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TR.EENM Guidelines for effective and efficient national E.164 numbering plan administration

Technical Report ITU-T TR.EENM

Guidelines for effective and efficient national E.164 numbering plan administration

Summary

This Technical Report aims to provide the most effective, efficient methods and guidelines for national E.164 numbering plan administrations depending on best practices.

Keywords

Administration, E.164 numbering plan, national numbering resources.

Note

This is an informative ITU-T publication. Mandatory provisions, such as those found in ITU-T Recommendations, are outside the scope of this publication. This publication should only be referenced bibliographically in ITU-T Recommendations.

Change log

This document contains the first publication of the ITU-T Technical Report on "Guidelines for effective and efficient national E.164 numbering plan administration", which was approved at the ITU-T SG2 meeting held fully virtual, 31 May – 11 June 2021.

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Guidelines for effective and efficient national E.164 numbering plan administration

1 Summary

This Technical Report aims to provide the most effective, efficient methods and guidelines for national E.164 numbering plan resource administration according to best practices.

2 Introduction

The nature of numbering resources in telecommunication is divided into national and international categories. International numbering resources are administrated by the ITU-T Telecommunication Standardization Bureau (TSB) according to ITU-T E-series Recommendations, while national E.164 numbering resources are left to Member States on a country by country basis. This Technical Report provides some guidance for Member States for effective and efficient numbering resources management.

3 Background

National E.164 numbering resources may include fixed numbers, mobile numbers, or geographical numbers after the country code (CC). They could also be short codes or unstructured supplementary service data (USSD) codes. These numbering resources are structured under a national numbering plan in each country. This numbering plan should be organized to meet the current and future demand of numbers; thus, the role of Member States should consider all principles described in [ITU-T E.164] and [ITU-T E.190]. This Technical Report would help Member States to achieve their goals effectively and efficiently.

4 Scope

This Technical Report provides information and guidance on effective, efficient methods for national numbering resources administration. It focuses on the role of administrations in managing numbering resources and the main guidelines that ensure the implementation of the principles and responsibilities outlined in [ITU-T E.190].

5 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Technical Report.

- [ITU-T E.101] Recommendation ITU-T E.101 (2009), *Definitions of terms used for identifiers (names, numbers, addresses and other identifiers) for public telecommunication services and networks in the E-series Recommendations.*
- [ITU-T E.129] Recommendation ITU-T E.129 (2013), *Presentation of national numbering plans.*
- [ITU-T E.161.1] Recommendation ITU-T E.161.1 (2008), *Guidelines to select Emergency Number for public telecommunications networks.*
- [ITU-T E.164] Recommendation ITU-T E.164 (2010), *The international public telecommunication numbering plan.*

[ITU-T E.190] Recommendation ITU-T E.190 (1997), *Principles and responsibilities for the management, assignment and reclamation of E-series international numbering resources*.

6 Terms, definitions and abbreviations

6.1 Terms defined in Recommendation ITU-T E.101

This Technical Report uses the following terms defined in [ITU-T E.101]:

6.1.1 international numbering resource: A numbering resource derived from an international number plan and assigned by the ITU-T, e.g., Recommendations ITU-T E.164 and ITU-T E.212.

6.1.2 administrator: The organization, on a global, regional, or national level, is entrusted with the administration of a resource derived from a numbering, naming, or addressing plan.

6.1.3 assignee: The applicant to whom the numbering, naming or addressing resources have been assigned.

6.1.4 assignment: Authorization given to an applicant for the right of use of number, naming, or addressing resources under specified conditions.

6.1.5 reclamation: The process through which the right of use given to the assignee for the assigned number, name, or address is withdrawn. The resource may be used for future potential re-assignment.

6.2 Abbreviations and acronyms

This Technical Report uses the following abbreviations and acronyms:

CC	Country Code
IoT	Internet of Things
M2M	Machine to Machine
USSD	Unstructured Supplementary Service Data

7 The national E.164 numbering plan

The national E.164 numbering plan is the design of the telephone number hierarchy as defined by each Member State. The characteristics of national numbering plans are defined in [ITU-T E.164], which also requires Member States to consider the current and future demand, flexibility, and accessibility. Nowadays the demand for numbering resources is increasing according to many factors like:

- a) new technologies,
- b) convergence,
- c) competition,
- d) smartphone capabilities,
- e) other players' usage (like over-the-top (OTT) applications, etc.), and
- f) rich content delivered through telecom channels.

Consequently, Member States may consider these factors to meet the increasing demand without losing control of competition management and causing numbering resources wastage. In the following clauses, some guidelines are defined to help Member States to achieve their objectives.

8 General principles

In addition to the principles defined in [ITU-T E.190] for international numbering resources administration, the principles for national E.164 numbering resources administration outlined in clauses 8.1 to 8.2 are taken into consideration.

8.1 The proper use of ITU-T E-series Recommendations

ITU-T E-series Recommendations give general principles and guidance of using international and national numbering resources that should be followed by Member States to obtain the best numbering plan structure.

8.2 Publication of national E.164 numbering plans

The publication of national numbering plans is a good practice as it shows the capacity of the numbering plan to accommodate future demand and the consistency of the numbering plan with ITU Recommendations. According to [ITU-T E.129], it will provide a standardized method for presenting ITU-T E.164 numbers in the national numbering plans (NNPs) of all countries (i.e., each country's application of [ITU-T E.164]). However, the main purpose of the publication is declared in WTSA Resolution 91 (Hammamet, 2016) as follows "that enhancing electronic access would be advantageous for Member States and international telecommunication operators or operating agencies, to help improve the reliability of telecommunication networks and services they carry and help improve revenue assurance for operators and may assist in countering misuse of international telecommunication numbering resources".

Although some parties identify some disadvantages of the national numbering plan publication (e.g., the use of unused ranges for spoofing), the advantages for publication are considered fairly valuable.

9 Factors for consideration for national numbering plan administration

The following factors are very important for national administrations to consider for numbering resources administration.

Each factor mentioned below has its impact on the administration and the evolution of the national E.164 numbering plan, although they have different weights of impact. The description and use cases of each factor are discussed below.

9.1 Criteria for assignment

Member States should define a set of assignment criteria for applicants, these criteria should allow for the assurance of the applicant's ability to properly and effectively use numbering resources. This measure could be effective in reducing the waste of numbering resources because it ensures that the applicant can use the resources before assigning them. These criteria may be, for example, the applicant's network's ability to use numbering resources or its exhaustion of pre-allocated resources or other criteria defined by the Member States.

9.2 Frequency and application of fees (once, annually or both)

Most countries apply fees for numbering resource assignments either once or annually (or both). Some other countries might not apply fees. The reason behind fees is to obtain financial resources for national administrations, but fees might be used as a control measure to reserve number blocks for real use and lead assignees to utilise those blocks effectively before asking for new blocks to avoid spending unnecessary upfront and annual fees. Countries that do not apply fees use other measures to ensure effective and efficient management. In general, fees are used in most cases to avoid numbering wastage or for scarce resources.

9.3 Block size

The assignment of smaller blocks might appear to be more efficient, but it has a drawback which is the overhead work for a frequent assignment process. On the other hand, larger blocks might lead to numbering resources wastage. In all cases the process of reclamation is complicated, and it has side effects so to avoid that it is advised to assign an "appropriate" size of blocks.

9.4 Number length

The number for each country has two dimensions. The first one is the country code. This is assigned by the ITU, and its length impacts the length available to the Member States to use, as defined by [ITU-T E.164]. The other dimension is the number length, which is an important factor for managing national numbering plans, but this measure is not easy to manage, especially considering customer care experience. This measure might be implemented for new national numbering plans. The different number lengths between fixed and mobile numbers, for example, might lead to spoofing of those numbers by adding to complete the shortest one and using it illegally with limited chance of detection. Therefore, Member States may consider this measure carefully, especially when there is a difference between fixed and mobile number length.

9.5 Use of geographic area codes

With the use of new technologies in transferring voice and data, the importance of geographic numbering may be different. Previously, geographic numbers were used to ease the calculation of tariffs depending on distance, nowadays tariffs are almost similar because of evolving technologies. Thus, Member States should think again about the numbers available for potential assignment for geographic use, they might consider those resources for re-designation for other services. Member States should assess their situation carefully before making decisions by considering other factors, for example, promotion, security, and emergency.

9.6 Reclamation

Reclamation is the process of revoking allocated blocks, most administrations avoid reclamation of numbering resources, as the avoidance of reclamation needs an accurate assignment process. Member States should therefore study the impact of reclamation carefully before reclaiming resources, at the same time they should apply an accurate and a tight assignment process.

9.7 Emergency numbers (including in-car emergency calling)

The harmonization of emergency numbers internationally – or at least regionally – according to [ITU-T E.161.1] gives end users great value. The ease of access to emergency numbers is one of the most important values given by the telecom sector. With evolving technologies, the use of emergency numbers has become very important. Consequently, Member States should consider this in the national numbering plan with a declared protocol with assignees to implement all needed procedures for emergency calls.

9.8 Numbering management system

In many countries, a dedicated system is used for national numbering plan administration. This system is shared between administrators and assignees to work interactively for allocation/assignment processes. This system can provide timely reports on the status of numbering resources utilization. In conclusion, this kind of system is a powerful tool for national numbering plan administration.

9.9 Support to assignees efficient reuse of the number space

This measure entails recycling unused numbers for a certain period, and later assign them to new subscribers. This measure is very sensitive in the sense that from one side it leads to maximum utilization of number space, and from the other side, it can affect customer experience. In most countries, the recycling process is used especially for mobile numbers to reduce numbering waste.

9.10 Lifecycle management

Relevant to the measure in clause 9.9, Member States should design a lifecycle management process for numbering resources, this process helps to get maximum utilization of numbering resources if the recycling is applied carefully.

9.11 Service-specific number ranges (e.g., for machine to machine (M2M) / internet-of-things (IoT), for mobile)

This measure will facilitate the national numbering plan, Member States can apply different rules for this type of numbers by assigning separate ranges for specific services, and can also meet the huge demand without affecting assignment procedures involving regular ranges of numbers. Some countries do not separate ranges for specific services, they use the same allocation/assignment processes for all numbers. In general, Member States should study the advantages and disadvantages of this measure before making decisions.

9.12 Short code/USSD, national-only numbers

Member States may consider the importance of short codes and national only numbering. Member States may also design an accurate process for assignment/reclamation to achieve the goal of these numbers. Harmonization of some short codes may be important to avoid wastage among telecom operators. Governance of short codes is a national matter as they are national only numbers. Consideration may be given to specifying a range of such codes such that they are consistent across operators and specifying a range that allows operators to offer commercial services.

9.13 Number portability, location portability

The use of number portability and location portability is a possible practice for numbering resources utilization. The use of this technology gives subscribers the right to keep their numbers when moving to another operator or geographical area. The provision of the service in a country may influence its numbering plan.

9.14 Other third-party applications

In the past, the use of mobile phone numbers was limited to the use of only telecommunication services and was not associated with any third-party applications or services. Nowadays, mobile numbers are used in different applications such as OTT applications, moreover, they are used for identification and verification for other purposes. Consequently, this expansion of mobile numbers as identifiers may be challenging for the effectiveness and the understanding of numbering resources utilization. The regular recycling process done by mobile operators according to some national regulations might assign a different number to the user. Member States may wish to consider these kinds of issues when designing the numbering resources lifecycle.

9.15 Future use/long-term planning (including forecasting)

Member States should always pay attention to emerging technologies and the rapidly increasing demand for numbering resources. They should forecast the demand for at least 10-20 years ahead, keeping eyes on current demands.

10 Issues that should be taken into consideration

This section identifies other elements that have implications for the administration of national numbering resources, but because they are outside of the control of the national numbering administrator, the elements are included for completeness but will not be described further:

- a) The ability of networks to meet the growing demand for numbers.
 - b) Customer information protection.
 - c) Customer education about changes in numbering plans and dialling plans.
 - d) Changes in the numbering plan should consider the risks of misuse and number spoofing.
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