ECSs providing temporary roaming in Ireland are not required to notify ComReg and so this should also apply to ECSs providing services through permanent roaming.

233. Three agrees with ComReg's proposal but questioned if such clarity will have any effect in practice as it maintained that ComReg is unlikely to be able to withdraw, modify or in any way manage numbers that have been assigned in a different country.

5.9.2 ComReg's Position

234. ComReg, having carried out its analysis while bearing in mind the views of respondents, will adopt the proposal.

235. Four of the five respondents to this question, namely Cubic, Eir, Three and Vodafone, agree with ComReg's proposal.

236. In response to AT&T's clarification request, ComReg confirms that "overseas numbers" includes numbers assigned in other countries and used in Ireland on a permanent roaming basis. Also ComReg notes that the term overseas numbers does not include numbers used in Ireland on a temporary roaming basis. ComReg's proposal seeks to ensure clarity regarding the obligations and conditions that apply to overseas numbers.

237. AT&T maintains that providers of overseas numbers used for permanent roaming in Ireland should not require authorisation in Ireland. In response to AT&T's view, ComReg notes that there is a fundamental difference between temporary roaming, or "periodic travel", and permanent roaming as highlighted in the roaming regulations[30] . These regulations state that "The "reference offer [which roaming providers have to publish] may include conditions to prevent permanent roaming or anomalous or abusive use of wholesale roaming access for purposes other than the provision of regulated roaming services to roaming providers' customers while the latter are periodically travelling within the Union". Therefore ComReg disagrees with AT&T's view, as it is our understanding that service providers who wish to use overseas numbers in Ireland by way of permanent roaming (or who use global numbers) should be authorised and adhere to the general authorisation conditions as set out in ComReg's proposal.

238. Three agrees with ComReg' proposal but comments that it may not be effective in practice. In response, and as previously highlighted by ComReg in this response to consultation, where there is a breach of Irish numbering rules or rules relating to customer protection, ComReg may request an appropriate response be taken by the NRA that assigned the numbers. This action is also proposed in the draft EECC[31].

5.10 Numbering for eCall

5.10.1 Introduction

239. Consultation 18/03 explained that, from 31 March 2018 all new vehicles sold in the European Union will be required to have a 112-based eCall in-vehicle system ("eCall"). 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") will also be sent to the PSAP operator.

[30] Regulation (EU) No. 2120/2015 of 25 November 2015

[31] The EECC is a single draft Directive to replace the existing European Regulatory Framework. Article 88(6) of the EECC proposes that "Upon request from a national regulatory authority of another Member State demonstrating a breach of relevant consumer protection rules or number-related national law of that Member State, the national regulatory authority of the Member State where the rights of use for the numbers have been granted, shall enforce the conditions attached under subparagraph 1 in accordance with Article 30, including in serious cases by withdrawing the right of extraterritorial use for the numbers granted to the undertaking concerned".

240. In Consultation 18/03, ComReg proposed to allow numbers from the proposed new M2M numbering range to be used for eCall in Ireland. It was noted that numbers from existing mobile ranges, Global ITU numbers and national numbers from other EU countries may also be used for eCall. ComReg maintained that such an approach would give vehicle manufacturers and their eCall device suppliers access to the widest possible source of numbers and so allow them to choose the number type(s) that most suits their commercial needs while meeting the needs of the eCall service.

241. ComReg put the following question to interested parties:

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.

5.10.2 Responses to Question 14

242. Five responses were received to this question.

243. AT&T, Cubic, Three and Vodafone, agree while Eir does not object to ComReg's proposal.

244. Three notes that, where an operator has been granted the rights of use of the number, and is also the owner of the network on which the call originates, then this will ensure a CLI is presented. Otherwise, Three observes that, it is necessary for the network operator who has provided the SIM to have a roaming agreement with the originating network for the call. This, Three states, will allow the originating network to contact the HLR of the SIM to obtain the CLI.

5.10.3 ComReg's Position

245. All five of the respondents to this question agree with the proposal. Given its analysis, while also noting the strong support from respondents, ComReg will adopt this proposal to allow numbers from the proposed new M2M numbering range to be used for eCall in Ireland. Also, in accordance with the CEPT eCall recommendation[32], ComReg notes that numbers from existing mobile ranges, Global ITU numbers and national numbers from other (EU and non-EU) countries may also be used for eCall

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

6 Switching Between Service Providers

6.1 Introduction

246. In Consultation 18/03 ComReg considers the issues concerning the switching of service providers in M2M deployments, many of which are on a global basis. ComReg notes 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. However, unlike P2P, many M2M communications are automated and the E.164 number is not visible to the end user. In such cases the E.164 number retention seems less likely to be an important factor.

247. The RIA in the Consultation describes a more complex value chain for M2M services compared with P2P. Such a complex value chain gives rise to, typically, a more complex switching scenario than that found in a Person-to-Person (P2P) scenario, particularly where there are large-scale deployments. Conversely, if only a small number of switching devices is involved, then interested parties were asked to consider if the Mobile Number Portability (MNP) process might be appropriate.

248. In Consultation 18/03 ComReg also notes that the Over the Air ("OTA") mechanism is cited in the draft EECC, 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.

249. ComReg put the following question to interested parties:

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

6.1.1 Responses to Question 15

250. Five responses were received to this question.

251. AT&T, Cubic, Eir and Three question the usefulness of MNP in the context of M2M. One of the reasons given for such a view is that numbers are of little significance in the context of M2M. Also, respondents indicated there would be an increase in complexity, cost and also a potential difficulty in using 15 digit M2M numbers with the MNP system.

252. Cubic maintains that number block re-assignment[33] would be an appropriate mechanism for number portability. However AT&T's view is that ComReg should not introduce mandatory switching mechanisms such as block re-assignment.

253. Cubic supports the use of OTA indicating that this mechanism allows the subscriber to change number or profile when switching provider. Three sees the difficulty in physically changing SIM cards, and the associated IMSI, in a network of M2M devices. It maintains that this is more of a barrier to switching than changing E.164 numbers. Consequently Three also sees OTA as a solution in order to avoid such difficulties when switching provider. AT&T sees the benefits of OTA but notes that such a switching mechanism increases costs and may not be appropriate, for example, in the case of lower value products. Therefore, in AT&T's opinion, while specific solutions such as OTA may be offered by service providers, such a solution should not be mandated by ComReg. In general, AT&T considers that mandating a single solution for service portability is not appropriate. Vodafone, while also believing that a single solution for service portability is not appropriate, view OTA switching as the basis that switching should take place, when it has been requested by the customer.

254. Three also highlights that M2M and P2P services are different so that service portability will not apply between M2M and P2P numbers, or M2M and fixed line numbers

255. Vodafone states that "it is not clear to us that, as ComReg state, *Regulation 25* of the Universal Service Regulations confers a legal right on customers to be able to switch service provider". Vodafone argues that this regulation does give subscribers the right to port numbers, but "*does not mandate a switching right per se for users of P2P mobile communication services, let alone a switching right that should be applied to M2M customers*."

256. Vodafone also considers that this distinction (between the right to port numbers and the right to switch) is important to note, as, in Vodafone's view, "the rationale for the number portability right is that it is the number itself that is an important element of ensuring choice and competition in the provision of mobile communication services." Vodafone contends that there is no such comparable significance associated with the number for M2M services. Notwithstanding these points, Vodafone agrees with ComReg's conclusion not to propose specific national regulatory requirements for M2M switching.

[33] Block reassignment entails transferring the rights of use of numbers within a given number block from one service provider to another.

257. In summary, there was broad support for the use of OTA as an option when switching provider. There was less support for other mechanisms such as block re-assignment and the use of the MNP system. However all respondents to this question, namely AT&T, Cubic, Eir, Three and Vodafone contended that ComReg should not propose specific national regulatory requirements for M2M switching at this stage.

6.1.2 ComReg's Position

258. ComReg notes that its position remains the one put forward in Consultation 18/03. In the Consultation, ComReg notes that Service Provider Switching must be provided for, since it is both a pro-competition measure and a legislative requirement. However, ComReg also indicated in Consultation 18/03 that it was hesitant to propose specific national regulatory requirements for M2M switching at this stage as, given the global nature of the M2M market, it was important not to hinder innovation and competition. The respondents concurred with this view, indicating that ComReg should not mandate specific regulatory measures for service supplier switching in such an M2M market at this time. ComReg will therefore not introduce regulatory requirements for specific service provider switching mechanisms at this stage but will continue to monitor European and international developments in this area and may issue a further consultation on Service Provider Switching in due course.

259. In response to Vodafone's comments on ComReg's analysis of the options to switch M2M service provider:

- ComReg does not accept its understanding of Regulation 25. In the first instance, ComReg notes that the title of Regulation 25 of the Universal Service Regulations is "Facilitating change of service provider".

- Furthermore, EU law has to be interpreted purposively, in light of the purpose to be achieved, and should not be interpreted in an unduly narrow way[34]. It is necessary when interpreting a provision of EU law to consider "not only its wording, but also the context in which it occurs and the objects of the rules of which it is a part."[35]

[34] *SRL Cilfit –v- Ministry of Health* C-283/81 [1982] ECR 3415.
[35] *Merck v. Hauptzollamt Hamburg-Jonas* Case 292/82, [1983] E.C.R. 1-3781.

- Bearing this in mind, ComReg notes that recital 40 of the Universal Service Directive (which has been transposed into Irish law by means of the Universal Service Regulations) states that: “Number portability is a key facilitator of consumer choice and effective competition in a competitive telecommunications environment such that end-users who so request should be able to retain their number(s) on the public telephone network independently of the organisation providing service.”

- With regard to future developments, ComReg notes that recital 247 of the proposed EECC states that: “The possibility of switching between providers is key for effective competition in a competitive environment”.

7 Further Observations

260. Finally as ComReg wished to address all matters that might inform the Mobile Numbering review, it put the following question to interested parties:.

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.

7.1.1 Responses to Question 16

261. One response was received to this question.

262. Three asked ComReg to consider whether there is any restriction on an undertaking pairing an Irish E.164 (MSISDN) number with an E.212 (IMSI) number from another country, provided the conditions of use for both sets of numbers are met. This, Three maintained, could allow greater flexibility in service provisioning and management.

7.1.2 ComReg's Position

263. The IMSI was originally developed as a unique identifier for use in public land mobile networks at a time when its main use would have been for traditional P2P mobile services. These services were implemented nationally (although they also allowed for temporary roaming). Consequently, there was an implicit association between national E.164 mobile numbers and the corresponding IMSI which, for example would use the mobile country code 272 in the case of Ireland. It was not envisaged at that time that services might demand the use of numbering resources on a global and permanent roaming basis. Therefore the possible need to pair a national E.164 number with an IMSI from another country, was not considered. Therefore any explicit permission to allow such a pairing will need to be supported by further study. ComReg will consider all options in carrying out such a study. One such option, for example, might be an ECC study group project.

8 Next Steps

264. In Consultation 18/03, ComReg suggested steps for operators to open the new 088 M2M numbers range on networks, both nationally and internationally. ComReg welcomes the submissions from respondents on these suggestions and, particularly, the useful additionally steps that might be undertaken by ComReg and industry.

265. ComReg will continue to monitor international developments on the implementation of M2M numbers for extraterritorial use. ComReg will also monitor the implementation of eCall for any issues arising.

266. Due to the evolving M2M business models, ComReg notes that further work is required particularly on roaming and switching in this M2M market. As highlighted in Section 6.1.2, ComReg may consult further on Service Provider Switching in the future. In the meantime, mobile operators should consider M2M SP switching as an ongoing agenda item at their MNP Committee meetings.

267. Also, if found necessary in the light of this emerging M2M market, ComReg may review the conditions of use of the M2M numbers at some future point, to bring them into line with future market needs or regulatory framework developments.

268. The following is a list of steps to implement the new 088 M2M number range.

ComReg Actions in Q3 2018 (new 088 M2M number range)

1	Publish Response to Consultation and Decision.
2	Administrative update to Numbering Conditions of Use and Application Process.
3	Make 088 numbers available for assignment.
4	Meetings with mobile operators, OpenEir and any new 088 number assignees to agree detailed implementation steps.
5	Notify ITU of new 088 range. Notice in ITU Operational Bulletin.
6	Notify European NRAs of new 088 range via CEPT.

National Operator Actions, ideally by end 2018, but no later than June 2019

1	Mobile Operators apply to ComReg for 088 test block, if required.
2	Test 088 numbers internally (switching, OSS, billing, etc.).
3	Test with national interconnect providers e.g. OpenEir.
4	Test with ECAS (If required e.g. for eCall).
5	Industry MNP Committee considers switching options for M2M providers and makes recommendations to ComReg.
6	Operators declare 088 numbers open on national networks.

088 Number Applicants

1	M2M SP is assigned a block/sub-range of 088 numbers by ComReg.
2	Sub-range is built out and tested on national networks.
3	M2M SP requests international signalling provider (e.g. iBasis) to notify international carrier community that its sub-range is routable via the international signalling provider. SMS service providers also to be notified.
4	M2M SP requests their international carriers, roaming partners, and partner networks to open access. Mobile operators use GSMA IR21 notification process and carry out IREG testing. Likewise operators carry out tests to ensure reachability through SMS hubs.

ComReg Ongoing Actions

1	Monitor operators' progress on implementing the 088 range. Intervene if required.
2	Provide ITU with details of individual assignments of 088 number blocks.
3	If required, provide BEREC with details of individual assignments of 088 number blocks (Current proposal in draft EECC).

Appendix: 1 Final RIA

RIA Framework

269. 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.

270. 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

271. As set out in ComReg's RIA Guidelines,[36] 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.

272. 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.

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

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

Identification of Stakeholders

274. 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.

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

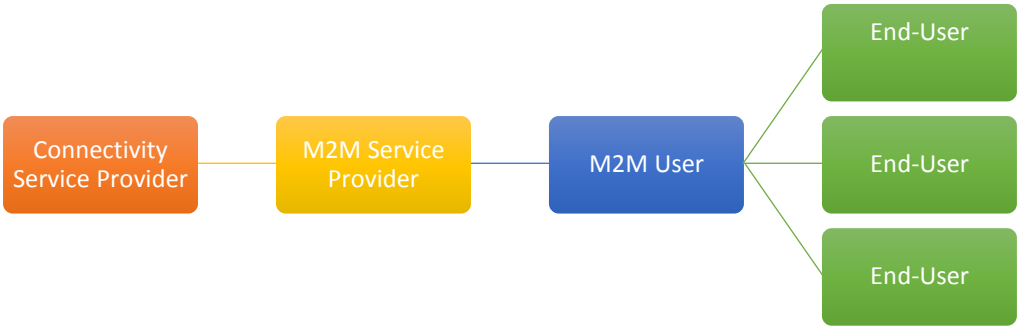

Figure 1 – M2M Value Chain

276. In practice, the value chain[37] 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.[38]

277. 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

[37] 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.

[38] 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.

electronic communication networks. These entities include MNOs and MVNOs.

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”);

278. 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.
- Responses received to ComReg’s Consultation 18/03 ‘Review of Mobile Numbering: Promoting Innovation and Facilitating New Service’.

279. 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.

280. 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 **Error! Reference source not found.**) 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.

281. 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

282. 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.

283. Currently, numbers assigned by ComReg from the five existing mobile number ranges[39] 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;

284. 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 six year period to 2017. Secondly, MBB subscriptions have declined from 590k to 290k over the same period. Substantial[40] 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.[41]

[39] 083, 085, 086, 087 and 089.
[40] Certain growth in line with increases in the population may occur but this will be marginal relative to available numbers.
[41] Currently the only typical requirement for separate devices is for personal and business use.

285. 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[42] 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

286. 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.

287. 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

288. The eCall Regulation[43] 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

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

[42] See Section 5.4 (Forecasts for National and Extraterritorial M2M Connections)
[43] 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)

290. 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.

291. 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 5.8 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).

292. An alternative to using E.164 national numbers are ITU E.164 Global numbering resources to provide international M2M services. For CSPs, [44] 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.

293. 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.

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

4. IPv6

294. In the long term there remains the likelihood that IP addresses (specifically IPv6)[45] 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

295. 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.

296. 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.[46]

Objectives

297. 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.

298. 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

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

[46] 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").

299. 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[47]". 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)

300. 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.

[47]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

301. In relation to introducing an entirely new range, ITU recommendation E.164[48] 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 10 billion numbers. Therefore, a new number range could have 7, 8, 9 or 10 digits.

New 7 digit range

302. Extending into one of the available 08X or 07X ranges with 7 digit subscriber numbers would increase the supply of numbers to 10 million (for each range). However, this would not meet the projected demand for numbers in the longer term, given the ICC forecast of 38.4 million 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).[49]Therefore, ComReg does not consider this a valid regulatory Option.

New 8 digit range

303. 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 100 million and is therefore considered as a separate regulatory option below.

New 10 digit range

304. 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.

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

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

[49] 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

306. 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').

307. 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.

308. 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').

309. 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

310. 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

311. 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.

312. 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

313. Under Option 2 a new M2M range of 8 digits would create an additional supply of 100 million numbers. This supply of numbers would satisfy short term demand for numbers as identified by the ICC upper-bound forecast of 71 million 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.

314. Under Option 3 a new M2M range of 10 digits would create an additional supply of 10 billion numbers. This supply of numbers would satisfy short term demand for numbers as identified by the ICC upper-bound forecast of 71 million 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.[50]

315. 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.

[50] 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.

316. 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.

317. 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

318. 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.

319. 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.

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

Impact on competition (Step 4)

Option 1

321. 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

322. 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

323. 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.

324. 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

325. 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.

326. 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

327. 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.

328. 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

329. 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.

330. 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.

331. 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

332. 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.

333. 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.

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

ComReg's Preferred Option (step 5)

335. 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.

336. 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[51] Electronic Communications Committee (ECC) recommendation[52] 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.

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

Appendix: 2 Decision

PART I – DEFINITIONS
A 2.1 The terms herein have the same meanings as set out in Regulation 2 of the European Communities (Electronic Communications Networks and Services) (Framework) Regulations 2011 (statutory instrument no. 333 of 2011) (the "Framework Regulations") and in Regulation 2 of the European Communities (Electronic Communications Networks and Services) (Authorisation) Regulations 2011 (statutory instrument no. 335 of 2011) (the "Authorisation Regulations").

PART II – STATUTORY REMIT
A 2.2 The functions, objectives, duties and powers of the Commission for Communications Regulation ("the Commission") in relation to management of the national numbering resource are set out in the Communications Regulation Acts 2002, as amended ("Act of 2002") and in the Common Regulatory Framework (including the Framework Directive and the Authorisation Directive as transposed into Irish law by the corresponding Framework Regulations and the Authorisation Regulations). These various functions, objectives, duties and powers are set out in Annex 10 of the "Numbering Conditions of Use and Application Process" (ComReg Document No. 15/136R1).

PART III - THE DECISION
A 2.3 The Commission, having had regard to its statutory remit to manage the national numbering resource pursuant to sections 10 and 12 of the Act of 2002 and the provisions of the Common Regulatory Framework relating to numbers, and having conducted a public consultation (ComReg Document No. 18/03) and having considered all of the responses received on foot of that consultation, and having had regard to its duty to apply objective, transparent, non-discriminate and proportionate regulatory principles pursuant to Regulation 16 of the Framework Regulations, and exercising its powers under Regulations 8, 13 and 14 of the Authorisation Regulations, and its power under Regulation 23(1) of the European Communities (Electronic Communications Networks and Services) (Universal Service and Users' Rights) Regulations 2011 (statutory instrument no. 337 of 2011) hereby makes the following Decision:

(i). Pursuant to Regulation 13(2) of the Authorisation Regulations, the Commission hereby establishes and publishes open, objective, transparent, non-discriminatory and proportionate procedures for the granting of rights of use for any class or description of number to any undertaking.

(ii). Pursuant to Regulations 14(1) and 15(1) of the Authorisation Regulations and Part C of the Schedule thereto, the Commission hereby specifies the conditions that attach to rights of use for any class or description of number, as are granted to any undertaking pursuant to Regulation 13(1) of the Authorisation Regulations, and pursuant to these Regulations:

adds the following text to the end of section 3.1 of the Numbering Conditions of Use:

"10. *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*".

adds the following text to the end of chapter 4 of the Numbering Conditions of Use:

"4.11 Machine to Machine Numbers

RoU Conditions

1. *"M2M Numbers shall have the digit structure "network access code (088) + 10-digit subscriber number"*
2. *"An M2M Number shall only be used for the provision of an M2M Service or a bundle of services in which an M2M service is a predominant component"*
3. *"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".*

adds the following text to paragraph 6.2(2) of the "Numbering Conditions of Use and Application Process": "*Rights of use for Mobile Numbers and MNCs shall only be granted to MNOs and MVNOs, and to OTT Service Providers, provided the OTT Service Provider qualifies as an ECS, and the OTT Service Provider has a contract with an Irish MNO to access its network."*

adds the following text to the end of section 6.2 of the "Numbering Conditions of Use and Application Process":

"7. *Rights of use for 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. 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*".

adds the following text to "Appendix 9: Classes of Numbers and Access/Area Codes" contained in the "Numbering Conditions of Use and Application Process":

Access Area Code	***Designation***	***Subscriber No. Length***	***Minimum Numbering Area (MNA)/Notes***
088	*Mobile*	*10*	*Maximum permissible E.164 number length of 15 digits (including international access code)*

adds the following text to the end of "Section 3.2 (10):Rights of Use Conditions " of the "Numbering Conditions of Use and Application Process":

"(k) numbers activated and in use extraterritorially."

adds the following text to Appendix 11 ("Definitions") of the "Numbering Conditions of Use and Application Process":

"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."

"M2M service" means a service consisting of the exchange of data between devices, over a public electronic communications network, with limited or no human intervention.

"OTT Service Provider" means a service provider of content, a service or an application that is provided to the end user over the public Internet.

A 2.4 The above Decision by ComReg shall be put into effect by amending the document titled the "Numbering Conditions of Use and Application Process" (ComReg Document No. 15/136R1) which sets out the procedures referred to in paragraph A 2.3(i) and the enforceable conditions referred to in paragraph A 2.3(ii).

PART IV. EFFECTIVE DATE

A 2.5 This Decision is effective from date of signature, and shall remain in full force unless amended by ComReg.

Undertakings which may carry traffic pursuant to the use of M2M numbers shall facilitate such usage by no later than twelve months of the coming into force of this Decision. .

Signed:
Gerry Fahy
Chairperson,
The Commission for Communications Regulation

Dated this 8th day of June 2018

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