ECC WG NaN Green Paper

Long Term Evolution in
Numbering, Naming and Addressing
2012 – 2022

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TABLE OF CONTENTS

1 INTRODUCTION

Efficient and effective regulations in the area of numbering, naming and addressing are only possible after a detailed and well informed dialogue with all the involved stakeholders in order to understand the market developments, the resulting needs of the market players and their impacts on numbering, naming and addressing.

For about 20 years in most countries the public authorities have been responsible for managing the numbering resource. During these years many important decisions were taken with a huge impact on users, service providers and operators. The main driver for this process was the liberalisation of the market.

Today we see many developments in the market places with a potential impact on numbering. Therefore the CEPT/ECC Working Group Numbering and Networks (WG NaN) took the initiative to prepare a strategic plan for numbering, naming and addressing, and to develop a vision for the next 10 years. This document looks 10 years forward into the future, trying to make predictions on how the market could look in 2022. Based on that a realistic and credible future working plan for the WG NaN was prepared**.**

It must also be clear that special attention is given to the measures proposed by the European Commission in the Digital Agenda Europe (2020) in the context of better harmonisation of numbering resources.

The reader of this Green Paper is invited to comment and to inform us about their insights on the long term evolution of numbering, naming and addressing.

VISION IN NUMBERING, NAMING AND ADDRESSING IN YEAR 2022

E.164 numbers will be a common resource needed for the provision of electronic communication services which will have to be coordinated at the national and international level (ITU-T). The main function will be naming, and public authorities will have to manage the resource to guarantee equal and high quality access for operators and users to the telecommunication market.

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2 TRENDS AFFECTING NUMBERING, NAMING AND ADDRESSING

2.1 USERS

The overall trend where users will prefer mobile terminals before a fixed terminal will increase. The value of mobility is high in the society today. In general new users only have mobile phones and more often that terminal is a smartphone. Today the majority of the population uses social media networks to e.g. share information, experiences, pictures and interesting web-links with family and friends. This will have the effect that users will tend to give up their traditional fixed telephone subscriptions, but might keep the fixed line for broadband services only. The competition results in lower cost for the end user but also different levels of quality of service (QoS).

Convergence between applications and technologies means more mobility and that increases requests for mobile numbers compared to the shrinking demand of fixed (geographic) numbers. The public authorities will need to review the national numbering plans to adapt them according to the changed marked needs.

The popularity of social media is expected to continue to grow in the future and much of the communications between users across all ages will be via this kind of application. This type of communication will reduce the need for telephone numbers. On the other hand, other types of addressing resources will be needed for mobile terminals in order to ensure smooth communications between different network technologies.

2.2 OPERATORS

Address books with telephone numbers can easily be shared via social media networks. Operators and service providers will try to gain profit by utilising names and addresses provided by users of social media. This phenomenon has already started to take place today. Those who have access to these address books can sell special offers in a very effective way to these private user groups which have a lot of interaction and communication with each other.

Mobile operators' growth of revenues in voice telephony and SMS has come to an end as the number of mobile subscriptions (penetration rate) exceeds the number of inhabitants in many countries. Also reductions in mobile termination rates and roaming retail tariffs by public authorities have a negative impact on revenues. It is logical that operators try to compensate this with new markets such as machine to machine communication (M2M), for example smart metering. In order to set up communication channels M2M-devices have to be uniquely identified via e.g. E.164 numbers or IPv6 addresses.

Multiple-play offers are the combined offers of, for example, fixed telephony, mobile telephony, TV and broadband internet access by one single operator. For users this is easy, because they have only one operator with one bill for all their communication services. Also the cost of a multiple-play offer is commonly lower than the sum of costs of the different services offered by the same operator. Operators try to push bundles as much as possible which brings benefits in economies of scale and up-selling possibilities. However, users are faced with less transparent offers and are locked up with their service providers. In many bundles some level of convergence is achieved between fixed and mobile connections (e.g. using the geographic/fixed number for

the mobile connection). Today both services are using different numbers but the proliferation of multiple play offers will have an impact on how numbers will be used in the future.

2.3 TECHNOLOGY

LTE (Long Term Evolution) and its enhanced version LTE Advanced are upcoming mobile technologies, which are also known as 4G (fourth generation of cellular wireless standards). LTE is fully based on IP-technology and the main advantage compared to 3G is that it is offering more broadband capacity. In the first phase LTE will be used mainly for data services. It can be used to replace 3G for mobile data services with improved performance or as an alternative to fixed line broadband in sparsely populated areas (with limitations e.g. regarding the channel capacity compared to fixed line broadband), where the latter cannot be offered in a cost effective manner. Even though LTE is an IP-based technology, it is still using E.164 and E.212 resources at least in its early implementation phases. Licences for LTE have been allocated in many CEPT countries and some countries are already running commercial networks.

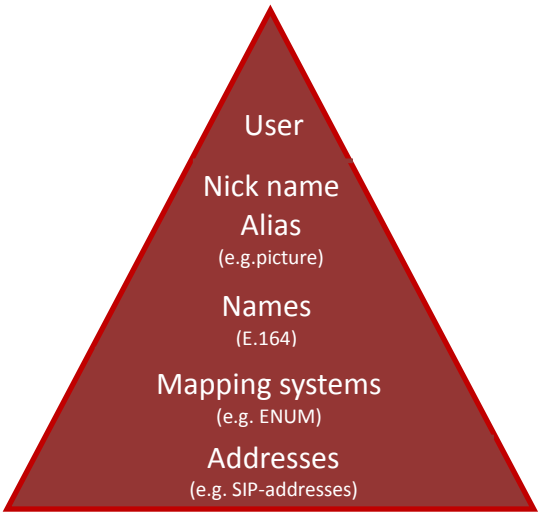
IP-technology is coming to all levels of telecommunication networks. Backbone networks are already almost fully IP-based. Circuit switched technology, used in fixed networks for a long time, is coming to an end of its life cycle and suppliers of this technology have generally frozen the development. Therefore it will be removed in most countries during the next 5-10 years. VoIP is more and more substituting traditional speech services and access to the network is increasingly carried out by broadband connection based on DSL, cable, 3G/4G or fibre technology. Corporate customers are using more and more VoIP-based PABXs. Also residential customers have VoIP-phones.

Near Field Communications (NFC) is a wireless technology, where machines and products can exchange data in short distance. NFC will be a built-in feature in mobile phones for mobile payments and identification purposes e.g. for opening locks. NFC implementation in mobile phones will probably have an influence to E.212 resources and maybe also to E.164 numbers.

3 IMPACT OF THE TRENDS

3.1 E.164 NUMBERING PLAN

Due to the above mentioned trends E.164 numbers will mainly remain as names. The visibility of numbers will decrease due to usage of intelligent customer equipment. For instance, users will use nicknames and/or pictures to call their contacts, i.e. these symbols will be translated locally to E.164 numbers which then will be translated to the respective addresses. This doesn't mean that E.164 numbers will disappear as they are needed to ensure worldwide compatibility. One impact of the decreasing termination rates is that the link between retail tariff, whole sale tariff and number will be disappearing by 2022.



E.164 numbers will be decreasingly used for routing because names will be mapped to numbers, which then will be mapped e.g. via infrastructure ENUM to e.g. SIP-addresses.

Technology is not a limiting factor in the transition path to a less fragmented structured numbering plan. Most of the non-geographic (non-mobile) numbers and short numbers will disappear, and we will have two main (naming) E.164 number ranges which will be used for person to person (P2P) communication and for M2M communication. Non-geographic (non-mobile) numbers, such as freephone, local rate and national rate numbers and other special tariff numbers, make no longer sense as time based charging will disappear and, due to the developments in smart devices, they will only be rarely dialled directly by humans.

P2P communications is here understood to include also business communications. In this number range service provider number portability will retain its importance even though numbers are less visible for residential users. There will be mechanisms which automatically update the contacts' telephone numbers in social media address books when the user changes a number. Directory services will be in networks as cloud services where smart terminals always get the correct and updated number and other relevant address information. Another consequence will be that the user-friendliness and length of E.164 numbers will be less of an issue because nicknames or photos are used for dialling a contact.

Furthermore the use of fixed (geographic) numbers will be strongly reduced and the remaining fixed numbers will be reallocated for mobile services. This convergence will result in a single number range for person to person communications of mobility services in the long run.

The majority of numbers will be used for M2M or similar types of communications in 2022. These number ranges may need to have a different regulatory approach (e.g. regarding emergency calls) than e.g. P2P. Considering services like car to car communications it should be ensured that numbers which are not needed any longer will be recycled.

Some services, such as M2M communications, require much numbering space. Thus some players may be tempted to use another country's national E.164 numbers for such services, especially if there are lack of suitable number ranges in own country. This so called extra-territorial use of E.164 numbers raises difficult questions, notably which legislation is applicable. Furthermore, it causes potentially many problems in areas such as numbering plan administration, number portability, law-enforcement, localisation in case of an emergency call and the possibility to evade from national regulatory requirements.

3.2 OTHER NUMBERING, NAMING AND ADDRESSING PLANS

Domain names and e-mail addresses will play an increasingly important role in electronic communications generally and in voice communications specifically. It will be more and more common to use personal domain names and underlying e-mail addresses. User owned domain names foster competition. If users change internet service providers and have an own domain name, they do not have to change e-mail addresses. This helps to avoid lock-in effects with internet service providers.

A 'click to call' capability will make it increasingly common to place a call without using E.164 numbers. This means in practice that a nickname will be translated into a routable address, e.g. a SIP-address, by skipping the 'E.164 name'.

SIP-addresses are widely used for routing both national and international calls. At national level, interconnection point is found in the present number portability central reference databases (CRDB), which also resolves originating calls to different types of addresses.

The process of changing a registrar and other involved providers is streamlined in a very effective way. A central entity or a registry is the facilitator of the exchange of information and makes it possible to create a one-stop shop policy.

By 2022 both IPv4 and IPv6 will be used. Some compatibility problems will still exist, which degrades full capabilities of the internet.

The usage of International Mobile Subscriber Identities (IMSI) will explode, as the area of entities eligible for a Mobile Network Code will be expanded by the ITU (e.g. semi-mobile networks, hotspot providers and application providers). By 2022 the numbering space in E.212 will be completely exhausted and the ITU will resolve this problem with E.212bis.

In addition with NFC feature, the payment premium rate services will use short numbers in mobile networks as a common and easy way for micro-payments in 2022. Due to these systems users will be able to buy products or transfer money by e.g. sending a PR-SMS. To obtain interoperability in different mobile networks and to foster market competition public authorities have to adapt their numbering plans.

3.3 EMERGENCY CALLS, LEGAL INTERCEPTION

Emergency calls

E.164 numbers are not only used for communication but also as an identifier for the operator of the emergency service to locate and identify subscriptions from where the call to the emergency services has been placed. The capability of reaching the emergency services is bundled with the normal voice telephony service. In 2022 we will be in an environment where it may not be possible to trust the CLI and the geographic accurate location information, therefore another approach is needed. We think that this information must be delivered by the CPE for the location information e.g. by GPS and/or triangular techniques. The identification problem can be resolved by a unique identifier to every CPE, such as present IMEI-code used for mobile phones. This identifier will be mapped to a subscription via a database.

Increased extra-territorial use of E.164 numbers will give problems with emergency services (location, identification of the subscription, misuse). It is highly unlikely that opening databases for emergency services in other countries can resolve the problem.

Legal interception and data retention

By 2022 legal interception is mainly carried out by using other identifiers than E.164 numbers, for example codes of a mobile phone/subscription, complemented by other possible identifiers.

The E.164 number serves as a key for finding out who has communicated at what time with what other number and for how long time (data retention). If we cannot any longer rely on the correctness of the E.164 number this will be difficult to execute and other solutions have to be found. Independently of this development we should continue to make efforts to maintain trust in the E.164 number as a CLI as long as possible.

The increased extra-territorial use of E.164 numbers will multiply this problem and data retention based on E.164 numbers will de-facto not any longer be the main method in 2022. On legal intercept no impact is anticipated.

3.4 HARMONISATION

Traditionally harmonisation means same numbers for same services, e.g. 116 numbers for social services. In 2022 numbers will not be important anymore in the harmonisation process. The services and their contents will be harmonised, as the numbers will not be visible anymore in 2022.

This will be carried out by operators and service providers at the same time the new customers come in. The new (soft) SIM-card will include harmonised serviced as a service provider package, and those harmonised services will appear in a smart-phone as their own menu-item.

The public authorities need to continue managing and coordinating the harmonisation process and its details.

3.5 NUMBER PORTABILITY

The central reference database (CRDB) will be populated with subscriber information and made able to validate porting requests in seconds. This will reduce the porting time substantially and reduce the amount of incorrect porting request since the validation is possible while the customer is interacting with the sales channel of the recipient operator. The operators will save costs.

If the CRDB changes operations to also provide IP-interconnect, the public authorities will have to monitor the developments and routing arrangements and assess the framework surrounding this with regards to elements such as security, integrity and reliability. Such national non-discriminatory IP-interconnection points for voice traffic should generally be promoted.

When remote provisioning of SIM-cards is a reality, a new E.212 address can be stored in the SIM-card through secure channels (over the air), i.e. change of a SIM-card is not necessary.

4 IMPACT TO WG NAN AND ACTION PLAN

The WG NaN intends to take actions to address the scenarios outlined in this Green Paper. It will consider making proposals for numbering, naming and addressing to assist the public authorities to take the necessary informed decisions.

Conclusion and action 1:

The E.164 numbering plan will be less and less fragmented and finally consist of two separate number ranges which will be used only for naming purposes: person-to-person communication (private and business communications) and machine-to-machine communication. The names will not contain any end-user tariff information.

When and how should we move within the next 10 years to these new arrangements? Is a reactive or pro-active policy required? How and when (1) to phase out the “old” number ranges and (2) to merge the remaining number ranges? Do we need alternatives for transparency related to the retail tariffs? The challenge for public authorities will be to manage the transition taking into account the legacy numbering systems and costs of numbering changes to customers and telecom operators.

Conclusion and action 2:

New E.164 numbers will be updated in smart devices very easily and free of charge when the user changes operator. Service provider number portability (mobile numbers) will be managed by software updates to SIM-card through secure channels. There will be no need to change SIM-cards physically anymore. Many CRDBs have attracted several other functions (emergency calls, directory enquiry services, interconnection points, ENUM, validation, etc.) in addition to portability functions. They are of increasing concern for public authorities. The notion of keeping the number is still valid, and remains a factor of promoting competition.

Do we still need the (costly) traditional number portability system? What about possible new roles of the CRDB in the context of IP-interconnect? Do the public authorities need to be (actively) involved e.g. monitoring, facilitating and steering (ex-ante) the routing arrangements?

Conclusion and action 3:

To accommodate growth and increase competition in the mobile sector we will need much more flexibility in the use of mobile network codes. Consequently the relevant numbering space (E.212) will have to be expanded by the ITU-T.

The WG NaN will seek to use its national representations in the ITU-T to support in a coordinated way the flexible use and expansion of the E.212 resources. We also see that discussions between ITU-T, 3GPP and GSMA are needed for this topic.

Conclusion and action 4:

Harmonisation will be done at service level, not at the level of the numbering resources.

The WG NaN will have to set up practices and mechanisms to coordinate the harmonisation function in an efficient and effective way.

Conclusion and action 5:

To foster competition, the possibility of changing ISPs while keeping a provider independent e-mail address should become a normal practice in Europe for users.

The WG NaN must develop a plan to promote the usage of e-mail addresses not based on ISP and or hosting provider brands by the consumers.

Conclusion and action 6:

Extra-territorial/Cross border usage of E.164 numbers will be a common practice.

The WG NaN will develop a set of rules and procedures for countries to be applied on a bilateral basis to frame the extra-territorial and cross border usage of E.164 numbers. These questions have also been raised in ITU-T who is responsible for the rules concerning the E.164 numbering plan. Probably there will be difference in treatment between P2P and M2M E.164 numbers.

Conclusion and action 7:

Debundling of voice service and calls to emergency services will be a reality.

The WG NaN will have to find alternative and better solutions for the requirements (identification, localisation, routing and call back obligations) for accessing the emergency services.

Conclusion and action 8:

The traditional role of E.164 numbers played in legal interception and data retention will disappear.

The WG NaN will have to find alternative solutions probably based on parameters embedded in devices.

Conclusion and action 9:

In practice numbers are used by many public authorities (e.g. NRAs, police, emergency services) to get control on the underlying services in order to impose regulations. This will become more and more difficult.

The WG NaN will have to assess the concrete impact of this phenomenon and propose, if needed, alternative routes to impose these regulations.

Conclusion and action 10:

The possibilities for CLI manipulation will increase.

In the trusted telecommunications networks (fixed telephone network, 3G, 4G) the public authorities will still have the possibility to take measures in order to maintain trust in the CLI.

Conclusion and action 11:

The WG NaN does not expect that the relevance of the different national numbering plans will be moved to a pan-European level. No clear benefits for such a change could be identified. However, it will be increasingly important to have an efficient international dialogue on new developments on the administration of numbering resources.

It will be necessary to create international common guidelines to meet the new challenges on a broader global scale. It is recommended to create a Global Numbering Forum, which collects public authorities and administrations responsible for numbering management together.

VISION IN NUMBERING, NAMING AND ADDRESSING IN YEAR 2022

E.164 numbers will be a common resource needed for the provision of electronic communication services which will have to be coordinated at the national and international level (ITU-T). The main function will be naming, and public authorities will have to manage the resource to guarantee equal and high quality access for operators and users to the telecommunication market.

LIST OF ABBREVIATIONS

Abbreviation	Explanation
3G	Mobile network technology between GSM and LTE
CEPT	European Conference of Postal and Telecommunications Administrations
CLI	Calling Line Identification
CPE	Customer Premises Equipment
CRDB	Central Reference DataBase (of ported numbers)
DSL	Digital Subscriber Line
E.164	The ITU Recommendation: “The International Public Telecommunication Numbering Plan”
E.212	The ITU Recommendation: “The international identification plan for public networks and subscriptions”
ECC	Electronic Communications Committee (within the CEPT)
ENUM	E.164 NUmber Mapping
GPS	Global Positioning System
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISP	Internet Service Provider
ITU	International Telecommunication Union
LTE	Long Term Evolution – a next generation mobile network technology
M2M	Machine-to-Machine (communication)
MNC	Mobile Network Code (within IMSI)

NFC	Near Field Communications
NP	Number Portability
NRA	National Regulatory Authority
P2P	Person-to-Person (communication)
PABX	Private Automatic Branch Exchange
PR-SMS	Premium Rate SMS
PSTN	Public Switched Telephone Network
QoS	Quality of Service
SIP	Session Initiation Protocol
SMS	Short Message Service
SS7	Signalling System n:o 7
VoIP	Voice over IP
WG NaN	Working Group Numbering and Networks (within the ECC/CEPT)