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# Recommendations for the numbering regulation and numbering plan of Luxembourg

12 February 2021


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# Contents

## Executive summary

This report results from a study by consultants Hill and Antelope of the Luxembourg numbering regulation and numbering plan for the Institut Luxembourgeois de Régulation (ILR). Overall the consultants consider that, though the numbering plan is outdated, the numbering regulation is aligned with current EU practices and is largely satisfactory for current practical purposes. In particular, in the opinion of the consultants, there is no clear need at present to:

- Permit allocations to organisations other than ECNS providers (Section 2.2.1).
- Revise current practices about extraterritorial uses of numbers (Section 2.2.2).
- Change the structure of the numbering plan (Section 3.1.1).
- Replace existing numbers (Section 3.2.1).
- Introduce new numbers (Sections 3.4.4, 3.5.2 and 3.6.2).

Some improvements are possible, to:

- Ensure the correctness of numbering documentation (Sections 2.1.1, 2.4.1 and 2.4.5).
- Facilitate the delegation of tasks (Sections 2.1.9, 2.6.2 and 3.6.1).
- Enhance basic number administration (Sections 2.3.1 and 2.3.2).
- Make number lengths more uniform (Sections 2.3.32.3.6, 2.3.6, 3.2.1 and 3.2.2).
- Clarify the rules for number supply (Sections2.5.1, 2.5.2 and 2.5.3).
- Unify the treatments of number portability (Sections 2.6.1, 2.6.2and 2.6.4).
- Enhance consumer protection (Sections 2.6.3, 3.4.3 and 3.6.2).
- Inhibit the growth of number misuse and fraud (Sections 2.7.12.7.2 and 2.7.3).
- Delimit the services for M2M numbers (Sections 3.3.1 and 3.3.3).
- Develop the availability and safety of nomadic services (Sections 3.2.3 and 3.2.4).

The market continues to change, so there is a need in the future to:

- Monitor numbers that could become misused or redundant (Sections 2.3.4, 3.2.1, 3.4.2 and 3.5.1).
- Keep under review developments in M2M services that could require regulation (Section 3.3.3).

# 1 Introduction

## 1.1 Purpose of this report

This report results from a study by consultants Hill and Antelope of the Luxembourg numbering regulation and numbering plan[1]. Its findings and recommendations are intended for discussion in a public consultation that will provide the Institut Luxembourgeois de Régulation (ILR) with a basis for revising the numbering regulation, especially in the light of the European Electronic Communications Code[2].

The report builds on previous stages of the work that provided:

- An evaluation of the Luxembourg numbering regulation and numbering plan, supplemented by extensive special studies of the situations in eight "reference countries" (Belgium, Denmark, France, Germany, Ireland, the Netherlands, Norway and Switzerland).
- A survey eliciting stakeholder views on relevant questions, consisting of a written questionnaire followed by a series of interviews.

Stakeholders are invited to comment on the findings and recommendations, which cover many topics. Commercial confidentiality will be respected.

## 1.2 Arrangement of this report

The report has the following principal chapters:

- "The numbering rules with general application", corresponding in scope largely to titles 1 and 3 of the current numbering regulation.
- "The numbering rules for particular services", corresponding in scope largely to title 2 of the current numbering regulation.

Both chapters contain recommendations about revisions to the current numbering regulation, which in Luxembourg includes the numbering plan. They follow the ordering of the articles in

[1] Règlement 14/174/ILR du 14 juillet 2014 portant sur les règles relatives à la numérotation, sur le plan national de numérotation et sur les redevances relatives aux ressources de numérotation, http://legilux.public.lu/eli/etat/leg/rilr/2014/07/14/n2/jo.

[2] Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX:02018L1972-20181217.

the current numbering regulation in many places but are also grouped according to predominant themes. Their structure is not to be regarded as recommended for any revised numbering regulation.

The recommendations exclude corrections of misprints, improvements in the wording, re-arrangements of the articles or simple changes (such as changing a period from seven days to five working days), unless those have generally important consequences.

In many respects the current numbering regulation is satisfactory; where this is the case, in the interests of brevity, there are no comments on the relevant articles.

## 1.3 Regulations in Luxembourg relevant to this report

The parts of the current numbering regulation now in force cover:

- Definitions[3].
- The allocation, use and withdrawal of numbers[4].
- Number portability (for mobile numbers)[5].
- The consumer protection implications, use and allocation of carrier selection codes, shared revenue numbers, SMS/MMS short codes and harmonised numbers for services of social value[6].
- Telephony numbers (in general, with first digits in the range '2'-'9' and with first digits in the range '0'-'1')[7].
- Additional measures[8].
- The structure, use and allocation of international signalling point codes, national signalling point codes, mobile network codes and data network identification codes[9].

[3] Article 1.

[4] Articles 2-12.

[5] Articles 19-28.

[6] Articles 29-40.

[7] Articles 41-72.

[8] Articles 73-76.

[9] Articles 77-80.

- Numbering fees[10].

The revised numbering regulation would cover these topics along with some others drawn from supplementary regulations. These regulations provide for:

- **The exemption of voice mail box numbers from numbering fees**[11]. This regulation is now redundant, as voice mail boxes no longer have individual numbers beginning with '6'. The report assumes that it will be abrogated.
- **The portability of fixed numbers**[12]. This regulation supersedes a chapter of the numbering regulation and thereby removes some inconsistency from it. The report suggests that it should be consolidated with the statements on the portability of mobile numbers in the revised numbering regulation.
- **The designation of '242'**[13]. This regulation amends an article of the numbering regulation and thereby updates it in one respect. The report implies that it should be noted in the numbering register.
- **The treatment of ported numbers in blocks taken out of service**[14]. This regulation applies to fixed numbers only, because of its technical details. The report indicates that it should be incorporated with extensions in the revised numbering regulation.

[10] Articles 81-83.

[11] Règlement 16/201/ILR du 19 février 2016 modifiant le règlement 14/174/ILR du 14 juillet 2014 portant sur les règles relatives à la numérotation, sur le plan national de numérotation et sur les redevances relatives aux ressources de numérotation, http://legilux.public.lu/eli/etat/leg/rilr/2016/02/19/n1/jo.

[12] Règlement 16/204/ILR du 1er avril 2016 fixant les règles relatives à la portabilité des numéros téléphoniques dans les réseaux fixes en vertu de l'article 47(1) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/rilr/2016/04/01/n1/jo.

[13] Règlement ILR/T17/1 du 19 mai 2017 relatif à l'ouverture de la plage « 242 » du plan national de numérotation et portant modification du règlement 14/174/ILR du 14 juillet 2014 portant sur les règles relatives à la numérotation, sur le plan national de numérotation et sur les redevances relatives aux ressources de numérotation, http://data.legilux.public.lu/eli/etat/leg/rilr/2017/05/19/a511/jo.

[14] Règlement ILR/T17/7 du 12 juillet 2017 relatif au traitement des numéros portés en service issus de blocs de numéros lorsque ces blocs sont mis hors service, http://data.legilux.public.lu/eli/etat/leg/rilr/2017/07/12/a653/jo.

The main laws relevant to telecommunications deal with:

- **Electronic communications**[15]. This law provides, along with much else, basic requirements for numbering, many of which are developed further in the current numbering regulation.
- **Data protection**[16]. This law provides rules about traffic data processing, CLI presentation and suppression, directory entries and unsolicited communications.
- **Further specific provisions for data protection**[17]. This law extends the data protection law with rules about security breaches, customer consent and caller location information.
- **Data collection related to prepayment customers**[18]. This law amends the electronic communications law to require ECNS providers to collect subscription details (names, addresses, dates of birth and confirmations of identity) from prepayment customers.
- **Data collection related to customers and to suspects**[19]. This law amends the electronic communications law and the data protection law to require ECNS providers to collect subscription details (names, addresses and dates of birth) from customers and to allow for pseudonymous investigations and technical surveillance.

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[15] Loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2011/02/27/n1/jo.

[16] Loi du 30 mai 2005 – relative aux dispositions spécifiques de protection de la personne à l'égard du traitement des données à caractère personnel dans le secteur des communications électroniques et – portant modification des articles 88-2 et 88-4 du Code d'instruction criminelle, http://legilux.public.lu/eli/etat/leg/loi/2005/05/30/n4/jo.

[17] Loi du 28 juillet 2011 portant modification 1) de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques; 2) de la loi modifiée du 2 août 2002 relative à la protection des personnes à l'égard du traitement des données à caractère personnel; 3) de la loi modifiée du 22 juin 1963 fixant le régime des traitements des fonctionnaires de l'Etat; 4) du Code de la consummation, http://legilux.public.lu/eli/etat/leg/loi/2011/07/28/n5/jo.

[18] Loi du 7 juin 2017 portant modification de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2017/06/07/a557/jo.

[19] Loi du 27 juin 2018 adaptant la procédure pénale aux besoins liés à la menace terroriste et portant modification 1) du Code de procédure pénale, 2) de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques, 3) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://www.legilux.lu/eli/etat/leg/loi/2018/06/27/a559/jo.

## 1.4 Abbreviations

| | |
|---|---|
| A2P | Application-to-Person |
| AML | Advanced Mobile Location |
| ARCEP | Autorité de Régulation des Communications Électroniques et des Postes |
| BAKOM | BundesAmt für KOMmunikation |
| BEREC | Body of European Regulators for Electronic Communications |
| BIPT | Belgisch Instituut voor Postdiensten en Telecommunicatie |
| CAPTCHA | Completely Automated Public Turing test to tell Computers and Humans Apart |
| CEPT | Conference of European Postal and Telecommunications administrations |
| CLI | Calling Line Identity |
| CRDB | Central Reference DataBase |
| CUG | Closed User Group |
| ECC | Electronic Communications Committee |
| ECNS | Electronic Communications Network or Service |
| EEA | European Economic Area |
| EU | European Union |
| ETSI | European Telecommunications Standards Institute |
| GSM | Global System for Mobile communications |
| GSMA | GSM Association |
| ILR | Institut Luxembourgeois de Régulation |
| IMSI | International Mobile Subscriber Identity |
| IoT | Internet of Things |
| IP | Internet Protocol |
| ITU | International Telecommunication Union |
| ITU-T | ITU-Standardization Sector |
| M2M | Machine-to-Machine |
| MMS | Multimedia Messaging Service |

| | |
|---|---|
| OTA | Over-The-Air |
| OTT | Over-The-Top |
| P2A | Person-to-Application |
| PBX | Private Branch eXchange |
| SHAKEN | Signature-based Handling of Asserted information using toKENs |
| SIM | Subscriber Identity Module |
| SMS | Short Messaging Service |
| STIR | Secure Telephone Identity Revisited |
| UICC | Universal Integrated Circuit Card |
| USSD | Unstructured Supplementary Service Data |
| VPN | Virtual Private Network |
| WTSA | World Telecommunications Standardization Assembly |

## 1.5 Notes on the text

Several of the respondents to the stakeholder questionnaire expressed opinions about only their direct interests. Accordingly in this report every statement about a "majority" of the respondents relates to those that expressed relevant opinions, not to all of those that responded to the questionnaire.

In the main text of the principal chapters italicised words are French; all others are English.

Article numbers followed by titles of amending legislation identify articles in the amending legislation, not the amended legislation.

Article numbers not followed by titles of documents refer to the current numbering regulation in Luxembourg[20].

[20] Règlement 14/174/ILR du 14 juillet 2014 portant sur les règles relatives à la numérotation, sur le plan national de numérotation et sur les redevances relatives aux ressources de numérotation, http://legilux.public.lu/eli/etat/leg/rilr/2014/07/14/n2/jo.

# 2 The numbering rules with general application

## 2.1 Common concepts

### 2.1.1 The numbering regulation, numbering plan and numbering register

The numbers considered in this report are mainly those that are managed nationally for the purposes of ITU-T Recommendation E.164[21]. The tools needed for managing them are as follows:

- The numbering regulation (*règlement de numérotation*) provides the rules that must be followed to keep the use of numbers orderly. It changes when the rules are revised, typically after public consultations.
- The numbering plan (*plan de numérotation*) defines what numbers might be used by which services. It changes when numbers gain or lose their designations (such as "fixed service", "nomadic service" and "mobile service").
- The numbering register (*registre de numérotation*) lists what numbers are provided for use by which organisations. It changes relatively often, when designated numbers change their states (such as "allocated", "blocked" and "free").

In some countries some or all of these are combined, though they typically have different styles of presentation or different rates of change. In Luxembourg the numbering plan is currently combined with, and presented in the same style as, the numbering regulation.

Alongside these tools might be guides to practice (which are described in Section 2.1.7) and codes of conduct (which are described in Section 2.1.8).

**In the consultants' opinion:**

- **The numbering plan and numbering register should be characterised in the revised numbering regulation at least to the extent of stating what mechanisms are adopted for changing them.**

[21] Section 7, ITU-T Recommendation E.164: The international public telecommunication numbering plan, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.164-201011-I!!PDF-E.

### 2.1.2 Number assignment, allocation and designation

The "notified enterprises" ("*entreprises notifiées*") of the electronic communications law in Luxembourg are Electronic Communications Network or Service (ECNS) providers[22]. Normally regulators manage numbers, and ECNS providers provide services that use numbers. Between them they perform actions such as assignment, allocation and designation. In this report the terms "assignment", "allocation" and "designation" are defined as follows:

- The assignment of a number is the granting of the right to use the number as the address of a termination point of communications. In Luxembourg an assignment is performed by an ECNS provider (except in the case of some special numbers assigned by ILR).
- The allocation of a number is the granting of all of the rights and responsibilities associated with the number. In Luxembourg an allocation is performed by ILR and entails changing the numbering register. The rights associated with a number include assigning the number to a customer (if the number is publicly accessible), and the responsibilities amount to ensuring compliance with the conditions of use for the number.
- The designation of a number is the identification of the service that normally uses the number. In Luxembourg a designation is performed by ILR and entails changing the numbering plan. The service identified should be specified in the numbering regulation.

In general, actions such as assignment, allocation and designation might be performed by the regulator or by an ECNS provider. The situation in the EU is summarised in the table below.

| **Action** | **Whether the action may be performed by the…** | |
|---|---|---|
| | **Regulator** | **ECNS provider** |
| **Assignment** | Only for some numbers | Yes |
| **Allocation** | Yes | Only in some countries |
| **Designation** | Yes | No |

[22] Article 2(12), Loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2011/02/27/n1/jo.

The English usage of "assignment", "allocation" and "designation" in this report is widespread. However, it differs from those in ITU-T Recommendation E.101 (on terms related to numbering for ITU-T recommendations) and the European Electronic Communications Code, both of which lack a distinguishing term for assignments[23,24].

In particular, in their French versions "*attribution*" has two meanings: in ITU-T Recommendation E.101 it signifies both assignment and allocation and in the European Electronic Communications Code it signifies both assignment and designation[25,26]. Neither document offers the ideal usage for a revised numbering regulation. The current numbering regulation offers an alternative: in it "*affectation*" signifies assignment and "*attribution*" signifies allocation[27]. The same usage appears in the electronic communications law[28]. However, there is yet another possible usage: in the anti-terrorism amendments to the electronic communications law "*allocation*" signifies assignment[29,30].

[23] Sections 6.2 and 6.5, ITU-T Recommendation E.101: Definitions of terms used for identifiers (names, numbers, addresses and other identifiers) for public telecommunication services and networks in the E-series Recommendations, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.101-200911-I!!PDF-E.

[24] Articles 94(3) and 96(3), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX:02018L1972-20181217.

[25] Sections 6.2 and 6.5, ITU-T Recommendation E.101: Definitions of terms used for identifiers (names, numbers, addresses and other identifiers) for public telecommunication services and networks in the E-series Recommendations, https://www.itu.int/rec/dologin_pub.asp?lang=f&id=T-REC-E.101-200911-I!!PDF-F.

[26] Articles 94(3) and 96(3), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX:02018L1972-20181217.

[27] Articles 1(2) and 1(4).

[28] Article 47(3), Loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2011/02/27/n1/jo.

[29] Article 2, Loi du 7 juin 2017 portant modification de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2017/06/07/a557/jo.

[30] Article 2, Loi du 27 juin 2018 adaptant la procédure pénale aux besoins liés à la menace terroriste et portant modification 1) du Code de procédure pénale, 2) de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques, 3) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://www.legilux.lu/eli/etat/leg/loi/2018/06/27/a559/jo.

Usages vary greatly: in the table below the English usage of "assignment", "allocation" and "designation" in this report is compared with the French usage in several documents (stating for each entry the predominant term where there is more than one in a document).

| Action | What the action is called in the French versions of… | | | | | |
|---|---|---|---|---|---|---|
| | The current numbering regulation | ITU-T Recom-mendation E.101 | The European Electronic Commun-ications Code | ARCEP numbering documents in France | BIPT numbering documents in Belgium | BAKOM numbering documents in Switzerland |
| **Assignment** | *Affectation* | *Attribution* | *Attribution* | *Affectation* | *Attribution* | *Attribution* |
| **Allocation** | *Attribution* | *Attribution* | - | *Attribution* | - | *Attribution* |
| **Designation** | - | *Affectation* | *Attribution* | *Allocation* | *Désignation* | *Affectation* |

**In the consultants' opinion:**

- **The revised numbering regulation should include definitions of "assignment", "allocation" and "designation" that are not bound by the varied and inconsistent usage in other documents (such as the European Electronic Communications Code).**
- **ILR should consider adopting the following French usage:**
  - **"*Attribution*" (instead of "*affectation*", which is found in the current numbering regulation) for the assignment of a number by an organisation to a customer.**
  - **"*Allocation*" (instead of "*attribution*", which is found in the current numbering regulation) for the allocation of a number by ILR to an organisation.**
  - **"*Désignation*" for the identification by ILR of the service that normally uses a number.**

### 2.1.3 Further administrative actions

Various actions besides allocation might change the rights and responsibilities of organisations in relation to numbers. Those for reserving and withdrawing numbers, as well as those for allocating numbers, are described in the current numbering regulation[31]. Those for transferring numbers in some circumstances are described in a supplementary regulation on the treatment of ported numbers in blocks taken out of service[32].

The change to the rights and responsibilities of the organisations needs to be made precise. For instance, when a request by an organisation to allocate a number is accepted, the right to assign the number is given to that organisation (if the number is publicly accessible), and, when a request by an organisation to reserve a number is accepted, the right to be allocated the number is taken from all of the other organisations.

In some cases the actions might occur either on the initiative of the regulator or at the request of organisations[33]. For instance, this is so when a number is withdrawn. The term "withdrawal" is used in this report, as well as in the current numbering regulation, regardless of who initiates the action. In this usage, the "return" of a number to the regulator occurs when a request that the regulator withdraw the number is accepted. This usage is simple in the current context, but an alternative might be better where the intention is to distinguish the circumstances surrounding actions on the initiative of the regulator from those surrounding actions at the request of organisations. Some documents therefore use the term "withdrawal" when the regulator initiates the action and the term "return" when organisations to whom numbers were allocated do so. For either usage the terms can be defined as follows:

- The withdrawal of a number is the annulment of the allocation of the number by the organisation who allocated the number.
- The return of a number is the relinquishment of the allocation of the number by the organisation to whom the number was allocated.

[31] Articles 5 and 8.

[32] Règlement ILR/T17/7 du 12 juillet 2017 relatif au traitement des numéros portés en service issus de blocs de numéros lorsque ces blocs sont mis hors service, http://data.legilux.public.lu/eli/etat/leg/rilr/2017/07/12/a653/jo.

[33] Article 8.

Thus a withdrawal or return of a number changes the rights and responsibilities of the organisation to whom the number was allocated, by removing the rights granted when the number was allocated.

Similarly a transfer of a number passes from one organisation to another the rights granted when the number was allocated. Again the action might occur on the initiative of the regulator or at the request of the organisations.

**In the consultants' opinion:**

- **The revised numbering regulation should include definitions of all those actions of ILR that change the rights and responsibilities of ECNS providers, such as "reservation", "withdrawal", "return" and "transfer".**

### 2.1.4 Fixed services, nomadic services and mobile services

The basic interpersonal services are as follows:

- Fixed services (*services fixes*) offer communications to or from termination points that do not move during communications, and that can move between communications only if the ECNS providers take suitable actions (such as reconfiguring the network termination points).
- Nomadic services (*services nomades*) offer communications to or from termination points that do not move during communications, but that might move between communications if the customers take suitable actions (such as restarting the terminals).
- Mobile services (*services mobiles*) offer communications to or from termination points that might move during communications.

In all of these cases, small changes in the locations of the termination points (within the range of WiFi, for example) are not regarded as moves. The differences between the services are summarised in the table below. They do not in themselves relate directly to technology.

| **Service** | **Whether maintaining communications while moving the termination point needs action by the…** | |
|---|---|---|
| | **Customer** | **ECNS provider** |
| **Fixed** | Yes | Yes |
| **Nomadic** | Yes | No |
| **Mobile** | No | No |

**In the consultants' opinion:**

- **The revised numbering regulation should include definitions of "fixed service" ("*service fixe*"), "nomadic service" ("*service nomade*") and "mobile service" ("*service mobile*") that distinguish between them just according to the degrees of mobility offered.**

The definition of "geographic number" ("*numéro géographique*") in the current numbering regulation refers to fixed network termination points[34]. It means much the same as "number for a fixed service" in this report, except that it mentions "PSTN/ISDN". It is not equivalent to the definition in the European Electronic Communications Code and in widespread usage elsewhere, in which a geographic number has geographic significance[35]. Removing it from the regulation would help to remove misconceptions about the geographic significance in numbers.

**In the consultants' opinion:**

- **The revised numbering regulation should omit the definition of "geographic service" ("*service géographique*").**

### 2.1.5 Associations between numbers and services

Numbers have conditions of use. These define the responsibilities relating to numbers of organisations to whom numbers are allocated. By doing so they limit the services that may use the numbers (where, in this report, a service "uses" a number if it offers communications to or from the termination point addressed by the number).

The conditions of use of numbers are stated in the relevant laws and regulations. They are not always together in one document, because they are prepared at different times and in different ways. For instance, in Luxembourg the anti-terrorism law amendments to the electronic communications law, which place responsibilities on ECNS providers that offer

[34] Article 1(18).

[35] Article 2(33), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

services using numbers, are not incorporated in the current numbering regulation[36,37]. However, many conditions of use are stated in the current numbering regulation. Some are implicit in definitions such as "*«Numéros géographiques»: tout numéro (y compris numéros à sélection directe à l'arrivée) utilisé pour adresser un point de terminaison du réseau téléphonique commuté fixe (PSTN / ISDN)*"[38]. Others are explicit in the statements about the services that may use numbers; for instance, those about numbers beginning with '20' include "*Le service inclut la possibilité pour l'abonné de modifier la destination des appels lui adressés par ce numéro, en fonction de sa localisation géographique momentanée*"[39]. Often concepts are defined generally and conditions of use are stated separately, for convenience and ease of revision.

The designations of numbers identify the services that normally use the numbers: fixed numbers are assigned to customers for fixed services, nomadic numbers are assigned to customers for nomadic services, mobile numbers are assigned to customers for mobile services, and so on. However, there can be exceptions. For instance, fixed numbers might be assigned to customers for mobile services, as happens when PBX extensions address mobile network termination points. Also, machine-to-machine (M2M) services for alarm systems were often installed before the introduction of M2M numbers and therefore use fixed numbers or mobile numbers; conversely, the current numbering regulation implies that customers for M2M services must be assigned numbers that address mobile network termination points, even if their M2M applications are not mobile[40].

By identifying particular services the designations of numbers determine the conditions of use for the numbers. They can also create expectations about the prices of the services that may use the numbers. Only these expectations, and the conditions of use for the numbers, should

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[36] Articles 1 and 2, Loi du 7 juin 2017 portant modification de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2017/06/07/a557/jo.

[37] Articles 2 and 4(1), Loi du 27 juin 2018 adaptant la procédure pénale aux besoins liés à la menace terroriste et portant modification 1) du Code de procédure pénale, 2) de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques, 3) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://www.legilux.lu/eli/etat/leg/loi/2018/06/27/a559/jo.

[38] Articles 1(18).

[39] Articles 44(1)(a)-44(1)(b).

[40] Articles 1(20) and 48(1).

limit the services. Accordingly the services must comply with the conditions of use but might be different from those that normally use the numbers.

The current numbering regulation notes that ILR will require the introduction of warning tones at the starts of calls if numbers are ported between ECNS providers having services with very different prices[41]. Though this requirement is not imposed currently, it remains pertinent. An analogous requirement is pertinent if the services using numbers have very different prices from those that normally use the numbers.

**In the consultants' opinion:**

- **The revised numbering regulation should require an ECNS provider to alert users free of charge at the starts of communications to a number if the service using the number has higher prices than a service using a different number allocated to the same ECNS provider and having the same designation.**

### 2.1.6 Administrative arrangements for technical numbers

The current numbering regulation includes articles about international signalling point codes, national signalling point codes, mobile network codes and data network identification codes[42]. In many countries the numbering regulation would not include such articles; it would instead concentrate on publicly accessible numbers. In other countries, by contrast, it would include not only such articles but also articles about other identifiers that are allocated by the regulators and are not publicly accessible; for Luxembourg these would be ITU issuer identification numbers according to ITU-T Recommendation E.118[43].

There is no need for these articles to appear in the same document as the articles about publicly accessible numbers. ECNS providers that want the information in them could be directed to ITU-T recommendations and the guides to practice of ILR.

**In the consultants' opinion:**

- **ILR should consider publishing the descriptions of the management of technical numbers in guides to practice instead of in the revised numbering regulation.**

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[41] Articles 25(2)-25(4).

[42] Articles 77-80.

[43] ITU-T Recommendation E.118: Automated international telephone credit card system, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.118-200605-I!!PDF-E.

### 2.1.7 Guides to practice

Guides to practice occur in many countries under various names. They contain details of what the regulator and the stakeholders are expected to do in particular circumstances; as they deal with expectations, they are typically not controversial and not enforceable. An example of one in Luxembourg might be a document on allocating national signalling point codes (if it existed); another might be a document on using network routing numbers in roaming.

Guides could be useful for incorporating in the practices of ILR references to, or adaptations of, portions of ITU-T recommendations, such as procedures for:

- Communicating numbering plans, from ITU-T Recommendation E.129[44].
- Arranging extraterritorial uses of numbers, from ITU-T Recommendation E.212[45].
- Sharing information about misuse and fraud, from ITU-T Recommendation E.156[46].
- Allocating international signalling point codes, from ITU-T Recommendation Q.708[47].
- Allocating mobile network codes, from ITU-T Recommendation E.212[48].
- Allocating data network identification codes, from ITU-T Recommendation X.121[49].
- Allocating issuer identification numbers, from ITU-T Recommendation E.118[50].

[44] Section 8.2, ITU-T Recommendation E.129: Presentation of national numbering plans, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.129-201301-I!!PDF-E.

[45] Section E.2, ITU-T Recommendation E.212: The international identification plan for public networks and subscriptions, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.212-201609-I!!PDF-E.

[46] Section 5, ITU-T Recommendation E.156: Guidelines for ITU-T action on reported misuse of E.164 number resources, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.156-202006-I!!PDF-E.

[47] Section 7, ITU-T Recommendation Q.708: Assignment procedures for international signalling point codes, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-Q.708-199903-I!!PDF-E.

[48] Annex B, ITU-T Recommendation E.212: The international identification plan for public networks and subscriptions, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.212-201609-I!!PDF-E.

[49] Annex A.2, ITU-T Recommendation X.121: International numbering plan for public data networks, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-X.121-200010-I!!PDF-E.

[50] Appendix I, ITU-T Recommendation E.118: Automated international telephone credit card system, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.118-200605-I!!PDF-E.

- Notifying ITU about carrier codes, from ITU-T Recommendation M.1400[51].

### 2.1.8 Codes of conduct

Codes of conduct occur in many countries under various names. They contain details of what the regulator and the stakeholders are required to do in particular circumstances; as they deal with requirements, they are typically determined after considerable public consultation and backed by some legal powers. An example of one in Luxembourg might be the code cited in the fixed number portability regulation (if it is not incorporated in the revised numbering regulation)[52].

Codes might also be devised by stakeholders, individually or collectively, other than the regulator, to document intended actions and interpret laws and regulations; for instance, in Luxembourg, Post has a code on shared revenue services and GIE Telcom administers a code on safer mobile phone use by children[53,54]. Such codes are unlikely to have legal status except as parts of contracts.

Codes might summarise the laws and regulations applicable to particular transactions, give examples of compliance and non-compliance (perhaps in audiovisual formats), and describe complaint and appeal procedures. Developing them often requires the knowledge and experience of industry stakeholders and timescales different from those of legislatures. Their purposes, contents and processes for development are therefore different from those of much secondary legislation. They nonetheless can be "endorsed", and thereby given legal force, if they are devised and administered by the regulator. Whether codes of conduct are incorporated in the main secondary legislation is then purely a practical matter.

An alternative approach has been adopted in Australia, where the regulator may "register", or treat rather like regulations, codes from other organisations that have been drawn up

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[51] Annex E, ITU-T Recommendation M.1400: Designations for interconnections among operators' networks, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-M.1400-201504-I!!PDF-E.

[52] Procedure for fix number portability, https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-92.pdf.

[53] Conditions particulières de vente services à revenus partagés, https://www.post.lu/documents/10181/4240640/POST+Telecom_CPV_Services+à+Revenus+Partagés_CPV-0011_FR_OnProduction_v2_en+vigueur+au+23+avril+2016/cfe73269-5493-4e65-8048-0fe7d179a5ee.

[54] Luxembourg Code of Conduct for Safer Mobile Use by Younger Teenagers and Children, http://www.telcom.lu/luxembourg-code-conduct-for-safer-mobile-use-younger.pdf.

according to guidelines on their format, structure and content[55]. However, the regulator now wants to take full authority over devising and administering codes, as it considers that clearly drafted and properly enforceable rules made by it (rather than in the current co-regulatory arrangements) are required to deliver essential consumer safeguards[56].

Delegating tasks can help with incorporating in codes of conduct the knowledge and experience of industry stakeholders. Of course, if the regulator nonetheless delegates some tasks it should be able to take back full authority if necessary.

### 2.1.9 Delegation of tasks

There are various circumstances in which the regulator might introduce other organisations into its relations with the ECNS providers. In particular, it might delegate tasks in number management (such as allocating numbers or administering a code of conduct) or require an agent to operate a database (for ported numbers, barred numbers or assigned SMS/MMS short codes, for example). The organisations need to be chosen, checked and changed in consultation with the ECNS providers; as they may be replaced they should not normally be named in the regulations. The general principles for choosing, checking and changing the organisations can resemble those in Switzerland, for example[57].

**In the consultants' opinion:**

- **The revised numbering regulation should state requirements on, and procedures for replacing, any organisations to whom ILR delegates tasks.**

[55] Guide to developing and varying telecommunications codes for registration, https://www.acma.gov.au/sites/default/files/2020-09/Guide%20to%20developing%20and%20varying%20telecommunications%20codes%20for%20registration.pdf.

[56] ACMA submission to Consumer Safeguards Review Part C: Choice and Fairness, https://www.acma.gov.au/sites/default/files/2020-10/ACMA-submission-to-Consumer-Safeguards-Review-Part-C.pdf.

[57] Article 13, Ordonnance sur les ressources d'adressage dans le domaine des telecommunications, https://www.admin.ch/opc/fr/classified-compilation/19970410/index.html.

## 2.2 Eligibility for number allocation

### 2.2.1 Organisations other than ECNS providers

#### 2.2.1.1 International background

The European Electronic Communications Code suggests that regulators might allocate numbers to organisations other than ECNS providers under special conditions[58]. The organisations would probably be large ones (such as vehicle manufacturers and energy suppliers) capable of operating their own networks or contracting with others to operate the networks. The special conditions include assurances that:

- There are enough numbers available to satisfy current and foreseeable future demand.
- The organisations to whom the numbers are allocated can manage the numbers and can ensure compliance with the conditions of use for the numbers.

BEREC has issued guidelines on the conditions in which organisations other than ECNS providers might be allocated numbers[59]. In essence these guidelines state that the regulators should react to the organisations much as they would to newly established ECNS providers, emphasising checks that the organisations had the necessary technical facilities (on their own or through their partners or subcontractors). The regulators might therefore need to scrutinise cases more deeply than usual. Briefly, as in good practice already, the regulators should:

- Evaluate applications for numbers from the organisations.
- Monitor uses of numbers by the organisations.
- Conduct audits.

GSMA sees no need for regulators to allocate numbers to organisations other than ECNS providers. In particular it advises against the allocation of mobile network codes, which could

[58] Article 93(2), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[59] BEREC guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communications networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/9034-berec-guidelines-on-common-criteria-for-_0.pdf.

become scarce (though not yet in Luxembourg)[60]. It maintains that Over-The-Air (OTA) provisioning is already available in most use cases[61]. Consequently number portability should be feasible and regulators should not need to allocate numbers to organisations other than ECNS providers.

Currently in many EU member states (including Belgium, Denmark, France, Germany and Ireland) only particular voice short codes may be allocated to organisations other than ECNS providers, as confirmed in a survey by BEREC[62]. However, in the Netherlands some other numbers may be allocated to organisations and individuals[63/64]. Additionally, in Switzerland any numbers may be allocated to organisations in general circumstances, and freephone numbers, shared cost numbers and shared revenue numbers may be allocated to individuals[65].

#### 2.2.1.2 Current Luxembourg situation

According to the current numbering regulation, only particular voice short codes may be allocated to organisations other than ECNS providers[66]. Those beginning with '116' are

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[60] GSMA comments to the BEREC public consultation on the document: "Guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communication networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings.", https://www.gsma.com/iot/wp-content/uploads/2019/08/GSMA-Response-to-BEREC-Numbering-Consultation.pdf.

[61] GSMA comments to the BEREC public consultation on the document: "Guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communication networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings.", https://www.gsma.com/iot/wp-content/uploads/2019/08/GSMA-Response-to-BEREC-Numbering-Consultation.pdf.

[62] BEREC guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communications networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8622-berec-guidelines-on-common-criteria-for-_0.pdf.

[63] Beleidsregels uitgifte bedrijfsnummers, https://wetten.overheid.nl/BWBR0033303.

[64] Section 4.1.10, Monitor Nummeruitgifte 2019, https://www.acm.nl/sites/default/files/documents/2020-08/monitor-nummeruitgifte-2019.pdf.

[65] Article 2.1, Prescriptions techniques et administratives concernant l'attribution individuelle de numéros,https://www.bakom.admin.ch/dam/bakom/fr/dokumente/bakom/das_bakom/rechtliche_grundlagen/vollzugspraxis/Telekommunikation/tav_pta_2_10_ed9.pdf.

[66] Articles 12 ("*Tableau «Modalités d'attribution par l'Institut»*") and 2.

allocated to organisations providing particular services of social value[67]. Those beginning with '13' are allocated to organisations such as radio stations[68]. Aside from these, only '112' and '113' may be allocated to organisations other than ECNS providers, while in some EU member states directory enquiry numbers beginning with '118' can be allocated to such organisations.

#### 2.2.1.3 Stakeholder views

A majority (88%) of the respondents to the stakeholder questionnaire indicated that numbers should not be allocated by ILR to organisations other than ECNS providers. They did not see any demand for provisions permitting such allocations.

The respondents were all ECNS providers. Other organisations (such as vehicle manufacturers and energy suppliers, or even contract development institutes) might have had a different view.

#### 2.2.1.4 Considerations for the numbering regulation

Organisations that are not ECNS providers might well outsource their operations, especially as they could have difficulties in implementing interconnection and roaming agreements. Even if the numbers had been allocated by ILR to them they would need mechanisms much like number portability in order to change their outsource partners or subcontractors. There would be little practical difference between having numbers allocated by ILR to them and having numbers assigned by an ECNS provider to them, given that portability was feasible.

Organisations that did not outsource their operations would probably be capable of becoming ECNS providers already, when they could be allocated numbers by ILR without special provisions in the revised numbering regulation.

Regulators are urged to promote the use of OTA provisioning under the European Electronic Communications Code[69]. Given this, and the ease with which organisations can become ECNS providers in the EU, the benefits of allowing other organisations to be allocated numbers are not clear.

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[67] Article 37.

[68] Article 66.

[69] Article 93(6), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

According to the current numbering regulation, numbers other than certain voice short codes are allocated only to ECNS providers[70].

**In the consultants' opinion:**

- **There is no clear case at present for allowing numbers from Luxembourg (other than certain voice short codes) to be allocated to organisations other than ECNS providers, given that the relevant numbers are portable.**
- **The current numbering regulation complies with the European Electronic Communications Code requirements about eligibility for allocations of numbers.**

In particular, though in many EU member states directory enquiry numbers may be allocated to organisations other than ECNS providers, the European Electronic Communications Code does not require this.

### 2.2.2 Organisations having extraterritorial uses of numbers

#### 2.2.2.1 International background

The term "extraterritorial uses" refers to situations in which numbers that have been allocated in one country are used permanently in another country through physical infrastructure there. The permanent uses are taken to exclude the temporary uses supported by roaming, just as in ITU-T Recommendation E.212[71]. They typically require permission from the regulators in both countries, in accordance with the procedure in ITU-T Recommendation E.212[72].

The European Electronic Communications Code states that when numbers are used outside the country where they were allocated:

- The conditions of use for the numbers must be as stringent outside the country as they are inside the country[73].

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[70] Articles 2(1)-2(3).

[71] Section E.1, ITU-T Recommendation E.212: The international identification plan for public networks and subscriptions, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.212-201609-I!!PDF-E.

[72] Section E.2, ITU-T Recommendation E.212: The international identification plan for public networks and subscriptions, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.212-201609-I!!PDF-E.

[73] Article 93(4), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

- The services using the numbers must comply with consumer protection and other national rules in the country where the numbers are used[74].
- The regulators must inform BEREC which numbers may have extraterritorial uses[75].

Its preamble suggests that:

- Temporary uses of numbers supported by roaming should not be subject to these requirements on extraterritorial uses[76].
- Numbers for interpersonal communications services should not have extraterritorial uses, to reduce the likelihood of fraud[77].

Extraterritorial uses of numbers are viewed as undesirable in a CEPT ECC report, except when a large country looks after the interests of a small one (as does Italy, for example, for San Marino and Vatican City)[78]. The arguments of that report relate mainly to difficulties in deciding which national regulations to apply to numbers used outside the countries where they are allocated. However, if the countries concerned have broadly compatible regulatory objectives (as they have in the EU, for example), such difficulties should not arise.

In several countries (such as Denmark and the Netherlands, among the reference countries) extraterritorial uses are not mentioned in regulations. In others (including France, Germany Ireland and Norway) extraterritorial uses of numbers by M2M services are explicitly permitted

[74] Article 94(6), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[75] Article 93(4), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[76] Recital 248, Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[77] Recital 246, Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[78] Extra-Territorial Use of E.164 Numbers, https://www.erodocdb.dk/download/78c0fb7b-097c/ECCREP194.PDF.

and extraterritorial uses of other numbers are, in some cases, explicitly prohibited[79,80,81,82]. In Belgium permanent uses of numbers by connected car services and eCall services from another country are permitted, while other permanent uses will be considered case-by-case [83]. In Switzerland permanent uses of numbers from another country are permitted (and SIMs with numbers from the UK are widely available, perhaps because of their access to "roam like at home" prices); however, permanent uses of numbers from Switzerland in another country might not be permitted, as they would not be essentially in Switzerland[84].

#### 2.2.2.2 Current Luxembourg situation

Currently numbers from Luxembourg may be used in another country by an organisation that is not located in Luxembourg, if ILR and the regulator in the other country grant their approval. A general agreement to this effect is in force between Luxembourg and Belgium[85]. Under it various ECNS providers are using in Belgium International Mobile Subscriber Identities (IMSIs) from Luxembourg.

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[79] Article 2.3.5(e), Plan national de numérotation – Version du 1er août 2019, Décision n° 2018 0881 modifiée de l'Autorité de régulation des communications électroniques et des postes en date du 24 juillet 2018 établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/18-0881.pdf.

[80] Verfügung Nr. 80/2017 (Amtsblatt 16/2017 vom 23.08.2017) Exterritoriale Nutzung von ausländischen Rufnummern im Gebiet der Bundesrepublik Deutschland im Rahmen von Machine-to-Machine-Kommunikation, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/M2M/Vfg_80_2017_Exterritoriale_Nutzung_von_ausl_Rufnummern.pdf?__blob=publicationFile.

[81] Article 4.8.3, Numbering Conditions of Use and Application Process, https://www.comreg.ie/publication-download/numbering-conditions-of-use-and-application-process-document.

[82] Section 16, Forskrift om nummerressurser for elektroniske kommunikasjonsnett og -tjenester, https://lovdata.no/dokument/SF/forskrift/2004-02-16-426.

[83] Article 3.1, Circulaire du 6 octobre 2017 concernant l'utilisation extraterritoriale de ressources de numérotation étrangères en Belgique, https://www.ibpt.be/public/files/fr/22385/Omzendbrief_extra-territoriaal_gebruik_Minister_De_Croo_FR.pdf.

[84] Article 4.3, Ordonnance sur les ressources d'adressage dans le domaine des telecommunications, https://www.admin.ch/opc/fr/classified-compilation/19970410/index.html.

[85] Un accord bilatéral entre les régulateurs télécoms belge et luxembourgeois ouvre la possibilité d'appeler, d'envoyer des SMS et de surfer entre les deux pays sans frais d'itinérance, https://ibpt.be/file/cc73d96153bbd5448a56f19d925d05b1379c7f21/399ddf8121e58911ab3fe49c08b9ee9d501a09c0/FR_Persbericht_BIPT-ILR.pdf.

Extraterritorial uses might create demand for extra international signalling point codes and mobile network codes. According to the numbering register, out of the 40 international signalling point codes provided to ILR, 8 are free for allocation, and out of the 100 mobile network codes provided to ILR, 83 are free for allocation. Hence at some time ILR might need extra signalling area/network codes (offering 8 international signalling point codes each) but not extra mobile country codes (offering 100 mobile network codes each).

Numbers having extraterritorial uses might create demand for more like them. Though the level of demand is difficult to predict, it appears low enough to be met easily for M2M numbers (7% of which are allocated), mobile numbers (13% of which are allocated) and even nomadic numbers (23% of which are allocated). Accordingly extraterritorial uses of these numbers from Luxembourg are unlikely to cause shortages.

#### 2.2.2.3 Stakeholder views

A majority (68%) of the respondents to the stakeholder questionnaire indicated that, to encourage competition and flexibility in offerings to customers, there should be no regulation of extraterritorial uses of numbers. However, specific approval for extraterritorial uses is called for by ITU-T Recommendation E.212[86]. Moreover, a majority (76%) of the respondents also indicated that extraterritorial uses should be allowed, if at all, only within the EU.

Those that favoured regulation pointed out that users could be confused if organisations with no relation to Luxembourg had numbers from Luxembourg but never received calls in Luxembourg; accordingly they considered that calls to Luxembourg fixed numbers should normally terminate in Luxembourg. They observed, however, that confusion can exist already: unknown to the callers, calls to fixed numbers can be diverted to mobile numbers roaming abroad, if the call recipients have fixed-mobile convergence packages.

The inclination of the respondents overall seemed to be that there should be no extra obligations on the use of numbers from other countries in Luxembourg, and that the obligations on the use of numbers from Luxembourg should be similar inside and outside the country. In practice the obligations are likely to be similar in several countries besides those in the EU, such as some others in the CEPT.

[86] Section E.2, ITU-T Recommendation E.212: The international identification plan for public networks and subscriptions, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.212-201609-I!!PDF-E.

#### 2.2.2.4 Considerations for the numbering regulation

Many conditions imposed on numbers for use inside a country are consistent with use outside the country; for instance, if an allocation leads to a shortage of numbers then it does so wherever the numbers are used. Other conditions need to be compared between countries; for instance, there might need to be special requirements for registering new prepayment customers. The conditions vary between services, so extraterritorial uses might be restricted to the numbers for certain services.

Restricting extraterritorial uses to M2M numbers might increase slightly the protection against unwanted calls before there is effective authentication of CLIs against spoofing. However, extraterritorial uses would then not be permitted for M2M services that used fixed numbers, nomadic numbers or mobile numbers before there were distinctive M2M numbers. Permitting extraterritorial uses to these numbers might make unwanted calls more frequent, as interpersonal calls with CLIs apparently from Luxembourg could be coming from other countries[87].

The permanent use of numbers from Luxembourg in another country could be allowed if the use had no harmful effects (on safety, number availability, competition or consumer protection, in particular) and was acceptable to the regulator in the other country. The permanent use of numbers from other countries in Luxembourg could be allowed on reciprocal conditions. Similar conditions hold in Germany, for example[88,89]. There is a further condition in Belgium, that the numbers from other countries offer benefits unavailable from

[87] Recital 246, Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[88] Verfügung Nr. 78/2017 (Amtsblatt 16/2017 vom 23.08.2017) Änderung des Nummernplans Rufnummern für Mobile Dienste, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/Mobile%20Dienste/AmtsblattVeroefflgn/AenderungNPVfg78_2017.pdf?__blob=publicationFile.

[89] Verfügung Nr. 80/2017 (Amtsblatt 16/2017 vom 23.08.2017) Exterritoriale Nutzung von ausländischen Rufnummern im Gebiet der Bundesrepublik Deutschland im Rahmen von Machine-to-Machine-Kommunikation, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/M2M/Vfg_80_2017_Exterritoriale_Nutzung_von_ausl_Rufnummern.pdf?__blob=publicationFile.

numbers from Belgium[90]. This further condition seems unlikely to impose a constraint in practice but follows the wording of ECC Recommendation (16)02[91].

**In the consultants' opinion:**

- **ILR should permit extraterritorial uses of numbers in reciprocal arrangements with countries having regulatory requirements consistent with those of Luxembourg. Such countries may be inside or outside the EU.**

Some numbers are administered by ITU (such as the codes under '+881' and '+882' for global services and networks)[92]. The current numbering regulation in Luxembourg explicitly permits uses of such numbers: only notification to ILR, not approval by ILR, is required before such numbers are brought into service[93]. These are not extraterritorial uses, because the numbers are administered by ITU, not by countries, but they are similar in effect to extraterritorial uses. In explicitly permitting them but not mentioning extraterritorial uses the current numbering regulation implicitly casts doubt on whether extraterritorial uses are permitted. However, there is no need for the revised numbering regulation to mention them at all. Similarly there is no need for the regulation to mention extraterritorial uses: they are permitted, as the general agreement between Luxembourg and Belgium shows[94].

**In the consultants' opinion:**

- **The revised numbering regulation should omit statements to the effect that:**
    - **Uses of numbers administered by ITU are permitted.**

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[90] Article 3.1, Circulaire du 6 octobre 2017 concernant l'utilisation extraterritoriale de ressources de numérotation étrangères en Belgique, https://www.ibpt.be/public/files/fr/22385/Omzendbrief_extra-territoriaal_gebruik_Minister_De_Croo_FR.pdf.

[91] ECC Recommendation (16)02: Extra-Territorial Use of E.164 Numbers - High level principles of assignment and use, https://docdb.cept.org/download/efaa4652-e1c7/REC1602.PDF.

[92] Section 4.1, Recommendation ITU-T E.164.1: Criteria and procedures for the reservation, assignment and reclamation of E.164 country codes and associated identification codes (ICs), https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.164.1-200809-I!!PDF-E.

[93] Article 10(5).

[94] Un accord bilatéral entre les régulateurs télécoms belge et luxembourgeois ouvre la possibilité d'appeler, d'envoyer des SMS et de surfer entre les deux pays sans frais d'itinérance, https://ibpt.be/file/cc73d96153bbd5448a56f19d925d05b1379c7f21/399ddf8121e58911ab3fe49c08b9ee9d501a09c0/FR_Persbericht_BIPT-ILR.pdf.

- **Extraterritorial uses of numbers from other countries are permitted in reciprocal arrangements with those countries.**

- **The current numbering regulation complies with the European Electronic Communications Code requirements about extraterritorial uses.**

### 2.2.3 Organisations assigning numbers to customers in Luxembourg

#### 2.2.3.1 International background

Regulators take different views on where customers must be located if they are to be assigned numbers. For instance, in Belgium, Switzerland and Ireland, to be assigned fixed numbers customers must have premises in the appropriate geographic areas (though the fixed numbers may then be used by nomadic services)[95,96,97]. By contrast, in France, to be assigned fixed numbers (or indeed nomadic numbers or mobile numbers) customers must just usually or temporarily reside, or justify stable links involving frequent and significant presence, in the country[98].

There is, however, a further requirement in France, in that the ECNS providers who route traffic to the numbers must do so through interconnection points in the country[99]. A similar requirement for physical presence is found in Recommendation ITU-T E.164.1, where

[95] Article 43, 27 avril 2007 - arrêté royal relatif à la gestion de l'espace de numérotation national et à l'attribution et au retrait des droits d'utilisation de numéros, http://www.etaamb.be/fr/arrete-royal-du-27-avril-2007_n2007011252.html.

[96] Article 5.1.2, Prescriptions techniques et administratives concernant le plan de numérotation et la répartition des numéros E.164, https://www.bakom.admin.ch/dam/bakom/fr/dokumente/bakom/das_bakom/rechtliche_grundlagen/vollzugspraxis/Telekommunikation/tav_pta_2_2_ed7.pdf.

[97] Articles 4.1.2 and 4.1.4, Numbering Conditions of Use and Application Process, https://www.comreg.ie/publication-download/numbering-conditions-of-use-and-application-process-document.

[98] Articles 2.3.2(a), Plan national de numérotation – Version du 1er août 2019, Décision n° 2018 0881 modifiée de l'Autorité de régulation des communications électroniques et des postes en date du 24 juillet 2018 établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/18-0881.pdf.

[99] Articles 2.3.2(a), Plan national de numérotation – Version du 1er août 2019, Décision n° 2018 0881 modifiée de l'Autorité de régulation des communications électroniques et des postes en date du 24 juillet 2018 établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/18-0881.pdf.

numbers administered by ITU (for global services and networks) can be allocated only if there are interconnection points in at least two countries[100].

#### 2.2.3.2 Current Luxembourg situation

ECNS providers may assign numbers regardless of the links of their customers with Luxembourg and the extents of their networks in Luxembourg. In particular, they and their customers are not required to have physical addresses in the country. The anti-terrorism law amendments to the electronic communications law require customers to provide physical addresses, but those physical addresses need not be in Luxembourg[101,102].

#### 2.2.3.3 Stakeholder views

A majority (68%) of the respondents to the stakeholder questionnaire indicated that organisations that are allocated numbers by ILR should not be required to have physical addresses in Luxembourg. Those that disagreed with that view mainly pointed out that it is difficult to enforce the Luxembourg conditions of use if an organisation does not have physical presence in Luxembourg. Two of those, however, felt that it was contrary to the spirit of the EU to specify Luxembourg rather than the EU.

One respondent held that freephone numbers and shared revenue numbers should be exceptions to any rule that requires customers to have physical addresses in Luxembourg, as customers to whom those numbers are assigned are typically multinational. This view is held to some extent in France, where the regulator permits freephone numbers (but not shared revenue numbers) to be used without such a rule[103].

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[100] Sections 7.1.7 and 8.1.4, ITU-T Recommendation ITU-T E.164.1: Criteria and procedures for the reservation, assignment and reclamation of E.164 country codes and associated identification codes (ICs), https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.164.1-200809-I!!PDF-E.

[101] Articles 1 and 2, Loi du 7 juin 2017 portant modification de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2017/06/07/a557/jo.

[102] Articles 2 and 4(1), Loi du 27 juin 2018 adaptant la procédure pénale aux besoins liés à la menace terroriste et portant modification 1) du Code de procédure pénale, 2) de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques, 3) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://www.legilux.lu/eli/etat/leg/loi/2018/06/27/a559/jo.

[103] Articles 2.4.3(e), Plan national de numérotation – Version du 1er août 2019, Décision n° 2018 0881 modifiée de l'Autorité de régulation des communications électroniques et des postes en date du 24 juillet 2018 établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/18-0881.pdf.

#### 2.2.3.4 Considerations for the numbering regulation

While a mailing address in Luxembourg might suffice for receiving legal documents it will not suffice for lawful interception. For that purpose control of an interconnection point is needed. Getting a court order for lawful interception in another country might be quite complex and call for international co-operation between law enforcement agencies. Consequently the interconnection point might require to be controlled in Luxembourg, not in another country. This requirement is analogous to one of those stated above for France, given that control necessitates physical presence.

The requirements in France noted above are placed on both customers and ECNS providers: the customers must have links with the country and the ECNS providers must have interconnection points in the country. As ECNS providers need to be allocated publicly accessible numbers by ILR only if they assign them to customers, the revised numbering regulation in Luxembourg should place the requirements on the ECNS providers, not on the customers (over whom ILR has control only through the ECNS providers). Moreover, these requirements should not preclude making numbers available for extraterritorial uses in accordance with the European Electronic Communications Code[104].

**In the consultants' opinion:**

- **ILR should consider requiring that an organisation can be allocated Luxembourg numbers only if either the allocations are permitted in reciprocal arrangements for extraterritorial uses of numbers or both of the following conditions apply:**
    - **The organisation assigns such numbers only to customers that have links with Luxembourg (but not necessarily permanent presence there); for instance, the customers might have family members, work associates or business clients in Luxembourg.**
    - **The organisation routes through interconnection points controlled in Luxembourg all communications to and from such numbers that it assigns to customers.**

[104] Article 93(4), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

## 2.3 Number administration

### 2.3.1 The removal of reservations

In many countries reservations of numbers are not permitted; where they are permitted they are little used. They are useful mainly if two ECNS providers are competing to provide services to a customer that wants particular numbers; however, in Luxembourg the current numbering regulation does not provide for this. It is also made somewhat complicated by allowing reservations to be extended by up to one year[105].

In Luxembourg there are no "utilisation thresholds" (which are discussed in Section 2.3.5), except for M2M numbers[106]. Also, the fees for allocated numbers are the same as the fees for reserved numbers, except for M2M numbers[107]. Consequently ECNS providers lose nothing by having allocations instead of reservations, provided that for M2M numbers the utilisation threshold is abolished and the fees are made equitable[108].

Overall, reservations in Luxembourg do not have a clear role. Nonetheless, for convenience this report mentions them in various contexts (such as those of Sections 2.3.2 and 2.3.3) in case the revised numbering regulation provides for them.

**In the consultants' opinion:**

- **ILR should consider eliminating reservations.**

### 2.3.2 Basic administrative processes

#### 2.3.2.1 Stakeholder views

A majority (80%) of the respondents to the stakeholder questionnaire found no faults in the handling of requests to reserve, allocate or allow the return numbers. The remainder indicated that improvements would be welcome, to automate the acceptance of requests through a real-time interface accessible by ECNS providers. However, as one respondent that wanted these improvements commented, the volume of requests would probably not justify the foreseeable costs of such improvements.

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[105] Articles 5(1)-5(2).

[106] Article 48(1)(d).

[107] Article 5(3).

[108] Articles 13(4)(a)-13(4)(b).

#### 2.3.2.2 Considerations for the numbering regulation

The current numbering regulation requires decisions to accept or refuse requests for allocations to be taken in forty days[109]. In practice they normally take less time. The European Electronic Communications Code permits three weeks[110].

Handling requests to reserve or allow the return of numbers need be no more time-consuming than handling requests to allocate numbers. Much the same is true for requests to transfer numbers. Accordingly, for convenience this report mentions them in various contexts without prejudging whether the revised numbering regulation provides for them.

**In the consultants' opinion:**

- **The revised numbering regulation should state that requests for ILR to reserve, allocate, transfer or allow the return of numbers will normally be accepted or refused within three weeks.**

### 2.3.3 Block sizes

#### 2.3.3.1 Stakeholder views

The stakeholder questionnaire asked respondents to state, for each class of number (defined by its initial digit sequences), the quantities of numbers allocated to them, assigned by them and ported to or from them. For several respondents the allocations identified in the responses (from January 2020) differed from the internal records of ILR as well as from the records of the Systor database (from March 2020).

#### 2.3.3.2 Considerations for the numbering regulation

ILR may accept or refuse requests by ECNS providers that ILR reserve, allocate or withdraw numbers[111]. In the current numbering regulation the requests may be accepted for individual numbers or for blocks[112]. Such requests can fragment the numbering space and raise administrative costs.

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[109] Article 6(2).

[110] Article 94(3), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[111] Articles 6-8.

[112] Articles 6(3) and 8(1).

Though ECNS providers can return numbers only if ILR accepts their requests, ILR can withdraw numbers in other circumstances that are already described in the current numbering regulation[113].

**In the consultants' opinion:**

- **ILR should accept requests to reserve, allocate, transfer or allow the return of numbers only for contiguous whole blocks, each of which has the minimum size specific to the class of numbers. For instance, for numbers with a block size of 1'000, an applicant requesting 2'000 numbers would be allocated two blocks each of 1'000 numbers, not one block of 10'000 numbers, and an applicant requesting 1 number would be allocated one block of 1'000 numbers. In consequence, ECNS providers can return only whole blocks.**

### 2.3.4 Number recycling

The numbering plan appears to have plenty of capacity for the foreseeable future. However, this conclusion rests on an assumption that reasonable care will be taken to prevent numbers from being wasted.

Numbers are particularly likely to be forgotten when they are abandoned by the customers to whom they are assigned. This can happen, for example, if they are distributed on calling cards for tourists, if they are discarded as alternative numbers after being ported, or if they are associated with M2M devices or eCall vehicles that are scrapped. They should then be "recycled"; in other words, they should be handed back to the ECNS providers to whom they were allocated (and who might assign them again after quarantining them). For eCall vehicles the requirement to recycle numbers is noted by ECC Recommendation (17)04[114].

[113] Articles 8(2)-8(3).

[114] ECC Recommendation (17)04: Numbering for eCall, https://docdb.cept.org/download/093ec180-31a3/Rec1704.pdf.

The current numbering regulation includes requirements for recycling mobile numbers that have been ported and are regarded as abandoned[115]. The same requirements appear in the fixed number portability regulation (relating to postpayment customers only)[116].

The basis for regarding numbers as abandoned includes a requirement that the customers do not use them for a period of twelve months (in the case of prepayment customers)[117]. Towards the end of the period the customers should be warned (potentially more than once).

The current numbering regulation takes the period of quarantine to be six months[118]. Such requirements (including the period of quarantine and the basis for regarding numbers as abandoned) should apply to all numbers, regardless of whether the numbers have been ported.

The period of quarantine can affect the quantities of numbers that need to be allocated, especially when an ECNS provider needs numbers for frequent brief assignments (in temporary events, for example). Then the ECNS provider would either request ILR to allocate many numbers once or request ILR to allocate and subsequently withdraw fewer numbers on demand frequently. Frequent demands would strengthen the case for automating the acceptance of requests to allocate and withdraw numbers mentioned in Section 2.3.2.

**In the consultants' opinion:**

- **The revised numbering regulation should carry over from the current numbering regulation the period of quarantine and the basis for regarding numbers as abandoned.**
- **The revised numbering regulation should require that:**
    - **Numbers that have been ported and that are regarded as abandoned cease to be ported, so that the ECNS providers to whom they were allocated take back all rights and responsibilities associated with them.**

[115] Articles 26(8)-26(9).

[116] Article 17(7), Règlement 16/204/ILR du 1er avril 2016 fixant les règles relatives à la portabilité des numéros téléphoniques dans les réseaux fixes en vertu de l'article 47(1) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/rilr/2016/04/01/n1/jo.

[117] Article 26(8).

[118] Article 9(4).

- **Customers are warned (potentially more than once) as their numbers proceed towards becoming regarded as abandoned.**
- **Numbers that have been assigned are quarantined before they are assigned again.**

### 2.3.5 Utilisation thresholds

One way of avoiding the wastage of numbers is to introduce "utilisation thresholds". These are essentially the proportions of numbers that are required to be assigned before more are allocated (taking account of the numbers that are quarantined or ported, for example). They should be set with reference to the length and complexity of the sales distribution channels for SIMs. They typically range between 50% and 80%, though in Latvia they can often be only 30%[119].

Utilisation thresholds are useful if numbers are likely to become in short supply; for instance, they were introduced for fixed numbers and mobile numbers in Ireland in 2018 after five years of investigation[120]. They have not been introduced in several countries (such as Belgium and the Netherlands, among the reference countries). There are several other ways of reducing wastage; in particular, in the United Kingdom there are no utilisation thresholds but for many geographic areas there are numbering fees and block sizes of 100 or 1'000[121,122].

Numbers are liable to be hoarded or never recycled, especially in countries without utilisation thresholds or annual fees. Utilisation thresholds might be necessary if the annual fees for allocated numbers do not act as reminders and incentives to return unwanted numbers. Annual fees are already collected in Luxembourg, so making the fees high enough to act as significant incentives might be more appropriate than introducing utilisation thresholds.

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[119] Article 22.12, Noteikumi par numerācijas lietošanas tiesībām, https://likumi.lv/ta/id/278327-noteikumi-par-numeracijas-lietosanas-tiesibam.

[120] Articles 6.1.9 and 6.1.10, Numbering Conditions of Use and Application Process, https://www.comreg.ie/publication-download/numbering-conditions-of-use-and-application-process-document.

[121] Article B.15, General Conditions of Entitlement Unofficial Consolidated Version, https://www.ofcom.org.uk/__data/assets/pdf_file/0021/112692/Consolidated-General-Conditions.pdf.

[122] Articles B3.1.7 and B3.1.9, The National Telephone Numbering Plan, https://www.ofcom.org.uk/__data/assets/pdf_file/0013/102613/national-numbering-plan.pdf.

### 2.3.6 Numbering fees

#### 2.3.6.1 International background

The tables below compare the initial and annual fees in Luxembourg for allocated numbers with those in the reference countries. In the tables, an entry is '-' if a fee has not been set (typically because there are no numbers designated for the corresponding service) and is '0.0000' if the fee is zero. The notation "40,000; 400,000" indicates that the amount is 40'000 in some cases and 400'000 in others.

| Service | Initial fee (EUR/number) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Luxembourg | Belgium | Denmark | France | Germany | Ireland | Netherlands | Norway | Switzerland |
| Fixed | 0.1000 | 0.0032; 0.0320 | 0.0000 | 0.0000 | 0.0300; 0.3000 | 0.0000 | 0.0230 | 0.0000 | 0.0375 |
| Nomadic | 0.1000 | - | - | 0.0000 | 0.0300 | 0.0000 | 0.0230 | 0.0000 | - |
| Mobile | 0.1000 | 0.0127 | 0.0000 | 0.0000 | 0.0003 | 0.0000 | 0.0230 | 0.0000 | 0.0375 |
| M2M | 0.0001 | 0.0013 | 0.0000 | 0.0000 | - | 0.0000 | 0.0005 | 0.0000 | - |
| Freephone | 0.1000 | 1.2650 | 0.0000 | 0.0000 | 12-555 | 0.0000 | 88; 45 | 0.0000 | 75.0000 |
| Shared cost | 0.1000 | 0.1265 | - | 0.0000 | 20-325 | 0.0000 | - | 0.0000 | 75.0000 |
| Shared revenue | 0.1000 | 0.1265; 1.2650 | 0.0000 | 0.0000 | 17-475 | 0.0000 | 88; 45 | 0.0000 | 75.0000 |
| Other | 0.0000 | - | - | 0.0000 | 0.0300-0.4000 | 0.0000 | 0.0230; 0.5100; 721 | 0.0000 | 0.0375 |
| Voice short code | 1,200 | 1,265 | 0.0000 | 0.0000 | 255-2,650 | 0.0000 | 88; 721 | 0.0000 | 196 |
| SMS/MMS short code | | 22 | | | | | | | |
| **Service** | **Annual fee (EUR/number)** | | | | | | | | |
| | **Luxembourg** | **Belgium** | **Denmark** | **France** | **Germany** | **Ireland** | **Netherlands** | **Norway** | **Switzerland** |
| Fixed | 0.1000 | 0.0640; 0.0127 | 0.2700 | 0.0200 | 0.0000 | 0.0000 | 0.0067 | 0.0030 | 0.0187 |
| Nomadic | 0.1000 | - | - | 0.0200 | 0.0000 | 0.0000 | 0.0067 | 0.0150 | - |
| Mobile | 0.1000 | 0.0190 | 0.2700 | 0.0200 | 0.0000 | 0.0000 | 0.0067 | 0.0100 | 0.0187 |
| M2M | 0.0001 | 0.0007 | 0.0027 | 0.0020 | - | 0.0000 | 0.0001 | 0.0001 | - |
| Freephone | 0.1000 | 0.9490 | 0.2700 | 0.0200 | 0.0000 | 0.0000 | 34; 17 | 0.0150 | 11.0000 |
| Shared cost | 0.1000 | 0.1897 | - | 0.0200 | 0.0000 | 0.0000 | - | 0.0150 | 11.0000 |
| Shared revenue | 0.1000 | 0.1897; 0.9490 | 0.2700 | 0.0200 | 0.0000 | 0.0000 | 34; 17 | 0.0150 | 11.0000 |
| Other | 0.0000 | - | - | 0.0200 | 0.0000 | 0.0000 | 0.067; 0.0665; 135 | 0.0150 | 0.0187 |
| Voice short code | 1,200 | 6.3230-15,807 | 27; 270; 2,700; 27,000 | 40,000; 400,000 | 0.0000 | 0.0000 | 34; 135 | 200; 300 | 1400 |
| SMS/MMS short code | | 105-111 | | | | | | | |

#### 2.3.6.2 Current Luxembourg situation

The current numbering regulation tabulates the fees for numbers[123]. However, it does not indicate clearly how the fees are calculated if the numbers are PBX extensions that do not have exactly eight digits; for instance, a single eight-digit number that was extended to eleven digits for a PBX with 1'000 extensions might be regarded as 1 number or as 1'000.

[123] Article 83.

#### 2.3.6.3 Stakeholder views

A majority (85%) of the respondents thought that the numbering fees were currently appropriate. However, the remainder considered that the fees were too high, especially bearing in mind the true costs of number management and the taxes paid to cover ILR expenses. One suggested that the fees were at least ten times those elsewhere in Europe. This suggestion is not justified by the tables above, which suggest, broadly, that the fees in Luxembourg are higher than some and lower than others in the reference countries that impose fees. Of course many countries, including some of the reference ones, do not impose fees or do not impose both initial fees and annual fees.

The responses to the stakeholder questionnaire about the quantities of numbers allocated by ILR and assigned to customers imply that ECNS providers do not return to ILR numbers that are not needed and do not find the fees very burdensome. This is confirmed by a response that commented that splitting larger ranges in order to return smaller blocks might complicate number management and increase administrative costs, and therefore might be more expensive than paying higher fees.

#### 2.3.6.4 Considerations for the numbering regulation

The levels of the fees could have clear motivations. For instance, they could be intended to simplify the revised numbering regulation (through the elimination of reservations, for example) or to encourage the migration to numbers having standard formats (with length eight and initial digit sequence '23', for example) from numbers having non-standard formats (with length six and initial digit sequence '22', for example). In the latter case they might apply rules like the following:

- A number having a length two less than the standard length would be regarded as occupying $10^2$ (in other words, 100) numbers having the standard length.
- A number having a length three more than the standard length would be regarded as ensuring the occupancy of the $10^3$ (in other words, 1'000) numbers having the same length and the same digits except for the final three.

**In the consultants' opinion:**

- **ILR should review the numbering fees, bearing in mind that:**
    - **Lowering the fees for allocated M2M numbers from €10 to €3 per 10'000 numbers could allow the elimination of reservations in favour of allocations, while making very little change to the payments by ECNS providers and receipts by ILR (on the assumption that reservations last two years).**

- **Charging for each number with *n* digits too few (relative to the standard length) the fee for $10^n$ numbers having the standard length could hasten the withdrawal of fixed numbers having non-standard lengths.**
- **Charging for each number with *n* digits too many (relative to the standard length) the fee for 1 number having the standard length could encourage the assignment of fixed numbers having the standard length.**
- **Replacing the fees for portions of blocks by fees for complete blocks (of 1'000 numbers) could inhibit fragmentation.**

Of course ECNS providers will change their behaviours when fees change only if there are net benefits to them: the internal administrative costs after the change must be less than some years of annual fees would be without the change. This should be reflected in the level of the fees.

In countries where there are fees, the fees are often specified in a document that can be revised more readily than the numbering regulation. Doing this provides some flexibility. It is especially appropriate if the fees are intended to cover part of the costs of the regulator according to the annual budget.

**In the consultants' opinion:**

- **ILR should consider specifying the numbering fees in a document that is not the revised numbering regulation.**

## 2.4 Number documentation

### 2.4.1 Roles of the numbering plan and numbering register

The current states of certain numbers are not consistent with those specified in the current numbering regulation. For instance, the regulation is no longer correct in its statements about mobile numbers, which include "*Seuls les blocs des plages «621», «628», «661», «668», «671», «678», «691», «698» et «6799yxxx» sont attribués*"[124].

Mismatches like this arise if regulations specify small details that are likely to change (such as whether particular numbers are allocated). Amending such details requires legislative effort.

[124] Article 48(2)(d).

For instance, in Luxembourg an amending regulation has been needed to provide numbers beginning with '242' and having standard formats[125].

Legislative processes are not well suited to making small, frequent or technical changes. Good international practice is that even if the numbering plan is determined by legislation, changes in the availability of numbers should not be. Information on which numbers are free for allocation belongs in the numbering register, not in the numbering regulation or the numbering plan, unless it is likely to remain correct for many years.

Probably because items are specified in both its 'rules' part and its 'plan' part, the current numbering regulation contains minor contradictions about:

- The fees for reservations[126].
- The length and digit sequences of numbers beginning with '04'[127].
- The need for ILR to allocate numbers beginning with '05'[128].

Though the list of emergency numbers could be integrated with provisions on emergency calls in the revised numbering regulation it is currently given in a regulation on its own[129].

**In the consultants' opinion:**

- **Specific details of the designations of numbers (in the sense of Section 2.1.2), should be in the numbering plan, not in the revised numbering regulation. For instance, the numbering plan might show the range '23000000-23999999' as designated for fixed services and the range '45000000-45999999' as not yet designated for any services. In consequence, the revised numbering regulation should not mention specific numbers.**

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[125] Article 1, Règlement ILR/T17/1 du 19 mai 2017 relatif à l'ouverture de la plage « 242 » du plan national de numérotation et portant modification du règlement 14/174/ILR du 14 juillet 2014 portant sur les règles relatives à la numérotation, sur le plan national de numérotation et sur les redevances relatives aux ressources de numérotation, http://data.legilux.public.lu/eli/etat/leg/rilr/2017/05/19/a511/jo.

[126] Articles 5(3) and 83(4)(a).

[127] Articles 28(4) and 56(4).

[128] Articles 12 ("*Tableau «Modalités d'attribution par l'Institut»*") and 57.

[129] Règlement 14/182/ILR du 26 août 2014 relatif à la détermination de numéros d'urgence au sens de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques, http://legilux.public.lu/eli/etat/leg/rilr/2014/08/26/n1/jo.

- **Specific details of the states of designated numbers (in the sense of Section 2.4.6) should be in the numbering register, not in the numbering plan. For instance, the numbering register might show the range '23456000-23456999' as allocated to 'ABC' and the range '34567000-34567999' as free.**
- **Any conditions of use that limit the services using numbers should be in the revised numbering regulation, which should not identify any number ranges. For instance, nomadic services might be required to provide caller location information in emergency calls, regardless of which numbers they use.**
- **ILR should keep the list of emergency numbers separate from the revised numbering regulation so that it can be revised without amending the revised numbering regulation.**

### 2.4.2 Changes to the numbering plan

The current numbering regulation provides for notifications six months before new numbers replace old ones and for new numbers to operate in parallel with old ones for six months[130]. In many countries the regulations include further provisions about making major changes to the numbering plan. No shortage of numbers is foreseen in Luxembourg, so no such further provisions are needed.

**In the consultants' opinion:**

- **There is no clear case for refining the processes in the current numbering regulation for making major changes to the numbering plan.**
- **The revised numbering regulation should carry over from the current numbering regulation the period of notification and the period of parallel operation needed for making major changes to the numbering plan.**

### 2.4.3 Publication of the numbering plan

Both the numbering register and the numbering plan are expected to be published, potentially in the format intended for numbering plans in ITU-T Recommendation E.129[131]. As the numbering register has details that change fairly frequently and need not be communicated

[130] Articles 9(1)-9(2).

[131] Section 8.2, ITU-T Recommendation E.129: Presentation of national numbering plans, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.129-201301-I!!PDF-E.

to the ITU a different format might be preferred for it. However, the numbering plan should be available on the ITU web site (and, preferably, the regulator web site) in that format. Indeed ILR used that format when communicating updates to ITU in 2018[132].

Publishing the numbering plan in this format would be easier if the numbering plan were separated from the revised numbering regulation, at least by its presentation and position in the document, and perhaps also conceptually; for instance, it might become a schedule to the regulation rather than an integral part of it.

**In the consultants' opinion:**

- **The numbering plan could usefully be published in the format of ITU-T Recommendation E.129.**

### 2.4.4 Access to the numbering register

In many countries (such as the reference countries) the numbering register is publicly accessible, without the use of passwords, which are needed in Luxembourg[133]. A publicly accessible numbering register has at least the following advantages:

- It lets users find out, for example, which ECNS providers offer carrier selection or assign shared revenue numbers.
- It is used internationally by the police to identify ECNS providers to whom have been allocated numbers suspected of fraudulent activity[134].
- It fulfils the requirement under the European Electronic Communications Code to make decisions about allocations public[135].

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[132] Luxembourg (country code +352), https://www.itu.int/dms_pub/itu-t/oth/02/02/T020200007D0001PDFE.pdf.

[133] Article 4(2).

[134] Paragraphs 27 and 31, BEREC summary report on the Workshop on Fraud & Misuse of the E.164 number range, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8908-berec-summary-report-on-the-outcomes-of-_0.pdf.

[135] Article 94(3), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

Making the numbering register publicly accessible could help spammers to dial just allocated numbers (instead of all numbers). However, the spammers would probably prefer to dial just assigned numbers, which can be found in directories that are already publicly accessible.

**In the consultants' opinion:**

- **The numbering register should be publicly accessible.**

### 2.4.5 Audits of the numbering register

The current numbering regulation envisages that there would be occasional audits of the numbering register, in which the records held by ILR would be compared with those held by the ECNS providers[136]. In many countries the audits are scheduled at yearly intervals. In Luxembourg scheduling them to coincide with issuing invoices for the numbering fees would encourage ECNS providers to use allocations efficiently and return superfluous blocks.

Auditing involves comparing and reconciling the numbering register with the records held by the ECNS providers. The numbering register should be as complete and accurate as possible, to avoid clashes and to help forecast demand. A particular report generated each time by the same procedure from the Systor database could be taken to be the numbering register. Documents used for other purposes would be reconciled with it.

The generation by ILR of the numbering register from the Systor database might offer automatic reconciliation of the numbering register with the records held by the ECNS providers. However, it would assume that those records are up-to-date. In the past, ECNS providers sometimes assigned numbers that were not allocated to them, so their records might still differ from those in the Systor database. Comparing their records with those in the Systor database would allow mismatches to be found easily.

Auditing could reveal other useful information that is not usually present in numbering registers, such as the quantities of numbers assigned to customers. The ECNS providers could provide this information along with the information on the quantities of numbers allocated by ILR. In particular, informing ILR about the quantities of assigned numbers would allow ILR to monitor how efficiently numbers were used.

ILR needs to note trends in the demand for numbers that could affect its planning. These can be derived by comparing projected and actual demand in previous years and projected demand in coming years. Regulators sometimes ask for five-year projections but those are usually very uncertain; one-year projections can guide immediate action. Consequently the

[136] Article 11(1).

ECNS providers should state the quantities of numbers expected to be assigned to customers over the coming year, as well as the quantities of numbers already assigned to customers. The monitoring mentioned in Sections 3.2.1, 3.4.2 and 3.5.1 would use historical records and these projections to determine whether certain numbers could become candidates for withdrawal. The annual report on number use in the Netherlands illustrates this[137].

To simplify comparisons different ECNS providers should adopt the same formats for the information.

**In the consultants' opinion:**

- **ILR should conduct an annual audit of the numbering register, preferably at the time of issuing the invoices for numbering fees, to compare the records in the Systor database against the records held by the ECNS providers.**
- **The information provided by different ECNS providers for audits of the numbering register should be presented in the same format for holding by ILR in confidence, and should include:**
    - **The block size and number length (for each block).**
    - **The quantities of numbers assigned to customers, quarantined, ported in from other ECNS providers, ported out to other ECNS providers, supplied to other ECNS providers for service resale and used for internal network purposes (for each block).**
    - **The proportion of numbers expected to have been assigned to customers at the end of the next year (for each block).**
    - **The quantities of numbers expected to be have been requested for allocation by the end of the next year (for each service).**

The quantities and expected proportions should not appear in the publicly accessible number register, but they would help with forward planning and consistency checking. More details besides these are required in some countries, especially if numbers are scarce or disproportionately held by one ECNS provider.

[137] Monitor Nummeruitgifte 2019, https://www.acm.nl/sites/default/files/documents/2020-08/monitor-nummeruitgifte-2019.pdf.

### 2.4.6 States in the numbering register

The current numbering regulation names five states of numbers, which are free (*libre*), reserved (*réservé*), allocated (*attribué*), blocked (*bloqué*) and unusable (*inutilisable*)[138]. Different states of numbers follow from different administrative actions that change the rights of ECNS providers to the numbers in the ways mentioned in Section 2.1.2. Documenting the movements between the states can summarise the effects of the actions.

For instance, designated numbers might be free, reserved, allocated or blocked, while other numbers would be unusable. Actions by ILR that changed the state of a number from one of the first four states into another of them would change the numbering register, while actions by ILR that changed the state of a number between one of the first four states and the fifth would change the numbering plan as well. The table below indicates, as an example, which changes of state are brought about by different actions. Similar changes of state are implicit in the numbering register in Belgium[139].

| ILR action | State of the numbers… | |
|---|---|---|
| | Before the ILR action | After the ILR action |
| Acceptance of a request (from an ECNS provider) to reserve them | free | reserved |
| Acceptance of a request (from an ECNS provider) to allocate them | free | allocated |
| Acceptance of a request (from the ECNS provider for whom they have been reserved) to allow the return of them | reserved | free |
| Acceptance of a request (from the ECNS provider for whom they have been reserved) to allocate them | reserved | allocated |
| Withdrawal when the numbers remain designated and become available for reservation or allocation | allocated | free |

[138] Article 12(2)(c).

[139] Signification des symboles dans la base de données de numérotation, https://www.bipt.be/file/cc73d96153bbd5448a56f19d925d05b1379c7f21/2ff9be30547f5758401676c001357f88e492fd00/Signification_des_symboles_dans_la_base_de_donn%C3%A9es_de_num%C3%A9rotation.pdf.

| | | |
|---|---|---|
| Withdrawal when the numbers remain designated but do not become available for reservation or allocation, for example because they have not been quarantined, have been misused or have often been confused with frequently dialled numbers | allocated | blocked |
| Withdrawal when the numbers do not remain designated, for example because there is a number change | allocated | unusable |
| Decision that the numbers remain designated and become available for reservation or allocation | blocked | free |
| Decision that the numbers do not remain designated, for example because there is a number change | blocked | unusable |
| Decision that the numbers become designated and become available for reservation or allocation | unusable | free |

If the states are named in the revised numbering regulation then they should be defined there as the results of particular administrative actions. However, they are useful mainly in the numbering register; they could be defined alongside it (essentially as a guide to practice of the sort outlined in Section 2.1.7) and omitted completely from the revised numbering regulation; they could then be adjusted flexibly (to add or remove causes of blocking, for example).

**In the consultants' opinion:**

- **ILR should consider defining the states of numbers through an approach in which, instead of including extra details in the revised numbering regulation, ILR would prepare a guide to practice alongside the numbering register.**

## 2.5 Legitimacy of number supply other than by allocation or assignment

### 2.5.1 Transferring numbers between ECNS providers

#### 2.5.1.1 International background

According to ITU-T Recommendation E.190, numbers should not be sold, licensed or traded and should not be transferred, except in mergers, acquisitions, or joint ventures (when the transfers should be notified to the administrator)[140]. A widespread view is that this recommendation applies to all numbers that can be dialled or routed internationally. However, it can also be interpreted as referring only to numbers administered by ITU (for

[140] Section 6.2.6, ITU-T Recommendation E.190: Principles and responsibilities for the management, assignment and reclamation of E-series international numbering resources, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.190-199705-I!!PDF-E.

global services and networks). Interpretation of ITU instruments is the sovereign right of states. Moreover, ITU-T recommendations are not binding instruments: national regulators may make their own decisions about national numbers.

The term ”transfer” has several possible interpretations. In this report, a transfer of numbers between ECNS providers involves passing all of the rights and responsibilities associated with the numbers from one of the ECNS providers to the other; then it is equivalent essentially to withdrawing the numbers from the first ECNS provider and allocating them to the second. In these circumstances, any conditions on allocating numbers (such as that the numbers must form contiguous whole blocks) apply also to transferring numbers.

In the reference countries such transfers of numbers between ECNS providers usually require approval by the regulator subject to conditions like those for allocations. They are likely to be approved in any of the following circumstances:

- One of the ECNS providers takes over the services of the other, which is leaving that market.
- One of the ECNS providers merges with or acquires the other.
- One of the ECNS providers has ported, or is porting, many of the numbers from the other.

In fact, the regulator might welcome, or even require, transfers in several circumstances. For instance, in Norway the regulator may require a transfer of numbers to the ECNS provider to whom the highest proportion of them have been ported, if half of them have been ported from the ECNS provider to whom they were allocated[141].

#### 2.5.1.2 Current Luxembourg situation

The current numbering regulation refers to transfers of numbers in the context of porting numbers[142]. It does not refer to them in the context considered here[143]. However, transfers can occur under a supplementary regulation on the treatment of ported numbers in blocks taken

[141] Section 24, Forskrift om nummerressurser for elektroniske kommunikasjonsnett og -tjenester, https://lovdata.no/dokument/SF/forskrift/2004-02-16-426.

[142] Articles 23(2) and 27(1).

[143] Article 3(2).

out of service[144]. That regulation could reasonably apply to all numbers, but it currently applies to fixed numbers only, because it mentions GIE FNP[145]. Under it, if an ECNS provider requests the withdrawal of a block of fixed numbers, none of which is still assigned to customers by the ECNS provider, the block may be allocated to another ECNS provider to whom some of the numbers have been ported; that ECNS provider thereby acquires all of the rights and responsibilities associated with the numbers[146].

#### 2.5.1.3 Stakeholder views

The respondents to the stakeholder questionnaire noted in their interviews that letting one ECNS provider supply numbers to another is not only necessary in certain circumstances but also convenient in others, for consolidating allocated number blocks and simplifying administration.

#### 2.5.1.4 Considerations for the numbering regulation

Transfers are necessary in at least the circumstances mentioned above (because, for example, an ECNS provider is leaving a market or is acquired by another). Then all of the rights and responsibilities associated with the transferred numbers are passed to the other ECNS provider. There may be other circumstances in which transfers are convenient; the revised numbering regulation should provide for them.

**In the consultants' opinion:**

- **The revised numbering regulation should require that for a transfer of numbers:**
  - **Approval is obtained from ILR.**
  - **The parties are ECNS providers.**

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[144] Règlement ILR/T17/7 du 12 juillet 2017 relatif au traitement des numéros portés en service issus de blocs de numéros lorsque ces blocs sont mis hors service, http://data.legilux.public.lu/eli/etat/leg/rilr/2017/07/12/a653/jo.

[145] Article 2(2), Règlement ILR/T17/7 du 12 juillet 2017 relatif au traitement des numéros portés en service issus de blocs de numéros lorsque ces blocs sont mis hors service, http://data.legilux.public.lu/eli/etat/leg/rilr/2017/07/12/a653/jo.

[146] Article 3(1), Règlement ILR/T17/7 du 12 juillet 2017 relatif au traitement des numéros portés en service issus de blocs de numéros lorsque ces blocs sont mis hors service, http://data.legilux.public.lu/eli/etat/leg/rilr/2017/07/12/a653/jo.

- **All of the rights and responsibilities associated with the numbers are passed from one party to the other.**

### 2.5.2 Supplying numbers to service resellers

#### 2.5.2.1 International background

The European Electronic Communications Code refers to transfers in both the context of supplying numbers and the context of porting numbers[147]. It indicates that regulators should specify in which circumstances the rights and responsibilities associated with allocated numbers may be passed to other organisations[148]. For instance, organisations might want to reduce their interactions with the regulator or to use a network with numbering that is already operating; then they would prefer not to have their own allocations of numbers. Because of charging and routing complexities they might also prefer not to adopt an alternative stratagem, of porting unused (but nominally assigned) numbers from an operating network. In general, requesting supplies of numbers from an ECNS provider can be a useful alternative to both requesting allocations of numbers from the regulator and porting numbers from an ECNS provider.

The terms "suballocation" is often used to cover supplying numbers in such circumstances. It is avoided in this report, which focuses on the particular case of Luxembourg.

#### 2.5.2.2 Current Luxembourg situation

According to the current numbering regulation, numbers must not be sold or supplied to other organisations except when ECNS providers assign them to users for services specified at the time of allocation[149]. Nonetheless, the current practice is that one ECNS provider may supply allocated numbers to another ECNS provider who resells its services to customers but who is not permitted to supply the numbers to further ECNS providers. This practice, permitting the supply of numbers for service resale, is similar to that in Belgium, where it was intended

[147] Articles 94(2) and 106(5), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX:02018L1972-20181217.

[148] Article 94(2), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX:02018L1972-20181217.

[149] Article 3(2).

originally to simplify routing (though it does not do so when the numbers supplied can be ported to other networks)[150].

In more detail, in Luxembourg one ECNS provider (the number supplier) supplies numbers with services that another ECNS provider (the service reseller) sells to customers. The service reseller owns the information about those customers. Some responsibilities associated with the numbers lie with the number supplier but fulfilment of them depends on this information; the service reseller has obligations either to fulfil the responsibilities on behalf of the number supplier or to pass the information to the number supplier. These obligations should be written into the contract between the number supplier and the service reseller.

#### 2.5.2.3 Stakeholder views

Overall the respondents to the stakeholder questionnaire were unsure about how responsibilities are currently split when numbers are supplied to service resellers. They noted that supplying numbers for service resale could enhance competition by splitting work efficiently between the number supplier (who operates the network) and the service reseller (who supports the customers)[151]. They recognised the potential need for carefully defined restrictions to let law enforcement agencies obtain and centralise user identification information in the "IR.COM" database[152].

Currently in Luxembourg there is a tacit prohibition of supply cascades (in which service resellers to whom numbers have been supplied then supply those numbers to other service resellers). Various respondents to the stakeholder questionnaire who explicitly favoured permitting the supply of numbers for service resale also favoured permitting supply cascades. They considered that prohibiting supply cascades would constrain the market unnecessarily, and that, if records of the numbers were made available to the agencies when necessary,

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[150] Article 5, 27 avril 2007 - arrêté royal relatif à la gestion de l'espace de numérotation national et à l'attribution et au retrait des droits d'utilisation de numéros, http://www.etaamb.be/fr/arrete-royal-du-27-avril-2007_n2007011252.html.

[151] For instance, one respondent stated "In order to allow for an efficient split of work between providers implementing numbers for specific services in their networks and other providers selling these services to end users, we see a need for allowing reselling models for such services."

[152] For instance, one respondent stated "The main restriction of selling a number should be clear identification of the end-user, since this restriction contributes the most to the public safety." Another stated:"Although it might make sense to impose some restrictions to allow the NRA to keep control over the compliant use of numbers, such restrictions should be defined carefully and be kept to a minimum."

customers to whom numbers had been assigned could be identified. However, obtaining these records could be slowed by supply cascades when it might need to be performed urgently.

#### 2.5.2.4 Considerations for the numbering regulation

An ECNS provider has responsibilities for ensuring compliance with the conditions of use for the numbers allocated to it. When the numbers are supplied for resale, these responsibilities lie with the number supplier, to whom the numbers were allocated. However, by law there are some responsibilities associated with the numbers that lie with the service reseller; for instance, the anti-terrorism law amendments to the electronic communications law require ECNS providers to provide information for the "IR.COM" database if they offer services using numbers[153]/[154]. Moreover, the service reseller needs to fulfil at least those responsibilities that relate to its own customers (unless it passes information about those customers to the number supplier).

The responsibilities that the service reseller must fulfil are specified in the contract between the number supplier and the service reseller; their fulfilment can be enforced either by direct application of the law to the service reseller or through the operation of the contract. Between them the number supplier and the service reseller have obligations to fulfil all of the responsibilities.

The table below shows, as an example, how the number supplier and the service reseller might split the obligations to fulfil numbering responsibilities. In it the number supplier operates the network and the service reseller supports the customers, corresponding with their respective roles. In particular:

- By selling a service with a number to a customer, the service reseller grants the customer the right to use a number as the address of a termination point of communications. The number supplier has the responsibility for carrying traffic to and from the termination point. Usually the right to use the number as the address is

[153] Articles 1 and 2, Loi du 7 juin 2017 portant modification de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2017/06/07/a557/jo.

[154] Articles 2 and 4(1), Loi du 27 juin 2018 adaptant la procédure pénale aux besoins liés à la menace terroriste et portant modification 1) du Code de procédure pénale, 2) de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques, 3) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://www.legilux.lu/eli/etat/leg/loi/2018/06/27/a559/jo.

granted after the network has been provisioned to carry traffic to and from the termination point.

- In the usage of this report, the number supplier supplies the numbers to the service reseller, who then provides a service with a number to a customer. The number supplier knows how many numbers have been supplied, but only the service reseller knows how many are actually used.

| **Whether the responsibility is fulfilled by the…** | |
|---|---|
| **Number supplier (dealing with the network)** | **Service reseller (dealing with the customer)** |
| Paying numbering fees | |
| Carrying traffic to and from termination points addressed by numbers | Selling a service together with numbers |
| Providing information for audits of the numbering register about numbers supplied | |
| | Providing assistance to customers |
| | Implementing pricing rules |
| | Providing information on prices (online and at the starts of calls and messages) |
| | Maintaining content and subscription rules for premium rate calls and messages |
| | Providing information for directories in accordance with customer choices |
| Providing physical and virtual access for lawful interception | Providing information for the “IR.COM” database |
| Using the central reference database for number portability | Porting numbers for customers |
| | Providing caller location information in emergency calls |
| Facilitating the presentation and suppression of incoming and outgoing line identifiers | |
| Barring in the network calls and messages following due requests | |
| Ensuring fulfilment of all of the numbering responsibilities | |
| Satisfying any network-related rules laid down when the numbers were allocated | Satisfying any customer-related rules laid down when the numbers were allocated |

When conducting audits or investigating problems, for example, ILR needs to know whether the number supplier or the service reseller has the obligations to fulfil particular responsibilities. A simple way of achieving this is to require that ILR is told about any deviations from the split of obligations in the table. Another is to prohibit deviations from that split (in which case ILR would not need to be told when numbers are supplied for service resale).

The split of obligations to fulfil numbering responsibilities between the number supplier and the service reseller could be the same for supplying numbers for service resale as it is for porting numbers between two ECNS providers, except that the service reseller does not take over numbers that have been assigned to customers already and does not hand back numbers that have been abandoned by customers after being assigned.

Even understood in this way, the supply of numbers for service resale is fairly complicated and potentially confusing (as the interviews with the respondents to the stakeholder questionnaire demonstrated). It is not obviously needed: number allocation can be used instead, if numbers are easily allocated and not expensive and if ECNS providers can subcontract tasks such as network operations and customer care. Of course, ECNS providers that subcontract tasks to other organisations keep the obligations to fulfil the responsibilities associated with numbers allocated to them.

**In the consultants' opinion:**

- **If the revised numbering regulation provides for the supply of numbers for service resale, it should require that for any such supply of numbers for service resale:**
    - **The split of the obligations to fulfil numbering responsibilities is specified in the contract between the number supplier and the service reseller.**
    - **Approval is obtained from ILR if the split of the obligations to fulfil numbering responsibilities deviates from one specified in a regulation or a code of conduct endorsed by ILR which allows for such deviations.**
    - **The number supplier and the service reseller are ECNS providers.**
    - **The service reseller will not subsequently supply the numbers to another organisation.**
- **If the revised numbering regulation provides for the supply of numbers for service resale, a working group should develop for endorsement by ILR a code of conduct that specifies a split of the obligations to fulfil numbering responsibilities between number suppliers and service resellers.**
- **ILR should consider prohibiting the supply of numbers for service resale.**

### 2.5.3 Trading in numbers by customers

#### 2.5.3.1 International background

Trading in numbers is widespread in many countries (not just the reference countries), even where it is prohibited; for instance, it occurred in Ireland even when it was prohibited there. In fact, in some countries the regulator sells attractive telephone numbers, just as the vehicle registrar sells attractive vehicle registration numbers. In several countries (such as Denmark and Norway, among the reference countries) number aggregators acquire numbers from ECNS providers for resale to users. The EU has not attempted to discourage this practice.

#### 2.5.3.2 Current Luxembourg situation

According to the current numbering regulation, numbers must not be sold or supplied to others except when ECNS providers assign them to users for services specified at the time of allocation[155]. The consultants have not found online advertisements of numbers (or SIMs with numbers) for sale.

#### 2.5.3.3 Stakeholder views

A majority (85%) of the respondents to the stakeholder questionnaire agreed with the statement in ITU-T Recommendation E.190 that numbers should not be sold, licensed or traded[156]. However, in their interviews they, along with others, often felt that trading could provide flexibility. One respondent noted that trading might be useful for individual numbers in specific ranges, such as those beginning with '800', especially in order to match numbers in different countries.

#### 2.5.3.4 Considerations for the numbering regulation

Wanting to use attractive numbers seems a harmless ambition, so permitting trading in them might be acceptable, if safeguards can maintain security and prevent hoarding.

To maintain security in the presence of number trading there must be no unregistered use: users who buy numbers from other users must register their subscription details (including confirmations of identity, for prepayment users) with the relevant ECNS providers[157]. This can

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[155] Article 3(2).

[156] Section 6.2.6, ITU-T Recommendation E.190: Principles and responsibilities for the management, assignment and reclamation of E-series international numbering resources, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.190-199705-I!!PDF-E.

[157] Articles 1 and 2, Loi du 7 juin 2017 portant modification de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2017/06/07/a557/jo.

be difficult to ensure, but it can be made more likely if registering changes of details is made easy in ways such as that described below. Moreover, unregistered use can occur regardless of whether there is number trading, as criminals can steal or borrow phones or even buy SIMs from dealers that are not conscientious about registration.

Trading between customers of the same ECNS provider can make registering changes of details easy: sales can proceed by simple requests to the ECNS provider to cancel assignments to the sellers and establish assignments to the buyers, thereby registering the subscription details. Such sales could reduce the appeal and likelihood of unregistered use; they would be more effective in this if the traded numbers could be ported to other ECNS providers in extensions to the same simple requests. Processes supporting such requests are not prohibited under the current numbering regulation.

Though the sale of numbers by individual users is fairly straightforward, the aggregation of numbers for resale can create complications. It forces regulators to take account of number aggregators, who acquire numbers for resale without taking responsibility for managing the services. Any hoarding of numbers would cause concern if numbers could be in short supply or accumulated by a monopolist. However, the aggregation of numbers does not usually waste much of the supply: number aggregators tend to buy blocks, extract the attractive numbers for resale and sell the remainder back.

The aggregation of numbers for resale can be discouraged by requiring that the ECNS providers to whom numbers are transferred support incoming calls by using the networks of the ECNS providers from whom the numbers are transferred. This requirement is imposed in Belgium[158]. However, it deals with resale by ECNS providers, not with resale by customers. It still lets customers to whom many numbers are assigned resell the numbers individually to others. Customers might be deterred from doing this if requests to ECNS providers for multiple assignments have high prices or close scrutiny.

**In the consultants' opinion:**

- **ILR should consider facilitating the introduction of simple processes that would let individual assigned numbers be passed seamlessly between different customers of different ECNS providers.**

[158] Article 5, 27 avril 2007 - arrêté royal relatif à la gestion de l'espace de numérotation national et à l'attribution et au retrait des droits d'utilisation de numéros, http://www.etaamb.be/fr/arrete-royal-du-27-avril-2007_n2007011252.html.

## 2.6 Number porting

### 2.6.1 Consolidation of the portability regulations

The provisions of mobile and fixed number portability are currently defined in two different regulations. In the two cases most of the provisions are similar[159,160] and could be gathered in the same regulation for the sake of clarity and consistency.

Gathering these provisions together would avoid letting them diverge further, which would lead to complications for consumers. In particular, divergences might create difficulties when combined packages (offering fixed telephony, mobile telephony and broadband, for example) are to be switched in their entirety or split to let the components be switched separately. The need to align the processes for fixed number portability and mobile number portability is stressed in ECC Recommendation (12)02[161].

**In the consultants' opinion:**

- **The revised numbering regulation should have a shared chapter on points common to both fixed number portability and mobile number portability.**

The shared chapter should remove differences between the requirements on mobile number portability and fixed number portability that are no longer necessary. The differences currently relate to:

- Numbers treated by individual routing systems[162].
- Documents and consents needed in approving porting[163].
- Delays in providing information[164].

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[159] Articles 13-28.

[160] Règlement 16/204/ILR du 1er avril 2016 fixant les règles relatives à la portabilité des numéros téléphoniques dans les réseaux fixes en vertu de l'article 47(1) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/rilr/2016/04/01/n1/jo.

[161] ECC Recommendation (12)02: Number Portability - Best Practices, https://docdb.cept.org/download/e33e1688-c2d0/REC1202.pdf.

[162] Article 14.

[163] Article 20.

[164] Article 21(2).

- Reasons for refusing to port numbers[165].
- Rights to delay or reschedule porting[166].
- Tones warning about pricing for ported numbers[167].
- Costs of routing[168].

There might also be two other chapters, on details specific to fixed number portability or mobile number portability that were best omitted from the shared chapter. Among these details are those in the code cited in the fixed number portability regulation[169]. The approaches to associating details with regulations discussed in Section 2.4.1 can be applied here, too.

The term "CRDB" would be commonly used in describing both fixed number portability and mobile number portability; it would be qualified, to become "fixed number CRDB" or "mobile number CRDB", if necessary.

**In the consultants' opinion:**

- **Corresponding details for fixed number portability and mobile number portability should be replaced by whichever is technically more advanced, if this is technically feasible.**

### 2.6.2 Administrative arrangements for porting

The regulations mention GIE Telcom and GIE FNP as the CRDB operators (and GIE Telcom as the SMS/MMS short code database operator). Such provisions could become outdated even though their main purposes remain unchanged.

Choosing and changing the CRDB operators should be responsibilities of ILR in consultation with the ECNS providers, as outlined in Section 2.1.9. This is foreshadowed to some extent in the current numbering regulation[170].

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[165] Article 22(1)(i).

[166] Article 23(1).

[167] Articles 25(2)-25(4).

[168] Article 27(2)(c).

[169] Procedure for fix number portability, https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-92.pdf.

[170] Article 24(7).

CRDB data should be available at cost and should not be used for commercial activities, in accordance with ECC Recommendation (16)01[171].

**In the consultants' opinion:**

- **The revised numbering regulation should specify requirements on the availability and use of CRDB data, instead of naming specific CRDB operators.**

### 2.6.3 Consumer protection measures for porting

The current numbering regulation provides a delay of up to three working days in the transmission of information from donor ECNS providers to customers[172]. This is more than enough to let the donor ECNS providers gather the information.

**In the consultants' opinion:**

- **The revised numbering regulation should specify the process and timescale for reversing porting if customers change their decisions.**

Though the current numbering regulation requires ECNS providers to make customers aware of the right to port numbers it does not state when the ECNS providers should do this[173].

**In the consultants' opinion:**

- **The revised numbering regulation should require that the right to port numbers is drawn to the attention of customers with every notice of change to the terms and conditions.**

The fixed number portability regulation requires that the interruption to service be the shortest possible[174]. With IP technology the interruption should be negligible for the fixed networks (if only the voice service is affected), just as for the mobile networks; it should be at

[171] ECC Recommendation (16)01: 3rd party access to Number Portability Data (NP Data), https://docdb.cept.org/download/247c1c0b-a469/REC1601.PDF.

[172] Article 21(2).

[173] Article 25(1).

[174] Article 9(2), Règlement 16/204/ILR du 1er avril 2016 fixant les règles relatives à la portabilité des numéros téléphoniques dans les réseaux fixes en vertu de l'article 47(1) de la loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/rilr/2016/04/01/n1/jo.

most one working day (as in practice it is now), under the European Electronic Communications Code[175]**.**

**In the consultants' opinion:**

- **The number regulation should require that any interruption to service during porting is limited to one working day.**

In many countries ECNS providers are not permitted to try to win back customers who are porting their numbers, as otherwise some customers might get preferential treatment to the detriment of competition.

**In the consultants' opinion:**

- **ILR should consider requiring that the ECNS provider from whom a customer is porting a number does not contact the customer without being requested.**

### 2.6.4 Practical difficulties with porting

#### 2.6.4.1 Stakeholder views

One respondent to the stakeholder questionnaire noted that occasionally manual input to the porting system was responsible for routing errors. In particular, one ECNS provider made mistakes in porting because it did not recognise four-digit PBX roots but only five-digit ones; to prevent this at least the size of the block and the length of the PBX root must be reflected in ILR databases.

Another respondent observed that large organisations have extremely complicated networks, so their ECNS providers should be free to co-operate with them to agree individual processes to replace the standard processes.

For numbering, the most significant problem in the porting system is the varying length of fixed numbers. One respondent to the stakeholder questionnaire stated that changing current fixed numbers to ones having exactly eight digits would be disproportionate, even though it would improve the porting system. However, the system should at least show whether a ported number is an individual customer number, a PBX root or a PBX extension. That same respondent believed that the GIE FNP working group should discuss whether porting should

[175] Article 106(1), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

be allowed for individual PBX extensions (which is possible in the current implementation, according to some respondents).

Where an organisation operates a PBX to give access to its staff, an individual PBX extension would not be ported. Also, where a landlord operates a PBX on behalf of several tenants of a building, only the landlord, who is the "end-user", has the right to port under the European Electronic Communications Code. However, the contracts between the landlord and the tenants could provide similar rights to the tenants[176].

#### 2.6.4.2 Considerations for the numbering regulation

**In the consultants' opinion:**

- **The size of a range that is ported (and that is often defined by the length of a PBX root) should be reflected in the portability database.**

## 2.7 Number misuse and fraud

### 2.7.1 The extent of the problem

#### 2.7.1.1 International background

Number misuse and fraud are manifested in unwanted calls and messages, which are mostly either unsolicited marketing or fraudulent calls. Among fraudulent calls "I will clean up your computer", "I need to check your online order details" and "ping" or "wangiri" (Japanese "one [ring] and disconnect") are widespread types. For instance, "ping" or "wangiri" calls, by being too brief to be answered, prompt puzzled recipients to make return calls to the relevant CLIs; often these are costly international or shared revenue destinations for which the fraudsters receive shares of the revenues.

As call costs have fallen, the quantities of unwanted calls have risen in recent years and the proportions of fraudulent calls appear to be growing (in the United Kingdom, for example)[177]. English-language calling has led the way, but French-language calling seems to be following, at least in France and Switzerland even if not currently in Belgium and Luxembourg.

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[176] Article 106(2), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[177] Landline Nuisance Calls W6, https://www.ofcom.org.uk/__data/assets/pdf_file/0033/159288/landline-nuisance-calls.pdf.

Low complaint levels do not necessarily indicate that there are few problems, especially if complaint procedures are hard to find or use. Moreover split responsibilities for complaint procedures (between the telecommunications regulator and the data protection commission in Ireland, for example) can be difficult to grasp; for instance, automated random or sequential dialling is a nuisance but not a breach of data protection.

Often fraudsters are outside the reach of national courts and collect money before much evidence of fraud can be assembled. Regulators point to successes in court proceedings, but they now know that far more is needed. There is also evidence that "do not call me" lists are not very effective; they might even attract unwanted calls by identifying numbers that are in use. Presenting CLIs to recipients of calls and messages is not enough; it can even create further nuisance, for customers whose numbers are used as fraudulent CLIs, leading to unwanted return calls or messages.

Technical treatments in networks or at terminals are much more likely than court proceedings to provide effective protection against unwanted calls. Sometimes ECNS providers implement such treatments voluntarily, while in other circumstances encouragement or regulation may be needed.

#### 2.7.1.2 Current Luxembourg situation

Anecdotal evidence suggests that unwanted calls have not yet caused significant problems in Luxembourg. In 2018, according to its annual report, the Commission Nationale pour la Protection des Données received 450 complaints, of which only 9% related to unsolicited marketing (including email and short messages); the monthly average complaint level increased, from 18 to 51, when the General Data Protection Regulation came into effect[178].

Between 2015 and 2017 a small "honey pot" trial took place, to assess unwanted calls in eight countries (Belgium, France, Germany, Italy, Luxembourg, the Netherlands, Spain and the United Kingdom): previously unused numbers were dedicated to receiving calls, which were counted. The resulting rates of random or sequential dialling were comparable for the eight countries (but only for Spain and the United Kingdom were they statistically significant)[179]. The proportion of calls originating domestically ranged between 60% and 100% in the other countries, but in Luxembourg the proportion was only 36%, which might reflect the smallness

[178] Rapport annuel 2018, https://cnpd.public.lu/dam-assets/fr/publications/rapports/cnpd/rapport-annuel-%2B-annexes-2018-CNPD-BD.pdf.

[179] On the Effectiveness of the National Do-Not-Call Registries, https://www.ieee-security.org/TC/SPW2018/ConPro/papers/sahin-conpro18.pdf.

of the population, the limited quantity of call centres or the good behaviour of call centres. More recent figures are not available.

#### 2.7.1.3 Stakeholder views

A majority (69%) of the respondents to the stakeholder questionnaire indicated that unwanted calling is not a big problem in Luxembourg at present. However, 52% indicated that it could become a problem within the next five years.

#### 2.7.1.4 Considerations for the numbering regulation

Concern about the growing problems at international levels has resulted in the development and revision of ITU-T Recommendations E.156 (which has now been approved) and E.157 (which is to be approved in 2021)[180,181]. These have been complemented by WTSA Resolutions 61 and 65[182,183].

**In the consultants' opinion:**

- **ILR should consider preparing a guide to practice on the provisions about international information sharing in ITU-T Recommendation E.156.**
- **ILR should review the conditions imposed on international CLI delivery after the revised version of ITU-T Recommendation E.157 is approved.**

[180] ITU-T Recommendation E.156: Guidelines for ITU-T action on reported misuse of E.164 number resources, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.156-202006-I!!PDF-E.

[181] ITU-T Recommendation E.157: International calling party number delivery, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.157-200911-I!!PDF-E.

[182] WTSA Resolution 61 (Rev. Dubai, 2012): Countering and combating misappropriation and misuse of international telecommunication numbering resources, https://www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.61-2016-PDF-E.pdf.

[183] WTSA Resolution 65 (Rev. Hammamet, 2016): Calling party number delivery, calling line identification and origin identification, https://www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.65-2016-PDF-E.pdf.

### 2.7.2 Technical treatments

#### 2.7.2.1 International background

Considerable experience has been gained of technical treatments for combating unwanted calls and messages, particularly in English-speaking countries. A BEREC survey describes briefly what is done in fifteen countries of the EU[184]. The feasible and effective techniques vary between networks. This report contains only a general summary.

Unwanted calls and messages are combated by examining their CLIs, which might then be barred. Information on which CLIs are barred might be kept in a database or result from applying immediate tests. Straightforward tests, in increasing order of difficulty, indicate that CLIs should be barred if:

- They are not properly formed.
- They have not been allocated by the regulator.
- They have not been assigned to customers.
- They are not used for outgoing calls and messages from the customers to whom they have been assigned, according to either statements by the customers (such as government departments and banks) or the regulation (as for shared revenue numbers).

Except perhaps for the last of these, the tests should be easy to implement in networks having centralised databases for number portability. However, they do not guard fully against number spoofing or cover CLIs with foreign country codes.

[184] Annex 1, BEREC summary report on the Workshop on Fraud & Misuse of the E.164 number range, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8908-berec-summary-report-on-the-outcomes-of-_0.pdf.

In a short term pilot scheme in France, numbers are barred unless they lie in ranges where the ECNS providers can guarantee that there is no spoofing; this leaves open how the guarantees are obtained and still does not cover CLIs with foreign country codes[185]. A long term plan might be to adopt the IETF STIR protocol, perhaps with its implementation counterpart SHAKEN, to certify CLIs[186,187]. However, to be fully effective this requires worldwide adoption. Meanwhile, some ECNS providers identify CLIs to be barred by detecting abnormal traffic patterns.

Even with such schemes there can be problems with CLIs, as in some countries callers may restrict the delivery or presentation of CLIs. Accordingly the revisions to ITU-T Recommendation E.157 introduce "special allocated numbers". These would be allocated by regulators to ECNS providers, who would associate them with calls for which the caller numbers could not be transmitted.

Barring CLIs in networks, as close to the sources of calls and messages as possible, allows efficient and effective use of transmission paths and of network-wide details about CLIs. A full picture can emerge most rapidly if the ECNS providers share the details; CLIs (or indeed ranges of CLIs) might be barred at the request of a majority of the relevant ECNS providers. For this purpose a shared database of barred numbers could be operated on behalf of the ECNS providers by an organisation selected through a conventional tender.

Many customers find that customer-independent barring of CLIs by their ECNS providers eliminates almost all unwanted calls and messages. Others, with different communication patterns or vulnerabilities, might need customer-specific barring and diversion of CLIs, which could be implemented in the networks or at their terminals: calls and messages that were not barred would be connected if the CLIs were acceptable to the customers and would be diverted otherwise.

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[185] Section 9, Décision n° 2019 0954 de l'Autorité de régulation des communications électroniques et des postes en date du 11 juillet 2019 modifiant la décision établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/19-0954.pdf.

[186] IETF RFC 8226: Secure Telephone Identity Credentials: Certificates, https://www.rfc-editor.org/rfc/rfc8226.txt.

[187] ATIS/SIP Forum NNI Task Group ATIS-1000074: Signature-based Handling of Asserted information using toKENs (SHAKEN), http://www.atis.org/sti-ga/resources/docs/ATIS-1000074.pdf.

Both customer-independent and customer-specific barring and diversion are likely to be wanted. For instance, the regulator in Switzerland has suggested that each ECNS provider would provide two lists of barred numbers; one would be maintained by the provider but its operation could be enabled or disabled by the customers, and the other would be maintained by the customers, who could add or remove numbers[188]. The corresponding regulation has been amended to require the provision of barring and the collection of information about miscreants[189].

Diversion can take several forms, such as sending calls to voice mail, requiring callers to input CAPTCHAs, and letting call recipients hear callers before accepting calls. It aims to ensure that before connections are completed callers must respond in ways that are not yet readily automated, but there is an unending game between diversion and call centre systems with ever more advanced algorithms. There are several possible moves, as illustrated in a survey[190].

The applications for barring and diversion at terminals mostly operate on smart phones; some have been suspecting of harvesting information for sale to unwanted callers. For home phones there are external boxes (and in some countries wireless phones) that act similarly.

#### 2.7.2.2 Current Luxembourg situation

The ECNS providers issue some warnings on their web sites, usually about “ping” or “wangiri” calls only. For mobile services (but not for fixed services) they offer facilities for customers to bar particular CLIs at the terminals. They state, also, that fraudulent CLIs are barred in the networks, but they do not describe how they determine which CLIs are fraudulent.

#### 2.7.2.3 Stakeholder views

A majority (67%) of the respondents to the stakeholder questionnaire indicated that unwanted calls and messages should be detected and barred, using a combination of manual reporting and algorithms. A majority (68%) stated that a database identifying the CLIs of calls and messages to be barred should be common to all ECNS providers.

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[188] Les Suisses seront mieux protégés contre les appels téléphoniques indésirables, https://www.rts.ch/info/suisse/11761928-les-suisses-seront-mieux-proteges-contre-les-appels-telephoniques-indesirables.html.

[189] Article 83, Ordonnance sur les services de telecommunication, https://www.bakom.admin.ch/dam/bakom/fr/dokumente/bakom/das_bakom/rechtliche_grundlagen/Vernehmlassungen/Vernehmlassung-FMG-2020/verordnung-ueber-fernmeldedienste.pdf.

[190] SoK: Everyone Hates Robocalls: A Survey of Techniques against Telephone Spam, https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7546510.

The responses on network structure tended to imply that the mobile number database and the fixed number database would not be immediately helpful in creating and maintaining such a database. However, the databases should at least be closely related, as much of the information (on which numbers have been assigned to customers) is required for both porting numbers and barring or diverting calls and messages.

#### 2.7.2.4 Considerations for the numbering regulation

Most technical treatments depend on identifying calls and messages (or CLIs) to be barred or diverted. Barring calls and messages and withholding the relevant revenues might appear to be anti-competitive practices but regulators are permitted to require them under the European Electronic Communications Code[191].

Customers should have their services restored rapidly if they can show that calls and messages from them have been barred or diverted mistakenly.

**In the consultants' opinion:**

- **ILR should consider requiring that ECNS providers prepare to implement techniques for the barring and diversion of calls and messages.**
- **ILR should consider clarifying the circumstances in which ECNS providers are permitted to bar or divert calls and messages.**

To assist in the prevention of unwanted calls, rules for enhancing justifiable trust in CLIs are suggested in ECC Recommendation (19)03[192].

**In the consultants' opinion:**

- **The revised numbering regulation should incorporate the provisions of ECC Recommendation (19)03 by requiring that:**
    - **CLIs that are set up in the terminals of users are tested before their first uses and periodically thereafter, to confirm that they will not be barred under established rules.**

[191] Article 97(2), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[192] ECC Recommendation (19)03: Measures for increasing Trust in Calling Line Identification and Originating Identification, https://docdb.cept.org/download/675ad3ab-e72d/ECCRec1903.pdf.

- **CLIs that are set up in the networks (instead of the terminals of users) are chosen so that they will not be barred under established rules.**
- **CLIs that are passed between countries include sufficient information to allow accounting, the country codes of the originating countries and any presentation restriction indicators set in the originating countries.**
- **CLIs that are not barred are presented in calls and messages to parties (such as emergency call centres) with the authority to override the presentation restriction indicators.**

### 2.7.3 Legal treatments

#### 2.7.3.1 International background

In the EU, consumer protection against unwanted calls is still largely based on national regulations implementing the 2009 ePrivacy Directive. Under this, recorded marketing calls should be directed only to consumers who have opted in to receiving them (with certain exceptions for existing customers of the organisations making the calls)[193]. However, member states can choose to permit live marketing calls to consumers who have not opted out. In some member states, consumers are deemed to have opted out of receiving live marketing calls unless they have explicitly opted in[194]. In Germany, this rule is enforced quite rigorously, with court proceedings and heavy fines, but consumers still receive many unwanted calls[195].

[193] Article 13(1), Directive 2009/136/EC of the European Parliament and of the Council of 25 November 2009 amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services, Directive 2002/58/EC concerning the processing of personal data and the protection of privacy in the electronic communications sector and Regulation (EC) No 2006/2004 on cooperation between national authorities responsible for the enforcement of consumer protection laws Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32009L0136.

[194] Article 11(3), Loi du 30 mai 2005 – relative aux dispositions spécifiques de protection de la personne à l'égard du traitement des données à caractère personnel dans le secteur des communications électroniques et – portant modification des articles 88-2 et 88-4 du Code d'instruction criminelle, http://legilux.public.lu/eli/etat/leg/loi/2005/05/30/n4/jo.

[195] Maßnahmenliste, https://www.bundesnetzagentur.de/DE/Sachgebiete/Telekommunikation/Verbraucher/Rufnummernmissbrauch/Massnahmenliste/Massnahmenliste-node.html.

A draft ePrivacy Regulation by the European Commission has yet to be accepted by national governments[196]. It would harmonise these national regulations to some extent and thereby complement the General Data Protection Regulation. It would cover such matters as using cookies, conferring consent in browser settings, processing metadata, handling communications about serious crimes (child abuse image distribution and terrorist plotting, for example), and cross-border co-operation. With the European Commission refreshed, the European Direct Marketing Federation and others have proposed starting a new draft instead of revising the existing one[197].

#### 2.7.3.2 Current Luxembourg situation

Under the data protection law unsolicited communications (with certain exceptions for existing customers) require prior consent[198]. Consumers are deemed to have opted out of receiving live marketing calls unless they have explicitly opted in[199].

In 2013, when the consumer code was under review, the Union Luxembourgeoise des Consommateurs suggested looking at the example of the "do not call me" list in Belgium as a way for consumers to show explicit lack of consent to being called[200]. However, no centralised

[196] Proposal for a Regulation of the European Parliament and of the Council concerning the respect for private life and the protection of personal data in electronic communications and repealing Directive 2002/58/EC (Regulation on Privacy and Electronic Communications), https://data.consilium.europa.eu/doc/document/ST-12633-2019-INIT/en/pdf.

[197] Joint industry letter on the ePrivacy Regulation, https://www.fedma.org/2019/10/joint-industry-letter-on-the-eprivacy-regulation.

[198] Article 11(3), Loi du 30 mai 2005 – relative aux dispositions spécifiques de protection de la personne à l'égard du traitement des données à caractère personnel dans le secteur des communications électroniques et – portant modification des articles 88-2 et 88-4 du Code d'instruction criminelle, http://legilux.public.lu/eli/etat/leg/loi/2005/05/30/n4/jo.

[199] Article 11(3), Loi du 30 mai 2005 – relative aux dispositions spécifiques de protection de la personne à l'égard du traitement des données à caractère personnel dans le secteur des communications électroniques et – portant modification des articles 88-2 et 88-4 du Code d'instruction criminelle, http://legilux.public.lu/eli/etat/leg/loi/2005/05/30/n4/jo.

[200] Projet de loi modifiant le code de la consommation (doc. parl. N° 6478), https://www.ulc.lu/fr/publications/detail.asp?T=2&D=descr&ID=419.

list like this has been introduced in Luxembourg (by contrast with many EU countries), although individual companies might well operate their own, as does, for example, Eltrona[201].

#### 2.7.3.3 Considerations for the numbering regulation

Over time the techniques for barring CLIs will become more advanced; however, so will the tools for introducing fraudulent CLIs.

**In the consultants' opinion:**

- **A working group should consider the technical and regulatory matters involved in preventing unwanted calls from becoming a problem in Luxembourg. These include:**
  - **The extent to which individual ECNS providers regard their own ways of preventing unwanted calls and messages as proprietary.**
  - **The mechanisms for customers to report unwanted calls and messages to the ECNS providers and relevant national authorities.**
  - **The protocols for ECNS providers and relevant national authorities to report unwanted calls and messages under ITU-T Recommendation E.156.**
  - **Any rules needed under the General Data Protection Regulation to let ECNS providers exchange information about call and message initiators.**
  - **Any shortcomings in the application at international boundaries of ECC Recommendation (19)03.**
  - **The introduction of "special allocated numbers" after the revised version of ITU-T Recommendation E.157 is approved.**
  - **The rules and techniques for authenticating CLIs, by straightforward rule application, certification and traffic pattern detection.**
  - **The feasibility of exploiting the number portability databases in implementing CLI authentication.**
  - **The split between network and terminal activities for the barring and diversion of unwanted calls and messages.**

[201] Politique de protection de la vie privée, https://eltrona.lu/storage/app/uploads/public/5b9/146/026/5b9146026068b457550178.pdf.

- **Ways of identifying and protecting the customers who are most likely to be harmed by unwanted calls and messages (which may well be especially directed at them).**

# 3 The numbering rules for particular services

## 3.1 The structure of the numbering plan

### 3.1.1 Description of the numbering plan

For each designation of numbers in Luxembourg the table below displays:

- The service using the numbers (column 1).
- The first digit and length of the designated numbers (columns 2 and 3).
- The quantities of numbers designated by ILR, allocated to ECNS providers and (in some cases) assigned (columns 4, 5 and 7).
- The proportions of designated numbers that are allocated and (in some cases) the proportions of allocated that are assigned (columns 6 and 8).
- The proportion of allocated numbers that according to the current numbering regulation must be assigned to customers before the regulator will agree to allocate more numbers to a given ECNS provider (column 9).
- The constraints on the block sizes in allocations given in the current numbering regulation (column 10).

In the table, the quantities of designated numbers are the quantities of numbers in the relevant ranges except the unusable ones, which are marked as “not in use” in the ILR database. The notation “1,000; 10,000” indicates that the amount is 1’000 in some cases and 10’000 in others.

| Service | First digit | Length | Designated numbers | Allocated numbers | Allocated numbers per designated number | Assigned numbers | Assigned numbers per allocated number | Utilisation threshold | Block size |
|---|---|---|---|---|---|---|---|---|---|
| Fixed | 2-5; 7-9 | 4-11 | 5,160,000 | 4,243,000 | 82% | 273,300 | 6% | - | 1,000; 10,000 |
| Nomadic | 2 | 8 | 1,000,000 | 184,500 | 18% | | | - | 1,000; 10,000 |
| Mobile | 6 | 9 | 14,000,000 | 3,592,000 | 26% | 850,000 | 24% | - | 1,000; 10,000 |
| M2M | 6 | 12 | 10,000,000,000 | 2,880,000 | 0% | 101,800 | 4% | 80% | 10,000 |
| Freephone | 8 | 8 | 80,000 | 29,000 | 36% | | | - | 1,000; 10,000 |
| Shared cost | 8 | 8 | 80,000 | 4,000 | 5% | | | - | 1,000; 10,000 |
| Shared revenue | 9 | 8 | 229,000 | 102,001 | 45% | | | - | 1,000; 10,000 |
| Other | 0 | 12 | 1,000,000,000 | 340,000,000 | 34% | - | - | - | 10,000,000 |
| Voice short code | 1 | 3-6 | 1,982 | 177 | 9% | | | - | 1 |

The “other" numbers in the table are the numbers beginning with ‘0’ that can be allocated by ILR according to the national numbering plan[202]. They are obtained by extending the initial digit sequence to the allowed length and are given meanings by the ECNS providers to whom they are allocated. They are the only numbers in the table that are not publicly accessible.

The voice short codes are the numbers beginning with ‘1’ that can be allocated by ILR according to the national numbering plan[203]. They currently begin with ‘11’, ’12, ‘13’ or ‘15’. There are also some short codes (such as ones for accessing voice mail boxes) that begin with other digits and are not documented in the national numbering plan. Fuller details of all of these are given in Section 3.5.1.

The SMS/MMS short codes in the table are mentioned in the current numbering regulation[204]. The regulation constrains the prices and sequences of messages to limit “bill shock” but does not identify the short codes, which begin with ‘64’ and ‘67’.

Fixed numbers that begin with ‘2’ but not with ‘22’, ‘24’, ‘25’ or ‘29’ have eight digits by default but may have nine or ten digits if ILR so approves[205]. In this report they are described as “standard” and other fixed numbers are described as “non-standard”. The non-standard numbers, which begin with ‘22’, ‘24’, ‘25’, ‘29’, ‘3’, ‘4’, ‘5’, ‘7’, ‘8’ or ‘9’, have six digits by default; those six digits were themselves obtained from five digits, often by inserting ‘0’. In fact, fixed numbers are said to have between four and eleven digits to accommodate PBX roots and extensions[206].

The current numbering regulation identifies the numbers that are expected to be publicly accessible in Luxembourg[207]. However, some of these numbers, such as the voice short codes and SMS/MMS short codes, are likely not to be publicly accessible in other countries, even if they are preceded by the Luxembourg country code (‘352’).

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[202] Article 56.

[203] Articles 62-72.

[204] Articles 35-36.

[205] Article 74(1).

[206] E.164 Number Ranges in use in Luxembourg, https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-633.pdf.

[207] Article 41(1).

### 3.1.2 Assessment of the numbering plan

A numbering plan can help users to make and receive calls correctly if it has certain properties. Central among these are the following, accompanied here by comments on the position in Luxembourg:

- **Uniform number lengths**. Numbers used by similar services should have the same lengths if this helps to make them easy to use (as is likely, but unsupported by up-to-date evidence). The lengths of numbers are more uniform in almost all of the reference countries than in Luxembourg: for each designation the numbers differ in lengths by at most one (and are usually the same). Germany is exceptional: in it the fixed numbers can vary in length between six and eleven digits.
- **Simple number meanings**. Numbers used by different services should differ in the initial digits if and only if the services are very different. In Luxembourg this principle is applied, as numbers are not given unrealistic, unclear or confusing purposes. Aside from the short codes there are just seven designations for publicly accessible numbers (relating to fixed numbers, nomadic numbers, mobile numbers, M2M numbers, freephone numbers, shared cost numbers and shared revenue numbers). This is fewer than in the numbering plans of the reference countries, except Belgium and Denmark. Even so, some simplifications could be considered, such as letting the same services use fixed numbers and nomadic numbers (discussed in Section 3.2.4) and withdrawing the shared cost numbers (discussed in Section 3.4.2).
- **Enough short numbers**. Because of the electronic storage of numbers (in mobile phones, for example) there is no longer great value in making all numbers as short as possible. However, there is still a demand for short numbers that people will remember easily. The Luxembourg numbering plan can already satisfy this demand.
- **Some distinctive numbers**. Some number ranges should be open for customers to choose preferred numbers, which might have attractive patterns (like 43214321) or personal significance (like a date). For their own protection, customers should not be allowed to choose numbers that might be mistaken for ones that are called frequently, such as those for hospitals. Distinctiveness is harder to achieve if numbers have only six digits instead of eight.

Numbering plans should also allow the development of competition through:

- **Sufficiency of supply**. Numbers should be plentiful for several years. The ratio of assigned numbers to allocated numbers allocated is lower in Luxembourg than in almost all of the reference countries (with the only exceptions being Norway for fixed

numbers and Germany for mobile numbers). By these standards number supply in Luxembourg is generous, and numbers that are assigned to customers need not be withdrawn to make longer numbers available. Of course, some care should be exercised to recycle numbers that have been abandoned by customers.

- **Possibility of expansion**. Simple initial digit sequences should be available for the beginnings of new numbers in major number developments. In Luxembourg the second digit '0' has in effect been offering this, with the introduction of M2M numbers (beginning with '60') and nomadic numbers (beginning with '20'), but now only '70' is available. Having a spare first digit allows a tenfold increase in the number supply and is the preferred international practice, as exemplified by ECC Recommendation (15)02[208]. In Luxembourg a spare first digit is not available (and not obviously needed). However, if it is ever needed it can be obtained by forcing number changes (such as placing '23' in front of all six-digit numbers beginning with '7').
- **Portability**. Customers should be able to keep the numbers assigned to them when they change their choices of services using the numbers, even if they change their ECNS providers. Number portability provides this in Luxembourg, on the assumption that the services comply with the conditions of use for the numbers, as described in Section 2.1.5.
- **Freedom from clashes**. Numbers should have only one meaning each. This might be true in Luxembourg at present but it could easily become false. There are short codes (such as '600', '700', '9000' and '9009') that are publicised by the ECNS providers but have not been allocated (according to the numbering register). These could therefore clash in the future with allocated numbers.

Desirable properties of numbering plans (such as having uniform number lengths and having enough short numbers) can conflict. Overall the numbering plan of Luxembourg achieves a reasonable balance. The main possibilities for improvement arise with fixed numbers (as discussed in Sections 3.2.1, 3.2.2 and 3.2.4) and shared cost numbers (as discussed in Section 3.4.2).

[208] ECC Recommendation (15)02: Guidelines for major changes to National Numbering and Dialling Plans concerning E.164 Numbers, https://docdb.cept.org/download/6a6d56d5-12ce/REC1502.PDF.

**In the consultants' opinion:**

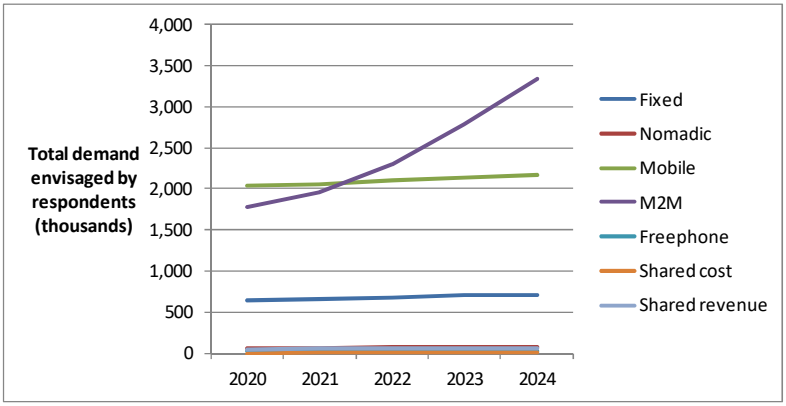
- **There is no clear case at present for changing the structure of the numbering plan except perhaps in the treatments of fixed numbers and of shared cost numbers.**

### 3.1.3 Demand for numbers

The stakeholder questionnaire asked respondents for their expectations of demand for numbers over five years. The resulting expectations of demand are aggregated in the table and chart below. They include those from all of the ECNS providers that have been allocated more than 20'000 numbers (as well as many smaller ECNS providers). They are broadly consistent with the quantities of numbers allocated by ILR and well below the quantities of numbers designated by ILR. However, they should be treated with caution, as estimates over five years are likely to be speculative and to depend on the interpretations of the respondents; for instance, there are different views about whether numbers abandoned by customers will be assigned again.

The table and chart below show that the respondents expect that the demand for M2M numbers will rise steeply while the demand for other numbers remains fairly stable; in particular, the rises in demand for fixed numbers and mobile numbers are roughly aligned with the projected increases in population (of about 2% annually). Nonetheless even for M2M numbers after five years the demand will be very small compared with the supply. The entries in the table and chart are in thousands.

| Service | Total demand envisaged by respondents (thousands) | | | | | Quantity already designated (thousands) | Quantity already allocated (thousands) |
|---|---|---|---|---|---|---|---|
| | 2020 | 2021 | 2022 | 2023 | 2024 | | |
| Fixed | 642 | 658 | 674 | 701 | 715 | 5,160 | 4,243 |
| Nomadic | 55 | 57 | 68 | 70 | 81 | 1,000 | 184 |
| Mobile | 2,031 | 2,062 | 2,104 | 2,138 | 2,172 | 14,000 | 3,592 |
| M2M | 1,774 | 1,965 | 2,297 | 2,782 | 3,335 | 10,000,000 | 2,880 |
| Freephone | 20 | 20 | 19 | 20 | 19 | 80 | 29 |
| Shared cost | 1 | 2 | 2 | 2 | 2 | 80 | 4 |
| Shared revenue | 48 | 51 | 61 | 63 | 63 | 229 | 102 |




**In the consultants' opinion:**

- **There is no clear case at present for making more numbers that are not short codes usable over the next five years.**
- **ILR should review during the regular audits whether more numbers are likely to be needed over the following five years.**

## 3.2 Fixed, nomadic and mobile numbers

### 3.2.1 The replacement of non-standard fixed numbers

#### 3.2.1.1 International background

In many countries over recent decades the numbering space occupied by fixed numbers (having broadly static or decreasing use) has been altered to make space for mobile and other numbers (having increasing use). This alteration has often been done by prefixing digits to fixed numbers, to bring together all fixed numbers behind particular first digits, and sometimes also to make number lengths more uniform. More uniform number lengths have been found simpler for both end users and ECNS providers.

#### 3.2.1.2 Current Luxembourg situation

In Luxembourg, currently non-standard fixed numbers beginning with any of the digits '2' to '9' (except '6') co-exist with standard fixed numbers having eight digits and beginning with '2'.

These non-standard numbers are supposed to have six digits but actually have between four and eleven digits[209].

The current numbering regulation requires that the numbers in new assignments to customers have eight digits unless ILR approves numbers having nine or ten digits[210]. This requirement might not lead far enough towards more uniform number lengths to be worthwhile. In fact there are said to be eleven-digit numbers[211]. Actually, twelve-digit numbers would be compatible with ITU-T Recommendation E.164[212].

Probably many six-digit fixed number ranges in Luxembourg are sparsely occupied. If six-digit numbers cease to be available for new assignments to customers, they will gradually disappear from use. Their disappearance will enlarge the vacant numbering space, to the extent that entire first digits such as '7' will become spare. Progress towards this can be maintained if ILR periodically compares the numbering records of the ECNS providers with the numbering register and withdraws vacant ranges.

#### 3.2.1.3 Stakeholder views

A majority (65%) of the respondents to the stakeholder questionnaire felt that users are irritated or confused by the varying lengths of fixed numbers. One reason for the varying lengths is the continued use of the non-standard fixed numbers alongside the standard ones. Accordingly three respondents advocated schemes for modifying or removing the non-standard fixed numbers.

Some of these schemes would offer benefits besides increasing uniformity in the lengths of fixed numbers. In particular, removing non-standard fixed numbers beginning with '8' or '9' would inhibit international carriers from listing fixed numbers as freephone numbers or shared revenue numbers that are not reachable from abroad; also, removing non-standard fixed numbers beginning with '7' would provide a vacant first digit for new purposes.

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[209] E.164 Number Ranges in use in Luxembourg, https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-633.pdf.

[210] Article 74(1).

[211] E.164 Number Ranges in use in Luxembourg, https://assets.ilr.lu/telecom/Documents/ILRLU-1461723625-633.pdf.

[212] Section 6.2.1, ITU-T Recommendation E.164: The international public telecommunication numbering plan, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.164-201011-I!!PDF-E.

The schemes mentioned are summarised in **bold** below, with the comments of the consultants:

- **The insertion of '00' at the ends of numbers.** This would leave unchanged the first digits of all the fixed numbers, so it would not make the fixed number ranges easier to describe or understand. It would increase by a factor of 100 the sizes of the allocated blocks. If the 99 additional numbers in each block were ever used there would probably be incorrect dialling or confusion over whether they represented PBX extensions.
- **The insertion of '3' at the beginnings of numbers**. This would not give all the fixed numbers the same first digit or even the same length (unless an extra digit was inserted after '3'). As six-digit numbers beginning with '3' and every possible "extra" digit have already been allocated, there could be incorrect dialling or confusion during any period of parallel running between the standard numbers and the non-standard numbers.
- **The insertion of '23' at the beginnings of numbers**. This is envisaged in the current numbering regulation[213]. An alternative to using '23' would be using '21', which does not begin any six-digit numbers. However, according to one respondent to the stakeholder questionnaire, international carriers still bill numbers beginning with '21' (and indeed '28') as mobile numbers, so the numbers would need to stay in quarantine for five or ten years before use[214].

#### 3.2.1.4 Considerations for the numbering regulation

Number lengths would probably be made somewhat more uniform by placing two digits in front of all non-standard numbers having between six and ten digits (so the standard numbers would have between eight and twelve digits). In particular, placing '23' there should be possible without introducing clashes if standard numbers assigned to first-time customers do not begin with '23'[215]. Even so, it could be costly and inconvenient, especially for end users.

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[213] Article 44(3).

[214] In particular, that respondent stated "At the same time the number range 21 should be activated as geographic numbers and announced as such via ITU, but no new numbers should be allocated from this range for another 5-10 years as international carriers still list and bill this number range as a mobile number range (just like number range 28, which is in use for geographic numbers)."

[215] Article 44(3).

This would be all the more so if number lengths were made much more uniform by replacing all the non-standard numbers that do not have eight digits by eight-digit numbers.

To assess the costs of such a change, note that there are about 300'000 allocated non-standard numbers and 100'000 assigned non-standard numbers that would be replaced. About 50% of these are taken by organisations, which would incur costs such as changing signs and business cards. Hundreds of thousands of people would undergo inconveniences such as having to change their address books. ECNS providers would incur costs of publicity, misdialling, and changed number announcements. Lengthening the period of notice before the change and the period of parallel operation (of the non-standard and standard numbers) could decrease the costs to organisations, which would need new signs and business cards eventually, but it could increase the costs to ECNS providers.

Instead of being forced, the increase in uniformity could be encouraged by differential charging for numbers or left to happen naturally as non-standard numbers become abandoned. Since the use of non-standard numbers is reducing, at any time the final few in a non-standard number range could be replaced with reduced cost and inconvenience. Modest incentives to customers with non-standard numbers might avoid forced changes. Already under the current numbering regulation customers must be assigned standard numbers if they change their fixed numbers[216]. However, first-time customers (who would not be changing existing numbers) might still be assigned non-standard numbers; preventing this calls for a requirement that is slightly stronger than the current one.

The option to replace non-standard numbers by standard numbers forcibly can remain available until there is a need for it. Replacement could take many years: the quantity of assigned non-standard numbers is declining at an annual rate of only 3%. The numbers beginning with '7' might be the first to disappear through gradual abandonment, as there are fewest of them now.

The same rules for replacement by standard numbers can apply to all non-standard numbers. This is so, in particular, for those beginning with '3' (given that "universal access" numbers beginning with '3' have not been allocated) and those beginning with '80' and '90', (given that there is no evidence of confusion with freephone numbers, shared cost numbers and shared revenue numbers).

[216] Article 73(2).

**In the consultants' opinion:**

- **ILR should not convert non-standard numbers into standard numbers forcibly until there is clear evidence that the benefits will outweigh the cost and inconvenience. The cost will reduce over time as non-standard numbers naturally fall out of use.**
- **ILR should work towards the elimination of non-standard numbers by monitoring their continued use and withdrawing blocks that are no longer used.**
- **The revised numbering regulation should require that non-standard numbers are not assigned to customers when they are abandoned by the original customers.**
- **The revised numbering regulation should require that numbers beginning with '23' are not assigned except by placing '23' in front of non-standard numbers to convert them into standard numbers.**
- **The revised numbering regulation should impose the same rules for replacement by standard numbers on all non-standard numbers.**
- **The revised numbering regulation should require that the numbers in new assignments to customers have the standard length for the relevant number range.**

### 3.2.2 Number lengths for PBX extensions

#### 3.2.2.1 International background

To reduce the demands on numbering space imposed by direct inwards dialling, in some countries the quantity of numbers assigned to an organisation is limited according to the capacity of its PBX. For instance, in Germany an organisation is assigned at most 500 numbers (or, exceptionally, 1'000 numbers) if its PBX has fewer than 60 channels and at most 4'000 channels if its PBX has fewer than 150 channels[217]. Similarly, in Singapore an organisation is assigned at most 1'000 numbers for every 30 channels on its PBX[218]. Some rules are more demanding than these: in Hong Kong an organisation is assigned enough blocks of 100 numbers to accommodate 6.3 numbers per channel (or, actually, at most 200 numbers for

[217] Annex 1a, Verfügung 25/2006 (Amtsblatt 9/2006 vom 10.05.2006) Struktur und Ausgestaltung des Nummernbereichs für Ortsnetzrufnummern, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/ONRufnr/Vfg_25_2006_konsFassung.pdf?__blob=publicationFile.

[218] Section 14.2(b), National Numbering Plan, https://www.imda.gov.sg/-/media/Imda/Files/Regulations%20and%20Licensing/Regulations/Numbering/Aug%202019/NNPWD%20Aug%202019.

every 30 channels on its PBX and at most 1'000 numbers if its PBX has fewer than 150 channels)[219].

#### 3.2.2.2 Current Luxembourg situation

The current numbering regulation assumes that an organisation is assigned 1'000 numbers if its PBX has at least 30 channels but fewer than 60 channels and 10'000 numbers if its PBX has at least 60 channels[220]. With this assumption, the quantity of numbers assigned in Luxembourg can be much greater than both the quantity of numbers used as PBX extensions and the quantity of numbers assigned in Germany for a PBX having the same capacity.

To conserve eight-digit numbers, organisations having 1'000 or 10'000 numbers can have numbers with nine or ten digits[221]. This prevents fixed number lengths from being uniform. Uniformity can be increased if organisations requesting 1'000 or 10'000 fixed numbers are assigned just the eight-digit numbers needed. For instance, an organisation requesting 2'000 fixed numbers then receives two blocks having 1'000 numbers each, not one block having 10'000 numbers.

#### 3.2.2.3 Considerations for the numbering regulation

The assumption in the current numbering regulation about the quantity of numbers assigned to a PBX leads to numbers having nine or ten digits. The question arises of how many eight-digit numbers are needed to let all organisations have only eight-digit numbers and thereby make fixed number lengths uniform. To estimate the quantity needed, note that in Luxembourg there are about 180 "large enterprises" with more than 250 employees[222]. Together, these large enterprises could have roughly 100'000 employees (with, for example, financial and insurance enterprises of all sizes together having 50'000 employees)[223]. They are unlikely to need more than 300'000 numbers (in 300 blocks of 1'000 numbers each) even if each of them is allocated numbers in blocks of 1'000 numbers each. Of course many of them already have numbers that they will not want to change; moreover, according to the

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[219] Appendix 7(3), Code of Practice Relating to the Use of Numbers and Codes in the Hong Kong Numbering Plan, https://www.coms-auth.hk/filemanager/statement/en/upload/385/cop-numbering_e.pdf.

[220] Article 75(1)(b).

[221] Article 74(1).

[222] Répertoire des Entreprises Luxembourgeoises 2019 https://statistiques.public.lu/catalogue-publications/repertoire/2019/repertoire-entreprises-luxembourgeoises.pdf.

[223] Labour market overview (in 1'000 persons) 2000 - 2018 Table summary, https://statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=12951&IF_Language=eng&MainTheme=2&FldrName=3.

numbering register there are currently 95'000 eight-digit fixed numbers free for allocation. However, if extra eight-digit numbers are required to accommodate all the large enterprises, 300'000 of them can begin with '240', '249' or '280' (when ILR makes these free for allocation).

Accordingly the number supply seems sufficient for assigning only eight-digit numbers, even to large enterprises. Assigning only eight-digit numbers might raise questions of fairness; for instance, an organisation might need to spread its numbers over several blocks, when a competitor having ten-digit numbers could market itself by quoting its single PBX root. There would be a compensating advantage, in having only shorter numbers, and there should be negligible differences in operating cost. Moreover, the uniformity would be welcomed by the three respondents to the stakeholder questionnaire that remarked on the awkwardness in handling PBX extensions, especially after porting. Overall, this particular concern about fairness does not seem to be significant.

**In the consultants' opinion:**

- **ILR should determine the quantity of numbers assigned to the extensions of a PBX case-by-case as a multiple of 100 or 1'000.**
- **The revised numbering regulation should prohibit publicising added digits (beyond the standard length for the relevant number range) after a number is allocated or say that added digits will be treated as private (and therefore not guaranteed to be ported or even accessible by dialling). This should be so for all numbers, though the problem arises mainly with fixed numbers.**

### 3.2.3 The support for emergency calls

#### 3.2.3.1 International background

Customer expectations about the support for emergency calls are likely to be based on traditional telephony, especially for services using fixed numbers. The services should both pass emergency calls to emergency call centres and provide accurate caller location information in emergency calls, as stated in the European Electronic Communications Code[224]. However, in many countries currently the provision of accurate caller location information is required only if it is acknowledged to be technically and economically possible. Accordingly

[224] Articles 109(1) and 109(6), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

the European Electronic Communications Code envisages that delegated acts will be developed in consultation with BEREC to clarify what constitutes accurate caller location information[225].

An EU court ruled in 2019 that caller location information should be available in emergency calls from mobile phones, even when there are no SIMs[226]. A similar rule has been adopted in Switzerland[227]. Already for smart phones and tablets using Android (and, to a lesser extent, iOS), Advanced Mobile Location (AML) functionality can provide accurate caller location information, at least when there are SIM slots or SIM dongles[228]. Moreover, the Android implementation of AML functionality does not require SIMs, provided that HTTPS (not SMS) is the chosen data communication method. Potentially, therefore, on smart phones and tablets not just mobile services but also voice over IP services that are nomadic might provide accurate caller location information.

For computers the position is less satisfactory than for smart phones and tablets; for instance, some voice over IP services can provide caller location information but nonetheless warn that they do not support emergency calls. However, networks and terminals can sometimes obtain accurate caller location information. If doing so is not feasible, then the information might be extracted from a database that must be updated daily, as in Germany[229]. The ECNS providers should advise customers to update the information whenever they change their locations, should hold it separately from other information about customers, and should transmit it exclusively in emergency calls.

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[225] Articles 109(6) and 109(8), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[226] C-417/18, Request for a preliminary ruling under Article 267 TFEU from the Vilniaus apygardos administracinis teismas (Regional Administrative Court, Vilnius, Lithuania), made by decision of 21 June 2018, received at the Court on 26 June 2018, http://curia.europa.eu/juris/document/document.jsf?docid=217487.

[227] Article 29a, Ordonnance sur les services de telecommunication, https://www.bakom.admin.ch/dam/bakom/fr/dokumente/bakom/das_bakom/rechtliche_grundlagen/Vernehmlassungen/Vernehmlassung-FMG-2020/verordnung-ueber-fernmeldedienste.pdf.

[228] Advanced Mobile Location, https://eena.org/our-work/eena-special-focus/advanced-mobile-location/.

[229] Technische Richtlinie Notrufverbindungen (TR Notruf), https://www.bundesnetzagentur.de/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Anbieterpflichten/Notruf/TechnischeRichtlinie/TRNotrufAusgabe2.pdf?__blob=publicationFile.

If accurate caller location information is difficult to provide, then the ECNS providers should associate correct registered addresses with numbers and warn customers periodically about any limitations on the support for emergency calls from such numbers, as in Belgium[230]. Requirements like this are found in other countries, such as Switzerland[231].

#### 3.2.3.2 Current Luxembourg situation

In Luxembourg fixed services and mobile services are required to provide caller location information automatically in emergency calls[232]. For fixed services, the caller location information can be regarded as accurate, as it includes the registered addresses of the callers; for mobile services it includes all the data relevant to the locations of the callers processed in the network, but such data is limited by the technology deployed.

Currently contracts with customers must state any limitations on the support for emergency calls (including caller location information)[233]. However, customers are not necessarily reminded periodically about the limitations.

The current numbering regulation requires that emergency calls can be made free of charge from public networks[234]. It also requires warnings to users of voice over IP on PBX extensions if emergency calls are not possible[235]. It does not include provisions for caller location information.

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[230] Article 43, 27 avril 2007 - arrêté royal relatif à la gestion de l'espace de numérotation national et à l'attribution et au retrait des droits d'utilisation de numéros, http://www.etaamb.be/fr/arrete-royal-du-27-avril-2007_n2007011252.html.

[231] Article 3.2.4, Prescriptions techniques et administrative concernant l'acheminement et la localisation des appels d'urgence, https://www.bakom.admin.ch/dam/bakom/fr/dokumente/tc/rechtliche_grundlagen/Notrufesr_784_101_113_14leitweglenkungundstandortidentifikationdernotru.pdf.

[232] Article 5, Loi du 28 juillet 2011 portant modification 1) de la loi modifiée du 30 mai 2005 concernant la protection de la vie privée dans le secteur des communications électroniques; 2) de la loi modifiée du 2 août 2002 relative à la protection des personnes à l'égard du traitement des données à caractère personnel; 3) de la loi modifiée du 22 juin 1963 fixant le régime des traitements des fonctionnaires de l'Etat; 4) du Code de la consummation, http://legilux.public.lu/eli/etat/leg/loi/2011/07/28/n5/jo.

[233] Article 72(3)(b), Loi du 27 février 2011 sur les réseaux et les services de communications électroniques, http://legilux.public.lu/eli/etat/leg/loi/2011/02/27/n1/jo.

[234] Article 64(3)-64(4).

[235] Article 76(5).

#### 3.2.3.3 Stakeholder views

The respondents to the stakeholder questionnaire confirmed that ECNS providers who do not operate their own networks generally hand emergency calls over to their network operators (such as Post, Mixvoip or Voxbone).

Also, as described by the respondents, currently in an emergency call from a nomadic number the caller location information is just the geographic address of the caller; in an emergency call from a mobile number the caller location information is mainly the cell identifier of the call, which can refer to a large rural area. There might be no periodic warnings to customers about the limitations in the accuracy of this information.

#### 3.2.3.4 Considerations for the numbering regulation

For preference there would be a system in which caller location information is obtained from the networks and terminals or from databases that are updated (automatically if possible) whenever the customers change where they use their telephony applications. In emergency calls the information obtained from the networks and terminals or from these databases should take precedence over the registered addresses of the callers and should be confirmed with the callers if possible.

**In the consultants' opinion:**

- **The revised numbering regulation should require that services using fixed numbers or mobile numbers provide accurate caller location information automatically in emergency calls.**

The customers should be warned periodically about any limitations in the accuracy of the caller location information. These limitations might relate to matters such as power failure and battery decay as well as to the accuracy of the customer location information.

**In the consultants' opinion:**

- **The revised numbering regulation should require that any limitations on the support for emergency calls (including caller location information) are drawn to the attention of, and required to be acknowledged by, customers periodically.**
- **ILR should review the acceptability of the limitations on the support for emergency calls (including caller location information) when relevant delegated acts are under development with BEREC.**

- **ILR should consider encouraging the elimination of limitations on the support for emergency calls (including caller location information). In particular, if accurate caller location information is not obtained automatically from the networks and terminals, the ECNS providers would be encouraged to maintain databases of caller location information that would be transmitted in emergency calls and that customers would be advised regularly to update.**

### 3.2.4 The use of fixed numbers by nomadic services

#### 3.2.4.1 International background

Fixed numbers are tending to lose their geographic associations. In three of the reference countries (France, Denmark and Switzerland) fixed numbers have lost, or are losing, their identifications with geographic areas. In all of the reference countries (Belgium, Denmark, France, Germany, Ireland, Netherlands, Norway and Switzerland) fixed numbers may be used by nomadic services. In the reference countries that have numbers originally designated for nomadic services (France, Germany, Ireland, Netherlands and Norway) those numbers may be used by fixed services.

As a consequence of an EU court case in 2019 (about the interpretation of the EU directives for voice over IP services in Belgium) a service that charges for calls out to numbers should be regulated as an ECNS[236]. Such a service might be a voice over IP service that is nomadic. It is then likely to use nomadic numbers, as an ECNS should provide valid CLIs even if it does not offer calls in from other numbers. Regardless of its use of numbers, it becomes subject to the rules on the support for emergency calls.

#### 3.2.4.2 Current Luxembourg situation

Fixed numbers have not identified geographic areas in Luxembourg for many years.

Nomadic numbers beginning with '20' have never identified geographic areas. According to the current numbering regulation they are to be used by nomadic services and by services that innovate by applying IP[237]. However, now all services apply IP (though not always at the termination points) and services using nomadic numbers are not necessarily innovative.

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[236] Case C‑142/18, Request for a preliminary ruling under Article 267 TFEU from the cour d'appel de Bruxelles (Court of Appeal, Brussels, Belgium), made by decision of 7 February 2018, received at the Court on 23 February 2018, http://curia.europa.eu/juris/document/document.jsf?docid=214741.

[237] Articles 44(1)(a)-44(1)(b).

The current numbering regulation refers also to "universal access numbers", such that different numbers in the same range can address termination points on different switches in different geographic areas[238]. However, these are supposed to be eight-digit numbers beginning with '3'; none are allocated, and all numbers beginning with '3' are now regarded as fixed numbers. In an IP network all fixed numbers and nomadic numbers are "universal access numbers" in this sense, so the term can be removed or broadened to cover all of these numbers.

#### 3.2.4.3 Stakeholder views

Some respondents to the stakeholder questionnaire felt that people no longer attached geographic significance to fixed numbers; one observed that no customer had ever objected to taking a nomadic number (which has definitely no geographic significance) instead of a fixed number (which might be thought to have geographic significance). Other respondents felt that people still attached geographic significance to the fixed numbers of organisations, which tend not to move to different areas.

One respondent stated that only services offering high quality voice should be allocated numbers, thereby implying that some voice over IP services should not get numbers at all. Nonetheless it favoured removing the distinction between the fixed numbers and the nomadic numbers beginning with '20', which it believed were not used exclusively for voice over IP services.

#### 3.2.4.4 Considerations for the numbering regulation

Letting nomadic services use existing ranges of either fixed numbers or mobile numbers is suggested in ECC Recommendation (12)04[239]. In Luxembourg, users would benefit from enhanced competition and service innovation if nomadic services could use fixed numbers; for instance, then customers taking fixed services could port their numbers so that they could take nomadic services from the same or another ECNS provider.

Additionally, fixed services might use the nomadic numbers beginning with '20', just as nomadic services could use fixed numbers. Then the fixed numbers and nomadic numbers together would be designated for the same services and might be called "universal access numbers", though this term is used for numbers beginning with '3' in the current numbering

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[238] Article 45(1).

[239] ECC Recommendation (12)04: Numbering for Nomadic Voice Services, https://docdb.cept.org/download/f8286342-eeea/REC1204.PDF.

regulation[240]. Designating the numbers for the same services would let the conditions of use apply uniformly and simply to all numbers beginning with '2'. However, the conditions of use would be only those that every nomadic service and every fixed service could comply with; for instance, they would not require that customers could make and receive calls anywhere without actions by their ECNS providers.

Fixed services and nomadic services should use numbers in the same range only if the advantages of doing so mentioned above outweigh the disadvantages. The main disadvantages come from customer expectations that are formalised as conditions of use for the numbers: people expect services using fixed numbers to provide accurate caller location information automatically in emergency calls and services using nomadic numbers to let customers make and receive calls anywhere without actions by their ECNS providers (such as reconfiguring the termination points). In many countries people expect fixed numbers to have geographic significance, but in Luxembourg by now this is rarely so.

3.2.3In brief, services using fixed numbers are expected to have features that services using nomadic numbers might not have, and services using nomadic numbers are expected to have features that services using fixed numbers might not have. More fully, requiring the provision of accurate caller location information automatically and adopting definitions like those in Section 2.1.4 separates fixed services and nomadic services into:

- Those that may use only fixed numbers (because they comply with the conditions of use for fixed numbers but not all of those for nomadic numbers).
- Those that may use only nomadic numbers (because they comply with the conditions of use for nomadic numbers but not all of those for fixed numbers).
- Those that may use either fixed numbers or nomadic numbers (because they comply with the conditions of use for fixed numbers and the conditions of use for nomadic numbers).

**In the consultants' opinion:**

- **ILR should consider developing a communication plan to inform users about the meaning in numbers, discussing particularly the absence of geographic significance in numbers and the nature of nomadic services.**

[240] Article 45(1).

### 3.2.5 The use of fixed numbers by mobile services

In the United States, where the receiving parties pay for calls to mobile phones, fixed services and mobile services may use numbers in the same range. By contrast, in the EU, where the services often have different markets and price packages, the services normally use numbers in different ranges. In Denmark, exceptionally, fixed services and mobile services may use numbers in the same range and ECNS providers may offer portability between fixed services and mobile services (though they are not required to do so); yet even there particular ranges are preferred for either fixed services or mobile services[241]. In Norway in 2017 the regulator rejected the possibility of introducing number portability between fixed services and mobile services and identified instead more cost-effective ways of avoiding shortages of mobile numbers[242].

Letting fixed services and mobile services use numbers in the same range is appropriate only if there are no significant differences in customer expectations that are formalised as conditions of use for the numbers. In principle, then, mobile services might use fixed numbers, if the prices to callers are the same and mobile services provide accurate caller location information automatically in emergency calls (as they should be required to do, as indicated in Section 3.2.3). In practice, fixed numbers are unlikely to be allocated for this purpose, as they are not free for allocation in sufficiently large blocks.

Even if mobile services might use fixed numbers, the converse is not true: fixed services should not use mobile numbers, because they do not comply with the conditions of use for mobile numbers: they do not let customers make and receive calls while moving.

[241] Den danske nummerplan, https://ens.dk/sites/ens.dk/files/Tele/nummerplanen_2016_november.pdf.

[242] Vurdering av mulig innføring av tjenesteportabilitet mellom fast- og mobiltelefoni i Norge, https://www.nkom.no/telefoni-og-telefonnummer/relevante-dokumenter-for-tilbydere/_/attachment/download/a1011bfe-1f62-49cb-93d3-0cd129b31994:c5e51ccdba30ae324cfd3c761b13bca3abbed56a/170824%20-%20Rapport%20om%20tjenesteportabilitet.pdf.

## 3.3 Machine-to-machine numbers

### 3.3.1 The use of machine-to-machine numbers for particular services

#### 3.3.1.1 International background

An M2M service provides remote monitoring of sensors and control of actuators built into vending machines, rubbish bins, utility meters, security alarms, domestic appliances, and so on.

In the EU the opinion of regulators as expressed by BEREC is that for numbering purposes M2M services can include Internet of Things (IoT) services and eCall services[243]. Indeed, one BEREC report treats M2M and IoT as synonymous[244]. Another takes eCall to be an instance of M2M[245]. Yet another defines M2M to include IoT[246]. The tendency in the EU is to avoid distinctions between M2M services, IoT services and eCall services for numbering purposes. This is so, in particular, in the reference countries; for instance, there are regulatory

[243] The interoperable EU-wide eCall, https://ec.europa.eu/transport/themes/its/road/action_plan/ecall_en.

[244] Enabling the Internet of Things, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/5755-berec-report-on-enabling-the-internet-of_0.pdf.

[245] Internet of Things indicators, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8464-berec-report-on-internet-of-things-indic_0.pdf.

[246] Section 2, BEREC guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communications networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8622-berec-guidelines-on-common-criteria-for-_0.pdf.

documents discussing and rejecting such distinctions in Belgium, Denmark, Germany, Ireland and Norway[247,248,249,250,251].

Even a slightly different perspective produces similar views. The South Asia Telecommunication Regulators' Council points out that industrial automation, for example, uses M2M communications independent of the internet[252]. GSMA writes of M2M communications co-ordinated in an IoT system[253]. Both statements are consistent with regarding M2M communications as the aspect of IoT relevant to numbering.

M2M services are often allowed to provide at least limited voice communication, such as voice calls only to service agents. A notable exception is in Hong Kong, where M2M services are in effect private data network services: they do not offer portability, they do not necessarily work across interconnections, and they must not provide voice or SMS/MMS communication[254]. If eCall services are regarded as M2M services then M2M services must be allowed to provide some voice communication.

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[247] Section 4, Décision du conseil de l'IBPT du 10 janvier 2018 concernant la détermination du plan de numérotation en matière de communications IoT et eCall, https://www.ibpt.be/public/files/fr/22431/2018-01-10_IoT-ECall_FR.pdf.

[248] Section 11, Vejledning til den samlede danske nummerplan, https://ens.dk/sites/ens.dk/files/Tele/nummervejledning_03.11.2016.pdf.

[249] Verfügung 33/2016 (Amtsblatt 11/2016 vom 15.06.2016) Exterritoriale Nutzung von ausländischen Internationalen Kennungen für Mobile Teilnehmer in der Bundesrepublik Deutschland im Rahmen von Machine-to-Machine (M2M)-Kommunikation, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/TechnischeNummern/IMSI/IMSI_exterritNutzung.pdf?__blob=publicationFile.

[250] Section 2.3.2, Updating the Numbering Conditions of Use and Application Process Document, https://www.comreg.ie/publication-download/response-to-consultation-19-88-on-updating-the-numbering-conditions-of-use-and-application-process-document.

[251] Høring om endringer i nummerforskriften 2019, https://www.nkom.no/aktuelt/nyheter/_attachment/41600?_ts=169dd8d2625.

[252] SATRC report on ICT regulatory framework for M2M communications and IOT for the SATRC countries, https://www.apt.int/sites/default/files/SATRC-SAPVI-02_M2M_Report.docx.

[253] What is the Internet of Things (IoT)?, https://www.gsma.com/iot/wp-content/uploads/2016/09/What-is-the-Internet-of-Things.pdf.

[254] Appendix 8(2), Code of Practice Relating to the Use of Numbers and Codes in the Hong Kong Numbering Plan, https://www.coms-auth.hk/filemanager/statement/en/upload/385/cop-numbering_e.pdf.

#### 3.3.1.2 Current Luxembourg situation

In the current numbering regulation M2M numbers are taken to be mobile numbers for telematic applications[255]. Here a "telematic application" ("*application télématique*") is defined to be "a communication service which uses a mobile network for the exchange of voice or data between a central system and its users, to the exclusion of any other communication", where the "central system" ("*centrale*") is taken to be "any entity which, for its precise and limited purpose, establishes communications with its own users or receives communications from its own users"[256]. This description is broad enough to cover many Internet of Things (IoT) services and eCall services. However, its implications are not entirely clear; for instance, it does not state clearly that a central system may send communications to users after establishing a communications link.

The current numbering regulation states that mobile numbers address termination points of "mobile phone" networks and therefore implies that mobile numbers do not address termination points in fixed networks with wireline connections[257]. Yet M2M services are not necessarily mobile services. For instance, home IoT networks (for utility meters, security alarms and domestic appliances, say) might be configured and interrogated in messages sent to their M2M numbers over fixed networks.

The European Electronic Communications Code requires there to be non-geographic numbers that may be used by services other than interpersonal communications services throughout the EU[258]. M2M numbers are not the only such numbers in Luxembourg; in fact, all numbers in Luxembourg are non-geographic and can be used by services other than interpersonal communications services. Even if the requirement in the European Electronic Communications Code is interpreted as envisaging extraterritorial uses, it can be satisfied in fixed networks as well as mobile ones, as outlined in ITU Recommendation E.212[259].

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[255] Article 48(1).

[256] Article 1(3).

[257] Article 1(20).

[258] Article 93(4), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

[259] Section F.3, ITU-T Recommendation E.212: The international identification plan for public networks and subscriptions, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.212-201609-I!!PDF-E.

In brief, M2M services are distinguished more by the devices served than by the location or degree of mobility of the devices. Their definition can avoid requiring them to be mobile services and can resemble closely the definitions by other regulators in the EU. In this way it can conform with the usage now adopted by BEREC[260].

#### 3.3.1.3 Stakeholder views

Almost all respondents to the stakeholder questionnaire agreed that no numbering distinction is needed between M2M and IoT or is appropriate for communications with supercomputing facilities or artificial intelligence systems. Since the numbers beginning with `60' have twelve digits, their range appears to be more than sufficient for the requests projected by respondents for M2M numbers.

A majority (60%) of the respondents to the stakeholder questionnaire indicated that there should be no limitations on the use of M2M numbers for voice calls. A different view emerged from the interviews: several agreed then that limitations on the use of M2M numbers for voice calls might be appropriate, particularly to prevent unsolicited marketing. However, these limitations are already in place: in Luxembourg unsolicited communications (other than some with existing customers) require prior consent[261]. In any case, a machine without a number might invent CLIs and initiate calls, as do robot callers and some call centre agents now.

Some other respondents considered that M2M services should be restricted to closed user groups, though there are questions about how and when the groups would be defined. One constraint on group membership already exists: in Luxembourg consumers are deemed to have opted out of receiving live marketing calls unless they have explicitly opted in[262].

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[260] Section 2, BEREC guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communications networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings, https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/9034-berec-guidelines-on-common-criteria-for-_0.pdf.

[261] Article 11(3), Loi du 30 mai 2005 – relative aux dispositions spécifiques de protection de la personne à l'égard du traitement des données à caractère personnel dans le secteur des communications électroniques et – portant modification des articles 88-2 et 88-4 du Code d'instruction criminelle, http://legilux.public.lu/eli/etat/leg/loi/2005/05/30/n4/jo.

[262] Article 11(3), Loi du 30 mai 2005 – relative aux dispositions spécifiques de protection de la personne à l'égard du traitement des données à caractère personnel dans le secteur des communications électroniques et – portant modification des articles 88-2 et 88-4 du Code d'instruction criminelle, http://legilux.public.lu/eli/etat/leg/loi/2005/05/30/n4/jo.

The respondents were not generally concerned about the competition between conventional telephony and Over-The-Top (OTT) uses of M2M networks with low prices. As one remarked, OTT calls and messages occur all the time on current networks, so M2M networks would not make this worse.

#### 3.3.1.4 Considerations for the numbering regulation

Limiting M2M services so that only humans could initiate voice calls would prevent some potential developments. For instance, people might need to speak to their doctors when their IoT monitors warn them of high blood pressure. Consequently, restrictions on the use of M2M services for voice services should not be too stringent.

**In the consultants' opinion:**

- **The revised numbering regulation should adopt a definition of "telematic service" ("*service télématique*") that avoids requiring M2M services to be mobile services and that resembles closely the definitions by other regulators in the EU, such as "a telematic service is a wholly or partly automated communication service which consists of the exchange of data or voice between devices with limited or no human interaction".**
- **The revised numbering regulation should clarify that IoT services and eCall services are M2M services and can therefore use M2M numbers.**

### 3.3.2 The porting of machine-to-machine numbers

#### 3.3.2.1 International background

The European Electronic Communications Code requires portability and the promotion of Over-The-Air (OTA) provisioning, where technically feasible, in order to facilitate switching between ECNS providers, particularly for M2M[263].

In principle portability is required in all of the reference countries; the regulators in most make no concessions about this in their official statements. Nonetheless, in France the regulator does not require ECNS providers to undertake to implement portability if they are to be

[263] Articles 93(6) and 106(6), Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code (Recast) Text with EEA relevance, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02018L1972-20181217.

allocated M2M numbers[264]. Similarly, in Germany the regulator does not require ECNS providers to demonstrate portability if they are to be allocated M2M numbers; however, it noted that portability was a legal requirement, so it could not issue a legally binding exemption and ECNS providers would need to provide portability in response to valid customer requests[265].

GSMA remarks that OTA provisioning is very often available for M2M[266]. Accordingly portability is very often feasible, though GSMA considers that it is not relevant to M2M applications such as meter reading and asset tracking[267].

#### 3.3.2.2 Current Luxembourg situation

The usual provisions for number portability that apply to mobile numbers do not currently apply to M2M numbers in Luxembourg. However, ILR may consider applying them case-by-case[268].

#### 3.3.2.3 Stakeholder views

A majority (57%) of the respondents to the stakeholder questionnaire considered that all M2M numbers should be portable; a further group (21%) felt that some should be portable but were not specific about which those should be. The remainder, opposed to any porting,

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[264] Article 2.3.5(g), Plan national de numérotation – Version du 1er août 2019, Décision n° 2019 0954 de l'Autorité de régulation des communications électroniques et des postes en date du 11 juillet 2019 modifiant la décision établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/19-0954.pdf.

[265] Mitteilung Nr. 770/2016 (Amtsblatt Nr. 11/2016 vom 15.06.2016) Portierbarkeit von Rufnummern für Mobile Dienste im Falle von Machine-to-Machine (M2M)-Kommunikation, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/M2M/M2M_Portierbarkeit_Rufnummern.pdf?__blob=publicationFile.

[266] GSMA comments to the BEREC public consultation the document: "Guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communication networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings.", https://www.gsma.com/iot/wp-content/uploads/2019/08/GSMA-Response-to-BEREC-Numbering-Consultation.pdf.

[267] E.164 regulatory exceptions for IoT connected services, https://www.gsma.com/iot/wp-content/uploads/2017/11/E.164position.pdf.

[268] Article 48(1)(f).

were concerned about the practical difficulties of porting if traditional SIM cards had to be replaced. Nonetheless, they considered that eUICC technology and OTA provisioning are to be welcomed and will become dominant[269].

Nine of the respondents indicated that they expect to have M2M numbers in the future. Of these, seven considered that M2M numbers should be portable, as this would enhance competition and benefit organisations that are not eligible to be allocated numbers[270]. Two disagreed[271].

#### 3.3.2.4 Considerations for the numbering regulation

Portability, with OTA provisioning, would be beneficial in many use cases, where it would stimulate competition. As acknowledged by the respondents in their interviews, the benefits accrue both to new entrants and to customers, and could be an alternative to the assignment of numbers to organisations other than ECNS providers (such as car manufacturers and energy suppliers).

The suggestion (by the GSMA) that portability is not relevant to applications such as meter reading and asset tracking seems unwarranted: a utility company or a logistics company might well want to change its telecommunications provider by exploiting the convenience of existing portability processes and systems. Both porting blocks of numbers (for each electricity transformer station, for example) and porting individual numbers (for each delivery vehicle during its maintenance) might be wanted.

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[269] For instance, one respondent stated "eUICC will become the standard and therefore, operators should push towards this direction allowing to reduce costs (SIM Card cost from production to delivery) and making the entire profile management fully digital and remote, enabling a better customer experience/satisfaction**."**

[270] For instance, one respondent stated "From a customer point of view, in case of portability, the process to swap operator is easier and smoother. Not allowing portability, the final customer has to face heavy processes and lengthy procedures in order to have the services (every time, like a brand new customer instead of making it evolve from existing level of service)."

[271] For instance, one respondent stated "Today, there is no need for number portability. Currently we have a one to one relationship between M2M ICCID-IMSI-MSISDN." Another stated "Customers do not request to have number portability. To date, number portability is not the blocking issue for a customer to switch to another operator; the fact of having to change the SIM cards for a large number of devices might be blocking. If customers want to change, the underlying operator of a M2M SIM card can make use of the possibility to add an operator "over the air" making use of the eUICC technology."

Indeed, if M2M numbers are not portable then the case for allocating numbers to organisations other than ECNS providers is greatly strengthened, as the GSMA tacitly implies[272].

In principle the infrastructure to support M2M number portability already exists in Luxembourg (except perhaps in some M2M devices with physical SIM cards), though extra data base records, suitable for twelve-digit numbers, could be needed.

A market can be quite complex: between the top level ECNS provider and the final customer there can be more than one intermediary (such as, for a connected car, a registered dealer or garage). Determining which of these can port numbers requires careful thought by others besides ECNS providers. It might well call for more than one level of service resale, contrary to the expectations outlined in Section 2.5.2.

**In the consultants' opinion:**

- **The revised numbering regulation should require that M2M numbers assigned in or after 2022 are portable, given that portability is technically feasible for M2M systems, advantageous for competition and favoured by most ECNS providers.**
- **A working group should address the practical issues related to M2M number portability. These include:**
    - **Porting an entire range.**
    - **Porting by different participants in the market, such as those intermediate between the ECNS provider and the final customer.**

### 3.3.3 Potential restrictions on machine-to-machine numbers

#### 3.3.3.1 International background

Irrespective of the relation between M2M and IoT, there are questions about which rules about fixed numbers and mobile numbers should apply also to M2M numbers.

[272] GSMA comments to the BEREC public consultation on the document: "Guidelines on common criteria for the assessment of the ability to manage numbering resources by undertakings other than providers of electronic communication networks or services and of the risk of exhaustion of numbering resources if numbers are assigned to such undertakings.", https://www.gsma.com/iot/wp-content/uploads/2019/08/GSMA-Response-to-BEREC-Numbering-Consultation.pdf.

GSMA suggests that some rules (on '112' access and CLI presentation, for example) might not be relevant to M2M applications such as meter reading and asset tracking[273]. A similar opinion is put forward in ECC Recommendation (11)03[274].

#### 3.3.3.2 Current Luxembourg situation

M2M numbers in Luxembourg are taken to be mobile numbers in the current numbering regulation[275]. As such they are subject to the same rules as mobile numbers (on '112' access and CLI presentation, for example), except for those relating to number portability[276]. Subjecting them to the same rules is especially important when they are used by services that allow human interaction, such as eCall services.

#### 3.3.3.3 Stakeholder views

Different respondents to the stakeholder questionnaire had very different views on what other regulations on M2M numbers there should be, including:

- As few regulations as possible, beyond generally applicable principles in such areas as privacy and security.
- No regulations on roaming, portability, and legal interception.
- No new specific regulations, given the evolving and innovative nature of M2M services.
- Full regulations on location tracking, number pricing, and legal interception.

There was a feeling that M2M applications are extremely varied and likely to develop in ways that people cannot now foresee, so that different regulations might need to apply to different applications; in any case flexibility would be required[277]. For instance, mobile numbers or M2M numbers in devices with suitable functionality (such as AML) might be used for geo-locating

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[273] E.164 regulatory exceptions for IoT connected services, https://www.gsma.com/iot/wp-content/uploads/2017/11/E.164position.pdf.

[274] ECC Recommendation (11)03: Numbering and Addressing for Machine-to-Machine (M2M) communications, https://docdb.cept.org/download/4d5a5aff-2927/REC1103.PDF.

[275] Article 48(1)(a).

[276] Article 48(1)(f).

[277] For instance, one respondent stated "The focus should be on ensuring that the numbering plan is as flexible as possible so as to be able to accommodate new uses that might arise. In addition, there needs to be a commitment to reviewing the plan at regular intervals to ensure that where new uses appear and the plan is not fit for purpose the plan can be reviewed and adapted in a timely manner."

animals as well as persons; the privacy implications might differ from those currently considered.

#### 3.3.3.4 Considerations for the numbering regulation

Bearing in mind the early state of development of M2M applications and the potential for adverse consequences, regulators should be cautious about relaxing current rules. For instance, CLIs can reasonably be required for any devices that could become corrupted or faulty. However, relaxing the rules might be desirable in the future.

**In the consultants' opinion:**

- **The revised numbering regulation should extend conditions of use from mobile numbers to M2M numbers. In particular, the conditions of use related to the support for emergency calls (including caller location information) should apply to M2M numbers as well as to mobile numbers.**
- **ILR should review from time to time the conditions applicable to M2M numbers in the light of market and technical developments in the use of M2M numbers. For instance, the use of M2M numbers for voice services might be restricted to calls made by humans and calls made by machines to members of particular closed user groups.**

## 3.4 Freephone, shared cost, shared revenue and "other" numbers

### 3.4.1 Supplies of freephone numbers

In Luxembourg freephone numbers beginning with '800' appear to be unproblematic. In particular, they should not give callers cause for complaint, as calls to them are free of charge to the callers, regardless of the networks used[278].

The numbers have eight digits[279]. There are also numbers among the existing short codes that are used for calls or messages that are free of charge. Three respondents to the stakeholder questionnaire favoured introducing more of these, perhaps with meanings matching those of some freephone numbers. These are considered in Section 3.6.2.

[278] Article 50(1)(a).

[279] Article 50(1)(b).

According to the current numbering regulation freephone numbers might be allocated individually or in block of 1'000[280]. In fact none appear to be allocated individually. The recommendation of Section 2.3.3 suggests that numbers should be allocated in multiples of the minimum block size; for freephone numbers currently, either 1 or 1'000 could be this minimum block size. There does not appear to be any shortage of freephone numbers (as only twenty-eight of the available 100 blocks of 1'000 numbers have been allocated), so 1'000 could be chosen as the minimum block size for administrative convenience.

### 3.4.2 The removal of shared cost numbers

#### 3.4.2.1 International background

Shared cost numbers are relatively familiar and understood in the EU. However, in several countries shared cost numbers have proved troublesome. For instance:

- In Germany they fall into six different price bands (each with fixed and mobile variants) determined by their fourth digits[281,282].
- In the United Kingdom they have been proposed for abolition and are, in any case, supposed to be falling into disuse through voluntary replacement by other, more tightly regulated, numbers[283].

[280] Article 50(1)(c).

[281] Verfügung 19/2009 (Amtsblatt 10/2009 vom 03.06.2009) Rufnummernbereich (0)180 für Geteilte-Kosten-Dienste, zukünftig Service-Dienste; Preisfestlegung für Anrufe aus den Festnetzen und Veröffentlichung nach § 67 Abs. 2 TKG, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/0180/Preisfestlegung01801bis5.doc?__blob=publicationFile.

[282] Verfügung 49/2012 (Amtsblatt 15/2012 vom 08.08.2012) (0)180 Rufnummern für Service-Dienste; Rufnummernteilbereiche (0)180-6 und (0)180-7; Preisfestlegung und Veröffentlichung nach § 67 Abs. 2 TKG, https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/0180/Preisfestlegung0180-6_0180-7.pdf?__blob=publicationFile.

[283] Future of telephone numbers First consultation, https://www.ofcom.org.uk/__data/assets/pdf_file/0022/144373/future-of-telephone-numbers.pdf.

- in Belgium, France and Ireland they have become more tightly regulated and branded as "standard rate numbers"[284,285,286].
- in Denmark and the Netherlands they do not exist at all.

The trouble with shared cost numbers lies in their pricing. Through the erosion of price ceilings by inflation or the introduction of packages offering free calls to fixed numbers, the prices of calls to shared cost numbers can become higher than those of calls to fixed numbers. This outcome is contrary to the original intention, expressed in such phrases as "calls to them cost callers no more than calls to fixed numbers". These phrases themselves appear in regulations, but can still cause difficulties, as in many countries the prices of national calls (to fixed numbers) are higher than those of local calls. Moreover, in Norway the prices of calls to mobile numbers, not fixed numbers, are taken as the constraint[287].

As a consequence of an EU court case in 2017 (about the interpretation of the EU directives in relation to after-sales calls to shared cost numbers in Germany) standard rate calls must be included in price packages that include contractual allowances for national calls to fixed numbers, at least when the call recipients are businesses[288].

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[284] Section 5.3, Communication du Conseil de l'IBPT du 14 décembre 2017 concernant les conditions tarifaires auxquelles doivent répondre les numéros 078 pour pouvoir encore être utilisés par des services clientèle d'entreprises B2C, https://www.bipt.be/file/cc73d96153bbd5448a56f19d925d05b1379c7f21/f7c3623669ea80bec421388a461d7e68e60926e0/Communication%20_Numeros_078.pdf.

[285] Section 2.b.1.ii, Décision n° 2012-0856 de l'Autorité de régulation des communications électroniques et des postes en date du 17 juillet 2012 modifiant l'organisation des tranches de numéros commençant par 08 et des numéros courts prévue par la décision n° 05-1085 du 15 décembre 2005, https://archives.arcep.fr/uploads/tx_gsavis/12-0856.pdf.

[286] Article 4.4.4, Numbering Conditions of Use and Application Process, https://www.comreg.ie/publication-download/numbering-conditions-of-use-and-application-process-document.

[287] Section 20f(b), Forskrift om nummerressurser for elektroniske kommunikasjonsnett og -tjenester, https://lovdata.no/dokument/SF/forskrift/2004-02-16-426.

[288] Case C‑568/15, Request for a preliminary ruling under Article 267 TFEU from the Landgericht Stuttgart (Regional Court, Stuttgart (Germany)), made by decision of 15 October 2015, received at the Court on 5 November 2015, http://curia.europa.eu/juris/document/document.jsf?docid=188524.

#### 3.4.2.2 Current Luxembourg situation

In Luxembourg shared cost numbers beginning with '801' are already treated as standard rate numbers: calls to them should cost callers no more than calls to fixed numbers[289].

Price packages usually include minutes of use and draw no distinctions between local and national calls or between fixed and mobile destinations. The motivation for using standard rate numbers is unclear, when calls to other, more familiar, numbers cost the same.

Shared cost numbers have been allocated to four ECNS providers (in four blocks of 1'000 numbers each). A search of published numbers suggests strongly that they are not in active public use.

#### 3.4.2.3 Stakeholder views

No respondents to the stakeholder questionnaire had plans for increasing the quantities of shared cost numbers that they had been allocated. Only one respondent had assigned any such numbers to customers.

#### 3.4.2.4 Considerations for the numbering regulation

**In the consultants' opinion:**

- **If the revised numbering regulation provides for shared cost numbers, ILR should monitor their use to see whether all of them could ultimately be withdrawn.**
- **ILR should consider withdrawing, and removing the designations of, all shared cost numbers.**

### 3.4.3 Consumer protection measures for shared revenue numbers

#### 3.4.3.1 International background

In many countries the competition from web sites and apps is leading to the declining use of shared revenue numbers (which are commonly called "premium rate numbers"). The regulations and codes of conduct are still needed for consumer protection, but their scopes and contents change as the markets change.

Similar competition is affecting dial-up content access (in any number range). In several countries, such as Germany and Austria, users must opt in if dialling might occur automatically. Extra constraints, such as automatic disconnection of calls after the delivery of specific

[289] Article 50(2)(a).

content, are advocated in ECC Recommendation (07)02[290]. These constraints could be regarded as either unnecessary or difficult to police, given that dial-up content access is by now uncommon.

#### 3.4.3.2 Current Luxembourg situation

The current numbering regulation constrains the prices and nature of calls to shared revenue numbers beginning with '900', '901' or '905'[291].

There is no "official" joint code of conduct for services using shared revenue numbers. However, at least one ECNS provider, Post, has published its own code of conduct for the services[292]. That code of conduct imposes requirements on the services that are more demanding than those in the current numbering regulation; for instance, it prohibits all communications except bidirectional voice (such as fax and internet dial-up) and it limits the lengths of statements about rules of games (to seven minutes) and calls from children (to ten minutes).

Currently dial-up content access through shared revenue numbers is just required to be reported to ILR[293]. This requirement recognises the potential for misuse of dial-up content access but does not immediately prevent it. However, prevention might not be necessary: given the great reductions in internet access costs throughout the world since shared revenue numbers were allocated, dial-up content access through shared revenue numbers could have disappeared.

The shared revenue numbers are not the only premium rate numbers in Luxembourg, as there are premium rate SMS/MMS short codes (which begin with '64' or '67'). These are subject to different consumer protection arrangements, which are considered in Section 3.6.1.

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[290] ECC Recommendation (07)02): Consumer protection against abuse of High Tariff Services, https://docdb.cept.org/download/950e0c68-b927/REC0702.PDF.

[291] Articles 30-34.

[292] Conditions particulières de vente services à revenus partagés, https://www.post.lu/documents/10181/4240640/POST+Telecom_CPV_Services+à+Revenus+Partagés_CPV-0011_FR_OnProduction_v2_en+vigueur+au+23+avril+2016/cfe73269-5493-4e65-8048-0fe7d179a5ee.

[293] Article 30(1).

#### 3.4.3.3 Stakeholder views

Respondents to the stakeholder questionnaire were asked about the general public understanding of meaning in numbers (particularly specific non-geographic initial digit sequences, such as '900', '901' and '905'). Some felt that people do not know the meaning in numbers. Others felt that people do understand that shared revenue numbers are expensive, without knowing particular prices.

The current numbering regulation contains obligations to make price announcements in the first 30 seconds of calls and to allow the callers to end such calls free of charge following the announcements[294]. One respondent was uncertain about whether the ECNS providers or the content providers (to whom the ECNS providers assign shared revenue numbers) had the responsibility for fulfilling such obligations. Though the responsibility could be specified by extending the obligations in the regulation, it could be left to the contracts between the ECNS providers and the content providers. The regulation would still need to state what should happen if the contracts failed to specify who was responsible.

No respondents commented on dial-up content access through shared revenue numbers. There might well be none in Luxembourg; certainly only two ECNS providers have numbers beginning with '12' that are specifically intended for internet access.

#### 3.4.3.4 Considerations for the numbering regulation

Generally alternatives to the use of shared revenue numbers are now so widespread that there is no strong case for changing the price limits on shared revenue services[295]. These limit to €30 the prices of calls charged per call[296]. The limit should apply also to the prices of calls charged per minute, so a call could have charges applied for 15 minutes if it were charged at the default maximum rate of €2 per minute[297]. This rule and limit are those already applied in Germany[298].

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[294] Article 32(2)(b).

[295] Article 33.

[296] Article 33(2).

[297] Article 33(1).

[298] Article 66d(2), Telekommunikationsgesetz, https://dejure.org/gesetze/TKG/102.html.

**In the consultants' opinion:**

- **The current limit of €30 per call should apply not only to calls charged per call but also to calls charged per minute, so a call charged at €1 per minute could have charges applied for 30 minutes, but a call charged at €2 per minute could have charges applied for 15 minutes, and so on.**

Nonetheless, as declines in revenues can lead to declines in scruples, practices such as placing calls to shared revenue numbers on hold might need to be stopped[299]. Moreover barring shared revenue numbers might grow in importance and should be free[300].

**In the consultants' opinion:**

- **ILR should consider prohibiting the use of shared revenue numbers whenever waiting may be required, irrespective of the service intent (in queues for customer care calls, for example).**
- **Barring of shared revenue numbers at the request of customers should be free of charge in all circumstances.**
- **ILR should consider specifying in the revised numbering regulation who is responsible for making price announcements and for publishing price information for calls to shared revenue numbers.**

Additional measures in ECC Recommendation (07)02 appear appropriate[301]. There are also some in ITU-T Recommendation E.156 Supplement 1 that are likely to be unnecessary if shared revenue services are declining[302].

**In the consultants' opinion:**

- **ILR should consider incorporating in the revised numbering regulation additional measures from ECC Recommendation (07)02 by requiring that:**

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[299] Article 32(2)(d).

[300] Article 34(1).

[301] ECC Recommendation (07)02: Consumer protection against abuse of High Tariff Services, https://docdb.cept.org/download/950e0c68-b927/REC0702.PDF.

[302] Section 6, ITU-T Recommendation E.156, Supplement 1: Guidelines for ITU-T action on reported misuse of E.164 number resources, Best practice guide on countering misuse of E.164 number resources, https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-E.156-200605-I!!PDF-E.

- **Basic services should remain available in disputes over payments for shared revenue services.**
- **Payments to shared revenue content providers should be delayed sufficiently to let suspected abuses be detected and should be suspended rapidly to let suspected abuses be investigated.**
- **Refunds or compensation should be paid to customers suffering from abuses.**

In brief, several extra requirements on shared revenue services could be included in the revised numbering regulation at a time when the market is probably changing. There might therefore be a need for a flexible approach that is not conveniently provided in a regulation, with its lengthy development schedule and limited expressive style (without examples or summaries of other legal instruments, in particular). Instead of expanding the treatment of shared revenue services in the regulation ILR might reduce it. There would then need to be a code of conduct, drawn up by ILR in collaboration with ECNS providers and organisations such as the Union Luxembourgeoise des Consommateurs. This code of conduct would be endorsed by ILR to give it legal force, in the same way as ILR might endorse the code of conduct on services using SMS/MMS short codes discussed in Section 3.6.1.

**In the consultants' opinion:**

- **ILR should consider regulating shared revenue numbers through an approach in which, instead of including extra rules in the revised numbering regulation:**
  - **Requirements on shared revenue numbers in the revised numbering regulation would be only ones that embody lasting general principles; for instance, the current limit of €30 per call might be omitted, to make future variation easier.**
  - **ILR would develop and issue for consultation a code of conduct for services using shared revenue numbers, taking into account the existing unofficial documents.**
  - **ILR would endorse the final code of conduct to give it legal force.**

Though ECC Recommendation (07)02 suggests some ways of controlling dial-up content access through shared revenue numbers, preventing dial-up content access completely seems appropriate, as there are now many better ways of obtaining content access.[303].

**In the consultants' opinion:**

- **ILR should prohibit dial-up content access through shared revenue numbers.**

### 3.4.4 Potential ranges of "other" numbers

#### 3.4.4.1 International background

In many countries other numbers have been introduced alongside freephone numbers, shared cost numbers and shared revenue numbers. These may be particular to the circumstances of the country; for instance, there are numbers in Singapore used by services offering free of charge calls to individuals and organisations located abroad[304].

Falls in prices are tending to merge some services using different number ranges, as noted in Section 3.4.2, while changes in technology are tending to make other services (such as paging and data access) obsolete. For instance:

- in Norway standard rate services use nomadic numbers, shared cost numbers, local rate numbers and national rate numbers[305]. In Ireland they use nomadic numbers, shared cost numbers and universal access numbers[306].
- In the Netherlands the paging numbers are likely to become designated for mobile services and the data access numbers are likely to be withdrawn: since 2016 the quantities of allocated paging numbers and data access numbers have fallen annually by 9% and 18% respectively[307].

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[303] ECC Recommendation (07)02: Consumer protection against abuse of High Tariff Services, https://docdb.cept.org/download/950e0c68-b927/REC0702.PDF.

[304] Section 9, National Numbering Plan, https://www.imda.gov.sg/-/media/Imda/Files/Regulations%20and%20Licensing/Regulations/Numbering/Aug%202019/NNPWD%20Aug%202019.

[305] Section 20f(b), Forskrift om nummerressurser for elektroniske kommunikasjonsnett og -tjenester, https://lovdata.no/dokument/SF/forskrift/2004-02-16-426.

[306] Article 4.4.4, Numbering Conditions of Use and Application Process, https://www.comreg.ie/publication-download/numbering-conditions-of-use-and-application-process-document.

[307] Sections 4.1.4 and 4.1.5, Monitor Nummeruitgifte 2019, https://www.acm.nl/sites/default/files/documents/2020-08/monitor-nummeruitgifte-2019.pdf.

In the EU alongside freephone numbers, shared cost numbers and shared revenue numbers the main numbers that continue to have special tariffs are personal numbers and corporate numbers. These are as follows:

- Personal numbers can be assigned to individuals who wish to receive calls in any location and on any terminal. Services using them might also be expected to have additional capabilities besides call diversion, such as unified messaging, personal telephone directories and personal diaries, as in the Netherlands[308]. Even when used by services with these capabilities personal numbers offer little more than mobile numbers now do, so demand for them has been declining in many countries (including the Netherlands). Accordingly, they were withdrawn by 2015 in Ireland and by 2019 in Switzerland[309,310]. In Belgium the regulator decided in 2015 not to introduce them, having failed to detect any demand[311]. They risk being confused with nomadic numbers and used by shared revenue services: in France nomadic numbers were changed in 2005, to avoid this risk[312,313]. In the United Kingdom the regulator has struggled to control personal numbers effectively since 2001, by barring those being used by shared

[308] Section 4.1.10, Monitor Nummeruitgifte 2019, https://www.acm.nl/sites/default/files/documents/2020-08/monitor-nummeruitgifte-2019.pdf.

[309] Numbering Conditions of Use and Application Process, https://www.comreg.ie/publication-download/numbering-conditions-of-use-and-applications-process.

[310] Section 4.1, Révision des ordonnances relatives à la LTC Rapport explicatif en vue de l'ouverture de la procédure de consultation, https://www.bakom.admin.ch/dam/bakom/fr/dokumente/bakom/das_bakom/rechtliche_grundlagen/Vernehmlassungen/revision-der-verordnung-zu-fmg/verordnung-ueber-fernmeldedienste-7.pdf.

[311] Section 2, Décision du conseil de l'IBPT du 19 juin 2012 concernant la non introduction des séries de numéros spéciales 076 et 079 respectivement pour des numéros personnels et des numéros d'entreprise, https://www.ibpt.be/public/files/fr/20378/3790_Communication_19_juin_2012_non_introduction_series_numeros_speciales_076_079_numeros_personnels_numeros_entreprise.pdf.

[312] Article 2, Décision n° 05-1085 de l'Autorité de régulation des communications électroniques et des postes en date du 15 décembre fixant l'utilisation des catégories de numéros du plan national de numérotation, https://www.arcep.fr/uploads/tx_gsavis/05-1085.pdf.

[313] Article 2, Décision n° 05-1086 de l'Autorité de régulation des communications électroniques et des postes en date du 15 décembre 2005 ouvrant la tranche de numéros 097BPQMCDU à l'attribution, https://www.arcep.fr/uploads/tx_gsavis/05-1086.pdf.

revenue services, monitoring the rest along with shared revenue numbers, and imposing wholesale termination rates on any remaining legitimate uses[314].

- Corporate numbers can be assigned to organisations in blocks having sizes appropriate to the sizes of the organisations. They might be used for making publicly accessible the connections on the networks of organisations, but PBX functionality in switches can do that, too. They therefore offer little more than fixed numbers do, especially if fixed numbers do not identify geographic areas. In only two of the reference countries (Switzerland and the Netherlands) are they distinguished from virtual private network numbers (which are discussed in Section 3.5.2). In Switzerland they are not common and are now allocated only to ECNS providers for organisations that have been assigned some already[315]. However, they have become widely available in the Netherlands, where the regulator can allocate them in blocks of at least 100 to organisations that are registered with chambers of commerce in the Netherlands[316]. As with personal numbers, in Belgium the regulator decided in 2015 that there was no demand for corporate numbers[317].

#### 3.4.4.2 Current Luxembourg situation

In Luxembourg there are no "other" numbers besides those beginning with '0'[318]. These particular numbers are network routing numbers. Consequently they are not publicly accessible and are not considered further in this report.

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[314] Restoring trust in personal numbering, https://webarchive.nationalarchives.gov.uk/20130705082349/http://www.ofcom.org.uk/static/archive/oftel/publications/numbering/pers1001.pdf.

[315] Article 5.2.2, Prescriptions techniques et administrative concernant le plan de numérotation et la répartition des numéros E.164, https://www.bakom.admin.ch/dam/bakom/fr/dokumente/bakom/das_bakom/rechtliche_grundlagen/vollzugspraxis/Telekommunikation/tav_pta_2_2_ed7.pdf.

[316] Beleidsregels uitgifte bedrijfsnummers, https://wetten.overheid.nl/BWBR0033303.

[317] Section 2, Décision du conseil de l'IBPT du 19 juin 2012 concernant la non introduction des séries de numéros spéciales 076 et 079 respectivement pour des numéros personnels et des numéros d'entreprise, https://www.ibpt.be/public/files/fr/20378/3790_Communication_19_juin_2012_non_introduction_series_numeros_speciales_076_079_numeros_personnels_numeros_entreprise.pdf.

[318] Article 56.

#### 3.4.4.3 Stakeholder views

The respondents to the stakeholder questionnaire made various suggestions about introducing additional numbers. The suggestions are summarised in **bold** below, with the comments of the consultants:

- **Numbers assigned to physical persons for life, much as are social security numbers**. The benefit of having these is unclear, in an age when citizens have social security numbers and almost all customers have portable mobile numbers. People would be cautious about accepting them, bearing in mind the potential for violations of privacy (such as unsolicited communications).
- **Numbers beginning with '683' and '692' (for freephone messages and shared revenue messages respectively) and allocated in blocks of 10'000**. Freephone numbers and shared revenue numbers could serve the same purpose and appear to be little used by voice services; they might be used by SMS/MMS services if the revised numbering regulation contained safeguards for such services analogous to those for voice services in the current numbering regulation.
- **Ranges of voice short codes and eight-digit numbers with matching meanings**. A majority (84%) of the respondents rejected this suggestion, made explicitly in the stakeholder questionnaire. A respondent gave as an example that six-digit voice short codes beginning with '118' and '119' could match some eight-digit numbers beginning with '800' and '900'. However, this scheme would allow only 1% of '800' and '900' numbers to be shortened, and then only by 25%. It might be more attractive to offer 200 four-digit voice short codes beginning with '18' and '19' for highly selected applications, which would halve their number lengths.
- **Numbers used independently of the network termination type (whether fixed, nomadic or mobile)**. This is discussed in Sections 3.2.4 and 3.2.5. Achieving it, as far as it is appropriate, does not need the introduction of new numbers.
- **Numbers authenticated to be free from misuse**. In France, where there are already many unwanted calls, certain nomadic numbers and mobile numbers are separated out for authentication, as described in Section 2.7.2[319]. In Luxembourg,

[319] Section 9, Décision n° 2019 0954 de l'Autorité de régulation des communications électroniques et des postes en date du 11 juillet 2019 modifiant la décision établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/19-0954.pdf.

where there are currently few unwanted calls, similar complications of the numbering plan can await the outcome of this pilot scheme.

#### 3.4.4.4 Considerations for the numbering regulation

The evidence from other countries does not point to introducing in Luxembourg any publicly accessible numbers alongside freephone numbers, shared cost numbers and shared revenue numbers. It suggests that even personal numbers and corporate numbers would not be very popular and that little would be gained by distinguishing the services using personal numbers and corporate numbers from the services using existing numbers. However, the evidence here does not relate to short codes, which receive separate consideration in Sections 3.5.2 and 3.6.2.

Generally, distinguishing between services according to their numbers is becoming ever less appropriate, as the regulator in Belgium has observed[320]. It reduces the efficiency of number utilisation, can create difficulties in demarcation (between M2M and IoT, for example) and might have little value when prices and other information for individual numbers can be found online.

**In the consultants' opinion:**

- **ILR should designate numbers (other than short codes) for new services only if there is a clear demonstration of demand that cannot be met by services using existing numbers.**

## 3.5 Voice short codes

### 3.5.1 Existing ranges of voice short codes

#### 3.5.1.1 International background

Worldwide the use of many voice short codes is falling. In particular:

- Directory information provision numbers are probably declining in use, as most people can obtain the information free of charge online. In some countries the decline has been accelerated by outrageously high call charges: in the United Kingdom the annual

[320] Section 2, Décision du conseil de l'IBPT du 19 juin 2012 concernant la non introduction des séries de numéros spéciales 076 et 079 respectivement pour des numéros personnels et des numéros d'entreprise, https://www.ibpt.be/public/files/fr/20378/3790_Communication_19_juin_2012_non_introduction_series_numeros_speciales_076_079_numeros_personnels_numeros_entreprise.pdf.

rate of decline reached 40% (and the prices reached €11 per minute in extreme cases) before the regulator limited the prices to about €3 per minute[321].

- Dial-up internet access numbers are becoming redundant as broadband is becoming universally available and affordable. Worldwide this is so also for numbers used by simple information provision services, such as the speaking clock.
- Mass traffic movement numbers (which indicate destinations that might reject call volumes above their answering capacities) are used by services that are designed to moderate bursts of traffic (due to radio games, television votes or major disasters, for example). They lose their importance if the growth in network or terminal capacity mitigates the effects of the bursts. Consequently they are now identified in the numbering plans of only two of the reference countries (Germany and the Netherlands). Moreover, in Germany they are reducing in use (to the extent that one of their two ranges was withdrawn in 2016 from lack of use) and in the Netherlands they lie in small ranges (for freephone services and premium rate services).
- Carrier selection codes (which indicate the choice of ECNS provider) are continuing to fall in use in Switzerland and the Netherlands[322,323]. Similar falls are likely to be found wherever there are the same competitive pressures and alternatives for making cheap calls.

#### 3.5.1.2 Current Luxembourg situation

The voice short codes beginning with '1' that can be allocated by ILR according to the national numbering plan are the following:

- The three-digit emergency call numbers '112' and '113'[324].

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[321] Directory Enquiries (118) Review Statement, https://www.ofcom.org.uk/__data/assets/pdf_file/0017/128420/Directory-Enquiries-118-Review-statement.pdf.

[322] Section 2, Message concernant la révision de la loi sur les telecommunications, https://www.bakom.admin.ch/dam/bakom/fr/dokumente/bakom/das_bakom/rechtliche_grundlagen/Bundesgesetze/fmg-revision-2017/botschaft-zur-revision-des-fmg-2017.pdf.

[323] Section 4.1.6, Monitor Nummeruitgifte 2019, https://www.acm.nl/sites/default/files/documents/2020-08/monitor-nummeruitgifte-2019.pdf.

[324] Articles 63(3)-63(4).

- The six-digit harmonised numbers beginning with '116', for services of social value[325].
- The five-digit directory information provision numbers beginning with '118'[326].
- The five-digit dial-up internet access numbers (and some other numbers, such as that for the speaking clock) beginning with '12'[327].
- The four-digit mass traffic movement numbers beginning with '13', for services that are designed to limit traffic to levels suitable for the networks and terminals[328].
- The five-digit carrier selection codes beginning with '15', which indicate the choice of ECNS provider (and are placed in front of numbers that have meanings independent of that ECNS provider)[329].

Several of these are probably falling in use in Luxembourg, just as they are elsewhere.

Some voice short codes that begin with digits other than '1' are not documented in the national numbering plan but are implemented by some ECNS providers. Among them are '600' (implemented by Orange), '6280' (implemented by Post), '700' (implemented by Tango) and '9000' (implemented by Join). According to the numbering register they might clash with existing reservations of twelve-digit numbers (as does '600'), occupy the space of 100'000 eight-digit numbers (as does '6280'), be free for allocation (as is '700'), or be blocked from allocation (as is '9000').

#### 3.5.1.3 Considerations for the numbering regulation

Short codes that have been allocated but are not used could prevent other, better, uses of the numbering space. Short codes that have not been allocated but that are used could also do so, in a rather different way.

**In the consultants' opinion:**

- **ILR should monitor the use of voice short codes to see whether reductions could ultimately lead to complete withdrawal of the codes.**

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[325] Article 63(7).

[326] Article 63(9).

[327] Article 65.

[328] Article 66.

[329] Article 68.

- **ILR should make the ECNS providers aware that their uses of voice short codes that have not been duly allocated can be ended without notice.**

### 3.5.2 Potential ranges of voice short codes

In Norway voice short codes can be allocated to organisations from a specific range[330]. There are enough codes available in that range to provide 1 per 600 enterprises or 1 per large enterprise (according to the Eurostat definitions of enterprises).

If in Luxembourg voice short codes could be allocated to organisations, as in Norway, scaling would suggest allocations of about 50 numbers (at a ratio of 1 per 600 enterprises) or 150 numbers (at a ratio of 1 per large enterprise). These organisations might want voice short codes for various purposes: there might be freephone numbers (typically handling calls before sales) and shared cost numbers (typically handling calls after sales), with perhaps also shared revenue numbers (depending on the goods or services sold). Catering for all these would consume a large proportion of the available voice short codes. Overall, it would complicate the numbering plan and reduce uniformity in number lengths; it should not be done without clear demand.

Another possible use of voice short codes is for Virtual Private Network (VPN) selection, as in Germany, for example[331]. A caller dialling a VPN selection code followed by a privately administered number for the same VPN is connected through a gateway that checks the CLI for caller credentials and completes the route to the private network number. VPN selection codes therefore operate rather like carrier selection codes. However, they are followed by private network numbers, which have lengths determined separately for each private network, contrary to objectives of encouraging uniform lengths. Moreover, VPNs are now widely provided through internet access and not limited to telephony, so few of them make use of voice short codes. Again a new range (for VPN selection codes, in this case) should not be introduced in Luxembourg without convincing justification.

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[330] Section 22, Forskrift om nummerressurser for elektroniske kommunikasjonsnett og -tjenester, https://lovdata.no/dokument/SF/forskrift/2004-02-16-426.

[331] Verfügung 48/2014 (Amtsblatt 16/2014 vom 03.09.2014) Nummernplan (0)18 – Rufnummern für Virtuelle Private Netze (VPN), https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Nummerierung/Rufnummern/018/Nummernplan.pdf?__blob=publicationFile.

Closed User Group (CUG) selection can be treated just like VPN selection (if the number following the CUG selection code is privately administered) or just like carrier selection (if the number following the CUG selection code is publicly accessible). Indeed in one number range there can be both treatments, as in France, for example[332]. However, the argument for introducing CUG selection codes is little stronger than that for introducing VPN selection codes.

**In the consultants' opinion:**

- **ILR should designate voice short codes for new services only if there is a clear demonstration of demand that cannot be met by services using existing voice short codes.**

## 3.6 SMS/MMS short codes

### 3.6.1 Administrative arrangements for SMS/MMS short codes

#### 3.6.1.1 International background

SMS/MMS short codes receive little attention in the numbering plans of some countries, where they are managed by the ECNS providers co-ordinated by an industry organisation, even if the regulator formally designates and allocates them. A typical case is in France, where a trade association sets price ceilings, facilitates assignments and administers a code of conduct[333]. Related arrangements hold in Switzerland and the Netherlands, except that there price ceilings are not set[334,335].

However, elsewhere the regulator manages SMS/MMS short codes, treating them mostly as premium rate numbers, just as are the shared revenue numbers. For instance, in Belgium the regulator has specified them fully in conditions of use with the force of law, instead of

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[332] Article 2.5.9(c), Plan national de numérotation – Version du 1er août 2019, Décision n° 2018 0881 modifiée de l'Autorité de régulation des communications électroniques et des postes en date du 24 juillet 2018 établissant le plan national de numérotation et ses règles de gestion, https://www.arcep.fr/uploads/tx_gsavis/18-0881.pdf.

[333] Recommandations déontologiques applicables aux services SMS+/MMS+, https://af2m.org/wp-content/uploads/2020/06/20170127-Chartes-SMS-VF.pdf.

[334] Code de conduite relatif aux services de téléphonie mobile à valeur ajoutée, https://www.salt.ch/media/filer_public/c3/47/c3472d62-25d0-4d52-a954-07ca27b2aa3d/code_of_conduct_fr.pdf.

[335] Gedragscode voor Betaalde SMS- en Mobiel Internet Diensten, https://www.payinfo.nl/media/gedragscodes/8da709cb-2c06-4461-8a0a-6affd14de429.pdf.

administering a separate code of conduct[336]. Taking responsibility for SMS/MMS short codes to this extent enables the regulator to require that if a voice short code and an SMS/MMS short code have the same digit sequence then they have matching meanings[337].

ECC Recommendation (06)03 advises that the regulator should take final responsibility for SMS/MMS short codes if existing national solutions are unsatisfactory[338]. This recommendation was put forward early in the development of the markets; since then the applications, and the possibilities for misuse, have multiplied and regulation of premium rate services has tended to become stricter. For instance, in Ireland in 2010 the regulator took over from an industry organisation, so the numbering plan now incorporates conditions of use for SMS/MMS short codes[339]. The regulator in Australia is now advocating a similar position generally and moving away from its previous dependence on co-regulation[340].

#### 3.6.1.2 Current Luxembourg situation

In Luxembourg SMS/MMS short codes beginning with '64' and '67' cater only for SMS messages. Content providers and content aggregators could circumvent this limitation by converting MMS messages into references (to web sites) that would be sent in SMS messages.

The current numbering regulation constrains the prices and sequences of messages to and from SMS/MMS short codes[341]. Nonetheless, overall it treats premium rate SMS/MMS short codes differently from shared revenue numbers beginning with '900', '901' or '905', which are also premium rate numbers. Moreover, it does not define the initial digit sequences of the

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[336] Articles 69-74, 27 avril 2007 - arrêté royal relatif à la gestion de l'espace de numérotation national et à l'attribution et au retrait des droits d'utilisation de numéros, http://www.etaamb.be/fr/arrete-royal-du-27-avril-2007_n2007011252.html.

[337] Articles 59 and 65, 27 avril 2007 - arrêté royal relatif à la gestion de l'espace de numérotation national et à l'attribution et au retrait des droits d'utilisation de numéros, http://www.etaamb.be/fr/arrete-royal-du-27-avril-2007_n2007011252.html.

[338] ECC Recommendation (06)03: Principles related to Numbering plans for SMS Short Codes, https://docdb.cept.org/download/35ad5e29-3387/REC0603.PDF.

[339] Article 5.1, Numbering Conditions of Use and Application Process, https://www.comreg.ie/publication-download/numbering-conditions-of-use-and-application-process-document.

[340] ACMA submission to Consumer Safeguards Review Part C: Choice and Fairness, https://www.acma.gov.au/sites/default/files/2020-10/ACMA-submission-to-Consumer-Safeguards-Review-Part-C.pdf.

[341] Articles 35-36.

SMS/MMS short codes, which in fact coincide with the initial digit sequences of some mobile numbers.

There is a code of conduct for services using SMS/MMS short codes devised by industry participants and administered by GIE Telcom[342]. In addition, at least one ECNS provider, Post, has its own code of conduct for the services[343].

#### 3.6.1.3 Stakeholder views

A majority (74%) of the respondents to the stakeholder questionnaire were not aware of any problems with the use of SMS/MMS short codes. However, seven respondents stated that there have been problems such as revenue sharing fraud, customer ignorance of the tariffs, and inability to reach numbers from outside Luxembourg. One of them remarked that the current code of conduct solved some of these problems but still suggested that it could usefully be enhanced and endorsed by ILR, and that premium rate SMS/MMS short codes should be eliminated.

One respondent noted that, in principle, different mobile service providers might assign the same SMS/MMS short code to different content providers or apply different rules to the same content provider. It, too, favoured enhancement and endorsement by ILR of the code of conduct.

A majority (64%) of the respondents to the stakeholder questionnaire indicated that SMS/MMS short codes should be allocated directly by ILR; they would then be part of the Luxembourg numbering plan, so they would be developed more consistently and reached more readily from other countries.

#### 3.6.1.4 Considerations for the numbering regulation

In the absence of a national prefix, as in Luxembourg, SMS/MMS short codes can cause confusion with other numbers or even occupy part of the numbering space that could be occupied by other numbers[344]. Further confusion may arise from ECNS providers using the same code in different ways, or different codes for the same purpose.

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[342] Luxembourg's Mobile Services Code of Conduct, https://www.post.lu/documents/10181/2291168/Luxembourg_MobileServicesCodeOfConduct_Version_2-0.pdf/a5017aa5-ad29-4639-a3a9-f2c81b18be98 .

[343] Conditions particulières applicables aux services SMS premium, https://www.post.lu/documents/10181/4240640/CPV_SMS+Open+Premium_FR_FC-0279_v4_OnProduction.pdf/fb98e1d7-bd59-481f-af14-71277fdfbb2b.

[344] Article 35.

**In the consultants' opinion:**

- **The revised numbering plan should state which numbers can be allocated as SMS/MMS short codes, even if ILR formally delegates the task of allocation.**
- **ILR should consider taking full authority over the allocation of SMS/MMS short codes, instead of formally delegating the task.**

The code of conduct for services using SMS/MMS short codes could be incorporated in the revised numbering regulation. However, it is fairly detailed in places and possibly liable to more frequent revision than the regulation. It might need expansion to provide adequate consumer protection; the corresponding code in the Netherlands, for example, is ten times as long[345]. Accordingly it should be separated from the revised numbering regulation and treated as in Section 2.1.8. It might be administered by an organisation other than ILR in conditions outlined in Section 2.1.9.

**In the consultants' opinion:**

- **ILR should consider regulating SMS/MMS short codes through an approach in which, instead of including extra rules in the revised numbering regulation:**
    - **ILR would develop and issue for consultation the code of conduct for services using SMS/MMS short codes, taking into account the existing unofficial documents.**
    - **ILR would endorse the final code of conduct to give it legal force.**

### 3.6.2 Potential ranges of SMS/MMS short codes

#### 3.6.2.1 International background

Premium rate services using SMS/MMS short codes have not undergone quite the same decline as their voice counterparts. They are used to buy not just information and entertainment but also tickets and vending machine goods (though they now face strong competition from near-field communications on mobile phones). The delivery of passwords and alerts free of charge is also very common. These uses have even led to increasing deliveries of Person-to-Application (P2A) and Application-to-Person (A2P) messages in which the applications are addressed by SMS/MMS short codes.

[345] Gedragscode voor Betaalde SMS- en Mobiel Internet Diensten, https://www.payinfo.nl/media/gedragscodes/8da709cb-2c06-4461-8a0a-6affd14de429.pdf.

#### 3.6.2.2 Current Luxembourg situation

The Luxembourg ECNS providers are currently developing guidelines on alphanumerical sender identification codes for SMS/MMS short codes. Such alphanumerical codes are used for sending A2P messages from applications (such as password generators and news sources) to which in general no reply is possible.

Alphanumerical sender identification codes might be either free to the recipients or paid for by the recipients. They do not use short codes beginning with '64' or '67' that identify their costs. Accordingly, "double agreement" procedures like those for shared revenue services in the current numbering regulation should ensure that the costs of messages are known before the messages are received[346]. For instance, there could be two messages, the first of which (uncharged) could contain pricing information, an SMS/MMS short code for the destination of the reply, and a request to opt in by replying, and the second of which (charged) would be sent after such a reply. In addition there should be safeguards against sending A2P messages in unsolicited marketing.

Alphanumerical sender identification codes could accommodate the growth in A2P messages noted by two respondents to the stakeholder questionnaire and thereby avoid the introduction of new eight-digit numbers or extra numerical SMS/MMS short codes to identify the senders of such messages. However, implementation constraints preclude sending messages to alphanumerical sender identification codes. Consequently, "double agreement" procedures point to using eight-digit numbers or numerical SMS/MMS short codes, not alphanumerical sender identification codes, in cases where A2P messages require replies. The eight-digit numbers, at least, might not need to come from a new range: numbers beginning with '800' could serve instead.

How alphanumerical sender identification codes would be defined, authorised and implemented is not clear at this stage.

#### 3.6.2.3 Stakeholder views

One respondent to the stakeholder questionnaire believed that the use of short codes beginning with '64' and '67', as well as the little-known relations between digits and tariffs, were restricting the effective use of the codes. Accordingly, it suggested introducing more appealing codes, at least for donations and competitions in P2A messages; its ideal, subsequently supported by another respondent, would have three-digit codes and breach the

[346] Article 35(1)(b).

current price ceiling of €5 per message[347]. However, it noted that money laundering could cause problems.

The respondent supporting the suggestion above noted that voice short codes beginning with '13' and SMS/MMS short codes beginning with '64' do not match: currently they have different uses (for calls and messages respectively) and allow different choices of remaining digits. It favoured having short codes that could be used for both calls and messages on all mobile networks, as in Belgium[348]. For this purpose four-digit codes beginning with '1' (like the current four-digit codes beginning with '13') might be preferable to three-digit codes that would be open to confusion with mobile numbers beginning with '6'.

#### 3.6.2.4 Considerations for the numbering regulation

Any large reform of the rules for SMS/MMS short codes should probably entail the abolition of the current short codes beginning with '64' and '67', because of the potential confusion over which rules apply. There would then be several ways in which users could be effectively protected and encouraged to use them. Any network-specific information might be confined to Unstructured Supplementary Service Data (USSD).

Allowing SMS/MMS short codes and shared revenue numbers to be used for both calls and messages would benefit users and broaden service offerings. However, it poses technical problems; for instance, during roaming, dialled numbers in voice calls are analysed in the visited network, but dialled numbers for SMS messages are sent to the home network. Nonetheless it is supported at least for harmonised numbers beginning with '116', for services of social value, in ECC Decision (09)06[349].

[347] Article 36.

[348] Articles 59 and 65, 27 avril 2007 - arrêté royal relatif à la gestion de l'espace de numérotation national et à l'attribution et au retrait des droits d'utilisation de numéros, http://www.etaamb.be/fr/arrete-royal-du-27-avril-2007_n2007011252.html.

[349] ECC Decision (09)06: Reserving the National Short Message Service (SMS) Numbering Range Beginning with '116' for Harmonised SMS Numbers for Harmonised Services of Social Value, https://docdb.cept.org/download/cc8c297a-07e1/ECCDEC0906.PDF.

**In the consultants' opinion:**

- **ILR should consider having measures for dealing with SMS/MMS short codes analogous to the measures for dealing with shared revenue numbers. Among these would be letting customers bar messages to and from SMS/MMS short codes free of charge, in accordance with ECC Recommendation (06)03.**
- **ILR should consider introducing more SMS/MMS short codes for A2P uses (such as password delivery) free of charge to the recipient, if technical barriers to unsolicited communications are introduced.**
- **ILR should consider introducing more SMS/MMS short codes for P2A uses (such as donations and competitions) with price ceilings higher than the current one of €5 per message, if the safeguards against money laundering are adequate.**
- **The revised numbering regulation should require "double agreement" procedures for SMS/MMS short codes, alphanumerical sender identification codes and shared revenue numbers.**
- **A working group should consider possible enhancements to the roles of SMS/MMS short codes. These include:**
    - **Letting the SMS/MMS short codes, the freephone numbers and the shared revenue numbers be used by both voice services and SMS/MMS services.**
    - **Designating some SMS/MMS short codes for a single purpose each (such as balance checking) that would be supported by all of the networks.**