



ECC WG NaN Green Paper

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

This ECC WG NaN Green Paper was approved by the Working Group Numbering and Networks (WG NaN) at its meeting in Stockholm, Sweden, 21-22 November 2012.

The Green Paper is a discussion note intended to stimulate dialogue and debate with all stakeholders. It is not a formal ECC Deliverable. The Green Paper will be reviewed annually by the WG NaN Strategy Task Force.

VISION IN NUMBERING, NAMING AND ADDRESSING IN YEAR 2022

E.164 numbers will still be the most common universal identifiers used 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 the national public authorities will have to manage the resource in the interest of all stake holders.

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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 place 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. The result of this is the Green Paper which is a discussion note and looks 10 years forward into the future, trying to make predictions on how the market could look in Europe in 2022. Based on that realistic and credible future, action points for the WG NaN are proposed.

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 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.

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E.164 numbers will still be the most common universal identifiers used 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 the national public authorities will have to manage the resource in the interest of all stake holders.

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Chairman WG NaN

2 TRENDS AFFECTING NUMBERING, NAMING AND ADDRESSING

2.1 USERS

The overall trend¹ 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. 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 resulting in an increased demand for mobile numbers compared to a shrinking demand for geographic numbers for traditional fixed line services. The public authorities will need to review the national numbering plans to adapt them according to the changed market 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 use of telephone numbers. On the other hand, other types of addressing resources will be needed for mobile terminals (e.g. IP addresses) in order to ensure smooth communications between different network technologies.



2.2 OPERATORS

As 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 traditional 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), e.g. smart metering. In order to set up communication channels M2M devices will 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. Multiple-play offers are in some cases more vulnerable in a network

¹ EU Digital Agenda – 2011 Telecommunication Market and Regulatory Developments
Available at: https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/Telecom_Horizontal_Chapter_0.pdf

break down situation, where the users may experience disruption to all services, e.g. telephony, internet access and TV, during the network failure. In many bundles some level of convergence is achieved between fixed, nomadic and mobile connections (e.g. using the geographic/fixed number for the nomadic or 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

Future networks need to accommodate new service and application areas such as Internet of Things, smart grids and cloud computing. Depending on the application, future networks will need to provide huge scalability both in terms of bandwidth and delay, i.e. QoS.

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 radio access network. In the first phase LTE will be used mainly for data services, later also for voice 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 the end of its life cycle and suppliers of this technology have generally frozen the development. Therefore it will be replaced in most operator networks during the next 5-10 years. VoIP services are more and more substituting traditional speech services and access to the network is increasingly carried out by broadband connection based on DSL, cable, Wi-Fi, 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 over short distances. NFC will be a built-in feature in mobile phones for mobile payments and identification purposes e.g. for opening locks.

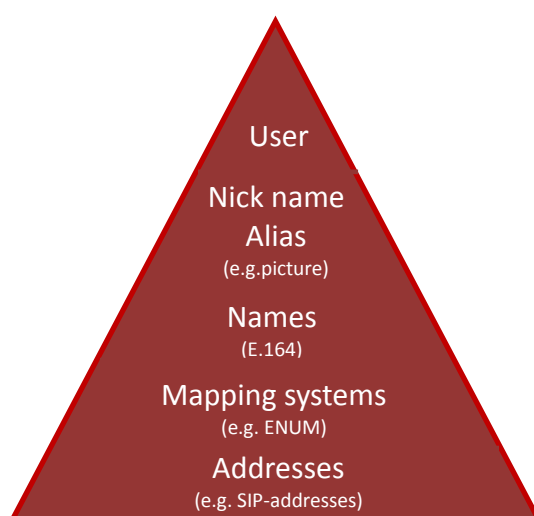
Long Term Evolution

3 IMPACT OF THE TRENDS

3.1 E.164 NUMBERING PLAN

Discussion

Due to the above mentioned trends the main functionality in an E.164 number will be naming. The visibility of numbers will decrease due to usage of intelligent customer equipment. For instance, users will use nicknames and/or photos 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. Telephone numbers have proven to be the most universal identifiers in the world, due to the fact that they do not have a disadvantage of different scripts used by various languages. 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 their naming functionality will be converted via a mapping system 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 communication and for M2M communication. Non-geographic (non-mobile) numbers, such as freephone, local rate and national rate numbers, will no longer make sense as time based charging will disappear and, due to the developments in smart devices, they will only be rarely dialled directly by humans. The importance of premium rate numbers will significantly decrease as they will gradually be replaced by application level payment functions.

Person-to-Person 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, and does not wish to benefit from number portability. 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 geographic numbers for traditional fixed line services will be reduced and the remaining fixed numbers will be reallocated for mobile and nomadic VoIP 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. Person-to-Person. Considering services like communications between vehicles 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 is a lack of suitable number ranges in their 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.

As a consequence of all these developments it will become very challenging to impose broader regulations, e.g. on consumer protection using numbers².

Conclusion #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 M2M communication. These numbering ranges with naming functionality will not contain any end-user tariff information. Some premium rate numbers may continue to exist, e.g. for payment purposes.



Action #1

The WG NaN has to study the impact of the above mentioned trends, and give answers to following questions:

- 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 #2

As extra-territorial use of numbers is not clearly addressed in national or international numbering regulations it may result in unclear legal situations and generate potential risks for market parties and public authorities. Such risks are related, for example, to national scarcity of numbers, applicable jurisdiction and the adherence to specific legal requirements. Extra-territorial/cross border usage of E.164 numbers will need a clear regulatory framework.

Action #2

The WG NaN is of the opinion that the extra-territorial use of E.164 numbers should be urgently studied in order to define a common European understanding. The WG NaN should also contribute to the ITU-T on this matter.

² This implies that alternative approaches, other than attaching certain conditions to the use of numbers, will have to be found to ensure ongoing consumer protection and transparency.

3.2 OTHER NUMBERING, NAMING AND ADDRESSING PLANS

Discussion

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 their own domain name, they do not have to change e-mail addresses. This helps to avoid lock-in effects with internet service providers.

www ↔ e-m@il

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 for national and international calls.

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 number of entities eligible for a Mobile Network Code (MNC) will be expanded by the ITU-T (e.g. private mobile networks and application providers). By 2022 the numbering space in E.212 will be near to exhaustion and the ITU-T will resolve this problem with a revised E.212 numbering plan.

In addition to micro payment solutions such as Quick Response (QR) codes, Unstructured Supplementary Service Data (USSD) and NFC, the payment premium rate SMS-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 premium rate SMS. To obtain interoperability in different mobile networks and to foster market competition, public authorities will have to adapt their numbering plans to ensure that for the same service the same number can be used in all mobile networks.

Conclusion #3

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.

Action #3

The WG NaN must develop a plan to promote and raise awareness of the usage of e-mail addresses not based on ISP and/or hosting provider brands by the consumers. Although use of so called MX-records would, in theory, solve this problem they are in practice controlled by the domain name holder who may not wish to re-route e-mails to the competitors.

Conclusion #4

To accommodate growth and increase competition in the mobile sector we will need more flexibility in the assignment rules of MNCs. One of the consequences is that the relevant numbering space (E.212) will have to be expanded by the ITU-T.

Action #4

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

3.3 EMERGENCY CALLS AND LEGAL INTERCEPTION

Discussion

E.164 numbers are not only used for communication but they are also used by 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. The European Union's eCall initiative, where vehicles involved in an accident can automatically call emergency services may increase the number of calls to emergency services in the future and the reliability of location information will be paramount. In 2022 we will be in an environment where it may not be possible to trust the OI/CLI and the accurate geographic location information, therefore another approach is needed. A new option is that the location information must be provided by the calling equipment e.g. by GPS and/or triangulation techniques in radio access networks. The identification problem can be resolved by a unique identifier for every device such as the International Mobile Station Equipment Identity (IMEI) used in mobile networks today. 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.

By 2022 legal interception will still be carried out by using E.164 numbers, but other identifiers can be increasingly applicable, such as email addresses and IP-addresses.

Conclusion #5

The possibilities for OI/CLI manipulation will increase resulting that OI/CLI cannot be trusted anymore. This problem is not only dealing with emergency calls, but is valid in a wider context.

Action #5

The WG NaN will need to take necessary steps to increase awareness of these developments.

Conclusion #6

Technology will allow alternatives to access the emergency services.

Action #6

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. This includes the cost-benefit study of de-bundling of voice services and emergency calls.

Conclusion #7

The traditional role of E.164 numbers played in legal interception will decrease, although there is a strong pressure from a public policy point of view to keep existing legal interception system.

Action #7

The WG NaN will need to take necessary steps to increase awareness of these developments.

3.4 HARMONISATION

Discussion

Traditionally harmonisation means same numbers for same services, e.g. 116 numbers for social services and 112 for emergency 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.



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

This will be implemented by operators and service providers at the same time the new customers come in by providing a harmonisation package. This package would include icons for services such as directory enquiries. This way the user would not even need to know the number of the service, as it can be accessed by “a click to call”. In case of roaming the operator would send a harmonisation package, which the user may download.

Conclusion #8

Harmonisation will be done at the service level, not at the level of the numbering resources, as numbers are less visible.

Action #8

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

3.5 NUMBER PORTABILITY

Discussion

Some central reference databases (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 requests since the validation is possible while the customer is interacting with the sales channel of the recipient operator.

If the CRDB changes its architecture and 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, reliability and potential unfair competitive behaviour. Such national non-discriminatory IP-interconnection points for voice traffic should generally be promoted.

When software based 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.

Conclusion #9

Many CRDBs have attracted several other functions (emergency calls, 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.

The new IMSI will be installed to a SIM-card through secure channels over the air, and thus there will be no need to change SIM-cards anymore. Mainly M2M-industry will benefit from this functionality.

Action #9

WG NaN will have to do cost-benefit analyses on adding additional functionalities to CRDBs and assess the impact of the expected decrease of the volume in ported numbers due to the introduction of automatically updated address books in devices.

3.6 INTERNATIONAL COOPERATION

Discussion

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.

Conclusion #10

Relevant public authorities should continue to collaborate in the field of numbering, naming and addressing to develop common policies and exchange best practices.

Action #10

The WG NaN will take initiatives to introduce the Green Paper in the global arena whilst exploring possibilities to continue exchanging views and practices world-wide within numbering, naming and addressing.

LIST OF ABBREVIATIONS

Abbreviation	Explanation
3G	3 rd generation mobile technology (UMTS)
4G	4 th generation mobile technology
CEPT	European Conference of Postal and Telecommunications Administrations
CLI	Calling Line Identification
CRDB	Central Reference DataBase (of ported numbers)
DSL	Digital Subscriber Line
E.164	The ITU-T Recommendation: “The International Public Telecommunication Numbering Plan”
E.212	The ITU-T Recommendation: “The international identification plan for public networks and subscriptions”
eCall	A European initiative intended to bring rapid assistance to motorists involved in a collision anywhere in the European Union
ECC	Electronic Communications Committee (within the CEPT)
ENUM	E.164 Number Mapping
GPS	Global Positioning System
IMEI	International Mobile Station Equipment Identity
IMSI	International Mobile Subscriber Identity
Internet of Things	Uniquely identifiable objects (things) and their virtual representations in an Internet-like structure.
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)
MX-record	A mail exchanger record in the Domain Name System that specifies a mail server responsible for accepting email messages on behalf of a recipient's domain
NFC	Near Field Communications
NP	Number Portability
NRA	National Regulatory Authority
OI	Originating Identification
PABX	Private Automatic Branch Exchange
PR-SMS	Premium Rate SMS
PSTN	Public Switched Telephone Network
QoS	Quality of Service
QR Codes	Quick Response Codes
SIP	Session Initiation Protocol
SMS	Short Message Service
USSD	Unstructured Supplementary Service Data
VoIP	Voice over Internet Protocol
WG NaN	Working Group Numbering and Networks (within the ECC/CEPT)