



TECHNICAL REPORT

**Network Technologies (NTECH);
Impact of alphanumeric user identifiers
on interconnection scenarios**

Reference

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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Network Technologies (NTECH).

Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Introduction

As the technology improves, various kinds of telecommunication services which might change the way of using telephone numbers might appear. For example, in Japan call transfer services or call transfer like services are introduced in the telecommunication market. They are quite different from the traditional "call forwarding service" or "call transfer services" in PSTN network. They offer consumers different ways to reach the destination when treating a call by using Internet and VoIP without a direct VoIP interconnection for interworking and service interoperability. Also in these different scenarios the unique significance of public numbering and its geographic characteristics, when present, should be guaranteed.

It has to be underlined that in general the integrity of public E.164 numbering should continue to be guaranteed by national and international regulatory measures (such as National Numbering Plans, regional Telecommunications Regulatory Frameworks, Recommendations ITU-T like E.164 [i.1]).

In the environment of Internet and VoIP networks, Internet domain names can be used. In general, scenarios of interworking between PSTN and VoIP/IP networks have been appearing and have been standardized by ETSI/3GPP. In those scenarios mapping between Internet domain names and E.164 numbers are introduced and standardized, using infrastructural and internal ENUM functionalities.

1 Scope

The present document provides a technical report on interoperability and mapping of Internet domain names to E.164 numbers in order to allow interconnection between networks. The focus of the present of document is on the analysis of the aforementioned mapping rather than on the analysis of the message flows for establishing the connectivity itself.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Recommendation ITU-T E.164 (2010): "The international public telecommunication numbering plan".
 - [i.2] 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 Recommendation".
 - [i.3] Recommendation ITU-T I.252.1: "Call offering supplementary services: Call Transfer".
-

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

E.164 number: A string of decimal digits that satisfies the three characteristics of structure, number length and uniqueness specified in Recommendation ITU-T E.164 [i.1]. The number contains the information necessary to route the call to the end user or to a point where a service is provided.

NOTE: Source Recommendation ITU-T E.101 [i.2].

identifier (ID): A series of digits, characters and symbols used to identify uniquely a subscriber, a user, a network element, a function, a network entity, a service or an application. Identifiers can be used for registration or authorization. They can be either public to all networks or private to a specific network (private IDs are normally not disclosed to third parties).

NOTE: Source Recommendation ITU-T E.101 [i.2].

telephone number; phone number; directory number (DN): The number, derived from the E.164 numbering plan, used by the calling party to establish a call to an end user or a service. The number may also be used for presentation services like calling line identification presentation (CLIP) and connected line identification presentation (COLP) and may also be published in different directories and/or directory enquiry services.

NOTE: Source Recommendation ITU-T E.101 [i.2].

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CLI	Calling Line Identifier
ENUM	E.164 Number Mapping
GW	Gateway
ID	Identification
ISDN	Integrated Services Digital Network
NW	Network
PSTN	Public Switched Telephone Network
SIP	Session Initiation Protocol
URI	Uniform Resource Identifier

4 Background of the present document

As the technology improves, different kinds of call transfer services or call transfer like services are introduced in Japan. Those services may change the way of using telephone numbers. It has to be underlined that in general the integrity of public E.164 numbering should continue to be guaranteed by national and international regulatory measures (such as National Numbering Plans, regional Telecommunications Regulatory Frameworks, Recommendations ITU-T like E.164 [i.1]).

Figure 4.1 describes an example of such a call transfer service in Japan. Between calling party and called party there is "Call Transfer Platform (Gateway)" which performs "mapping functions" between E.164 numbers or between Internet domain names and E.164 numbers. Those services may use a combination of formal call set up message flows standardized by ETSI/3GPP including mapping scenarios using infrastructural and internal ENUM functionalities. In that sense if the service is discussed only from the message flow level there seems to be no problem. But if the service is considered from the point of how E.164 number is assigned and how E.164 number is used, there may be an issue of whether the integrity of public E.164 numbering is maintained.

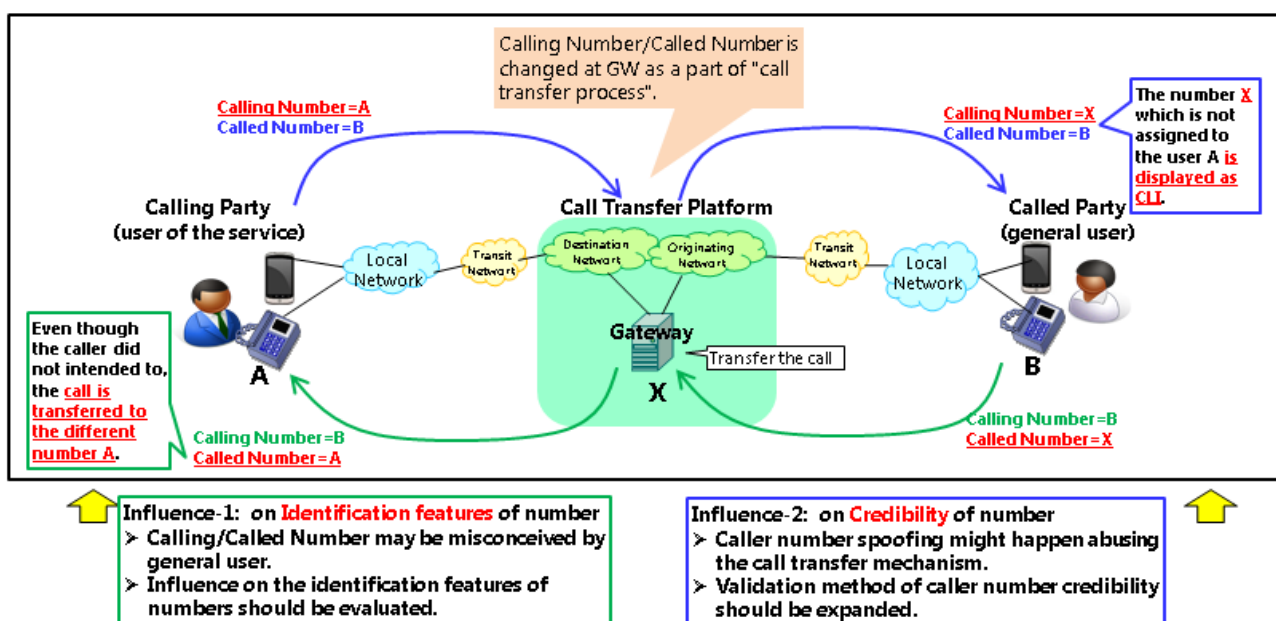


Figure 4.1: Image of call transfer service and influence on number in Japan

5 Actual example

5.1 Categorization of services influencing the telephone number

Figure 5.1 shows the categorization of call transfer services or call transfer like services in Japan which may affect existing identification role of number. Category-1 is call forwarding service which is standardized by Recommendation ITU-T I.252.1 [i.3] since ISDN era. Concerning Category-2 and Category-3 related International standard defining the service feature may not exist. But many use cases can be seen in Japanese telecom market in association with recent migration from PSTN to IP network or introduction of new of Internet based services. For those three categories, in order to connect originating side and destination side, call related processing including the number processing depending on the service take place between originating and destination by the use of the gateway, etc.

In figure 4.1 the entity "Gateway" performs the mapping between E.164 numbers or between Internet domain names and E.164 numbers. To realize those services the possible combination of formal call set up message flows standardized by ETSI/3GPP are used. In that sense if the service is discussed only from the message flow level there seems to be no problem. However the way E.164 number is assigned and validated may raise an issue with regard to the integrity of public E.164 numbering.

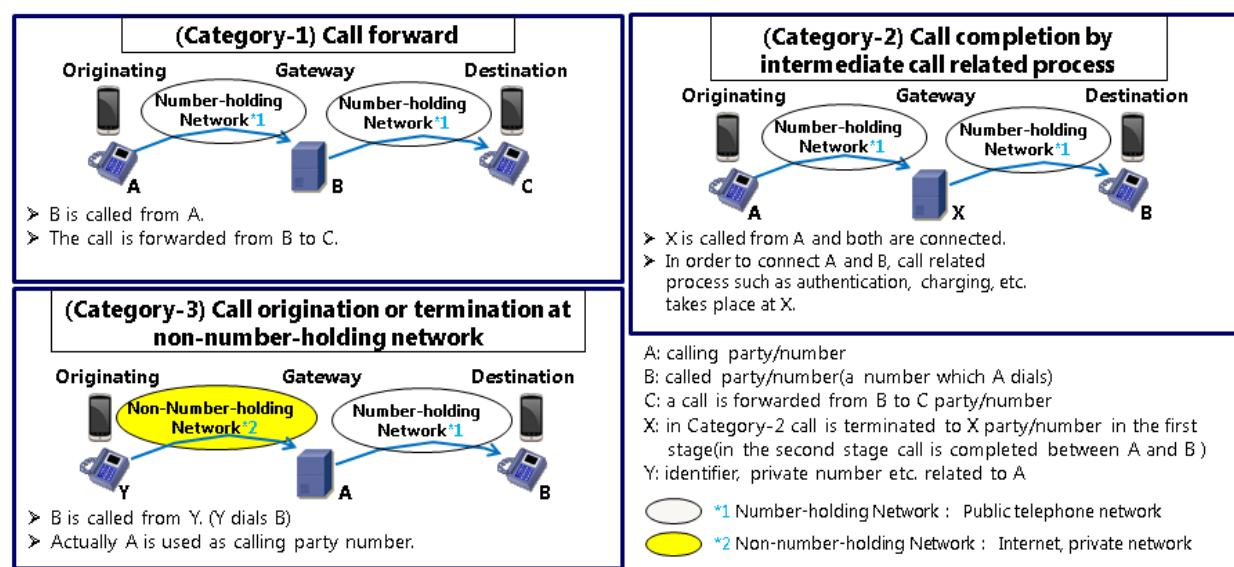


Figure 5.1: Categorization of transfer services in Japan influencing the telephone number

5.2 An example of the Service influencing the telephone number

Figure 5.2 depicts an example taken from the Japanese telecom market of Category-3 in figure 5.1. This is an example to map the Internet domain names to E.164 numbers.

The upper half of figure 5.2 represents the case calling party ID(SIP URI) from non-number holding NW is changed to geographic number.

The bottom half represents the case called party number (geographic number) from fixed-line phone NW is changed to ID(SIP URI).

These changes are done at Gateway (GW) which owns the mapping information of geographic numbers and IDs(SIP URIs) and will influence numbering significance such as geographic identification and so on.

Detailed analysis of this kind of mapping of the Internet domain names to E.164 numbers is discussed in clause 6.

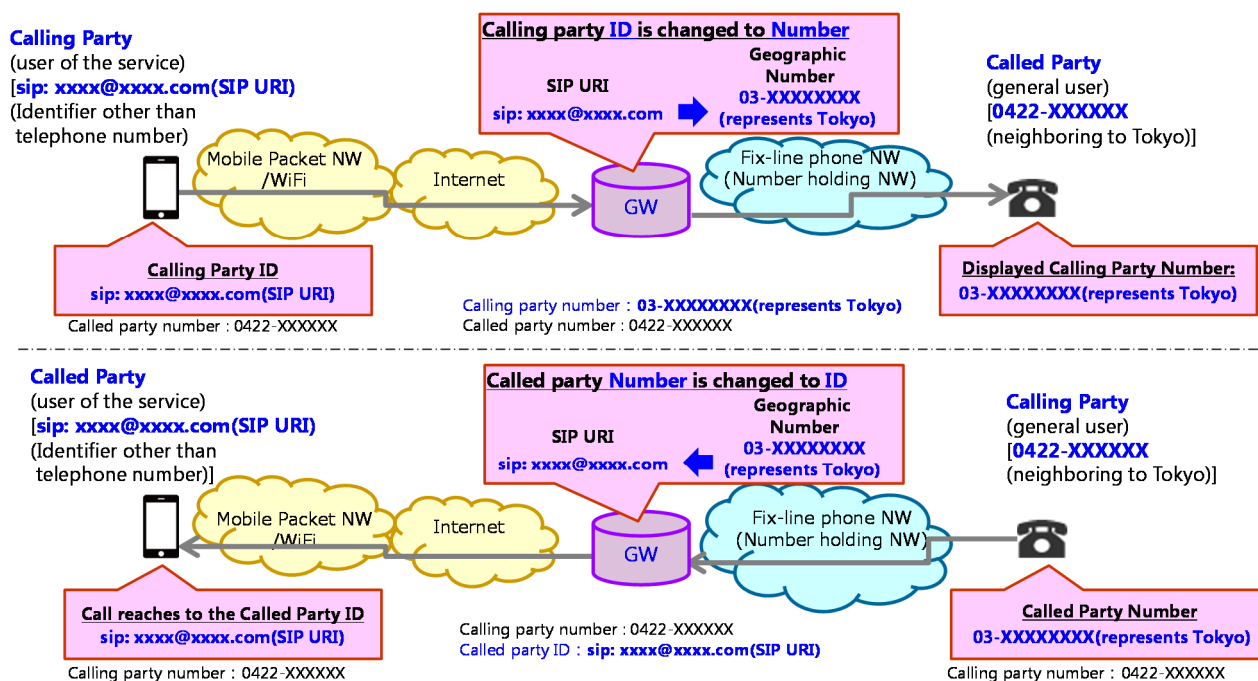


Figure 5.2: Example of the Service in Japan influencing the telephone number

6 Analysis of the mapping of the Internet domain names to E.164 numbers

6.1 Features of numbers influenced by the mapping

Identification features and credibility of calling party number are important features of numbers. However they may be influenced by the mapping process implemented in the services as is shown in the example of clause 5.

- Identification features of numbers:

Numbers are expected to serve the following five identification features in Japan:

- Service identification (for example fixed-line telephony, mobile telephony, Internet, etc.).
- Geographic identification.
- Charge identification.
- Speech quality identification (for example fixed-line telephony should have the highest quality in Japan).
- Social reliability identification (telephone numbers are generally accepted as a reliable identifier because it is allocated by operator after strict check on the credibility of applicant).

- Credibility of calling party number:

Credibility of calling party number is ensured mainly at the originating side. For example, the telephone number of the calling party is validated at the originating local switch during the connection process by checking whether the number is properly registered in the local subscriber database. However the mapping of calling party number may influence the degree of the credibility of calling party number identification features of numbers.

6.2 Assignment of numbers and validation

6.2.1 The Japanese case

Proper assignment of numbers and validation are necessary for maintaining identification features of numbers and credibility of calling party number. Conventionally this has been achieved by the followings in Japan:

- Before assigning a geographic telephone number, the telecom operator confirms the applicant's name, address and the day of birth by checking the identification document such as passport, driving license, etc.
- Sometimes, especially when the number is a geographic number, the residential fact is also confirmed in some way, such as by visiting the location.
- Subscriber information including telephone number is registered in the subscriber database at the time of contract by the telecom operator.
- Credibility of calling party number is assured at call set up by checking the subscriber database.

In case of service using mapping of Internet domain names to E.164 numbers (service with mapping), gateway is added to the service implementation environment and this has changed the way of assignment of numbers and validation. Figure 6.1 shows an example of number assignment mechanism of service with mapping (served in Japan) and is corresponding to Category-3 in figure 5.1 and more detailed figure 5.2.

In this case, a geographic number is assigned to the service provider's gateway in the geographic area. The service provider associate subscriber's ID and the assigned geographic number in its database as mapping information. The subscriber use the geographic number as the user's own number but does not have to have an address or facilities in the geographic area (virtual number usage of the geographic number). The mapping of the Subscriber ID to the CLI=A can be either static/permanent or dynamic/temporary. This way of number assignment mechanism may influence the identification features and the credibility of calling party number through the mapping. The most serious issue is the location of the calling user may be different from the geographic information of CLI displayed to the terminating user. This may lead to the degradation of the credibility of calling party number identification features of numbers.

After discussions in Japan one of the provider serving use case in figure 6.1 started to consider changing the current number assignment mechanism to a revised mechanism such as the use case in figure 6.2 in the clause 6.2.2.

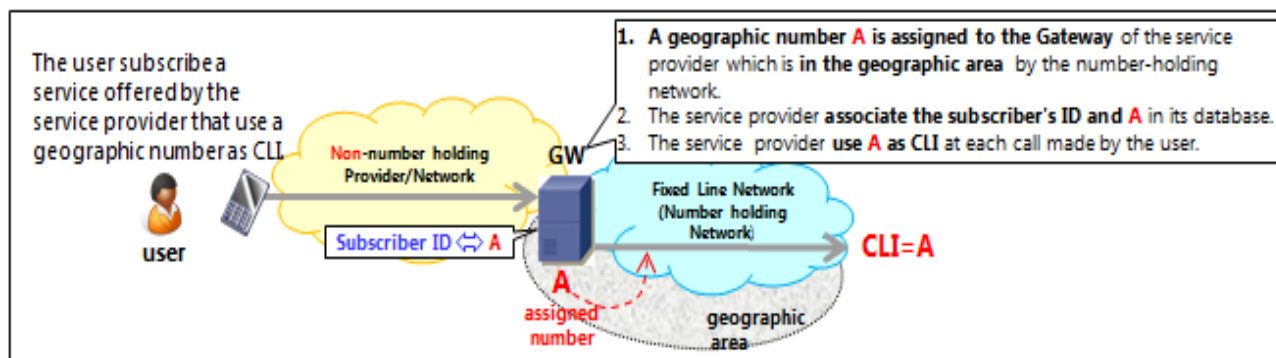


Figure 6.1: An example of number assignment mechanism of mapping service in Japan

6.2.2 Alternative ways

Figure 6.2 shows another example of number assignment mechanism of mapping service revised from the previous use case described in figure 6.1. The use case looks like similar to the example in clause 6.2 (virtual number usage of the geographic number) from the point of call set up message flows standardized by ETSI/3GPP. However it is different from the point of number assignment and validation.

In this case, the user lives in the corresponding geographic area or the physical line is assigned to this user in the geographic area. Even if the originating user uses the geographic number nomadically, the user has a close relationship to the corresponding geographic area. This is different from the example in clause 6.2 (virtual number usage of the geographic number).

Concerning the validation "Automatic validation" is available as is shown in figure 6.3. The service with mapping may need another kind of validation in addition to the validation at the time of assignment of the telephone numbers. It is the validation process for checking whether or not the user has a right to use the number.

This may lead to the less degradation of the credibility of calling party number identification features of numbers.

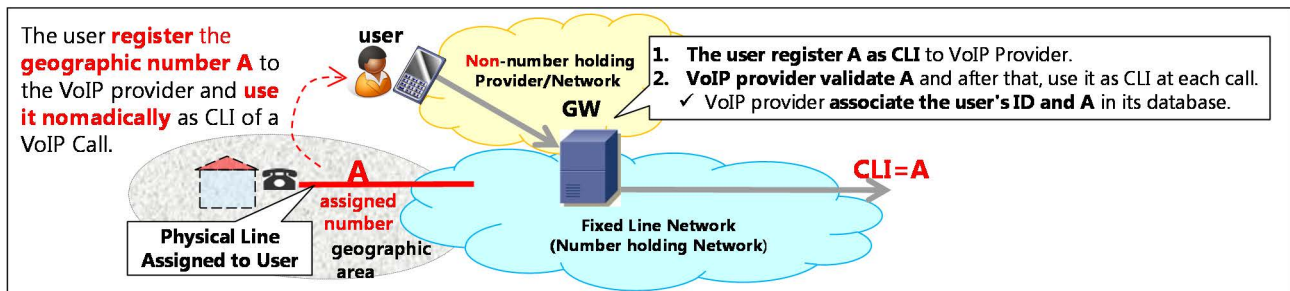
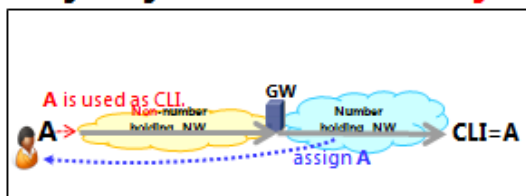


Figure 6.2: An example of revised number assignment mechanism of mapping service

> Number assignment image.

- ✓ The telephone number assigned to the caller by a number-holding network is used as CLI when the user originates a call in non-number holding network.



> Image of "Automatic Validation"

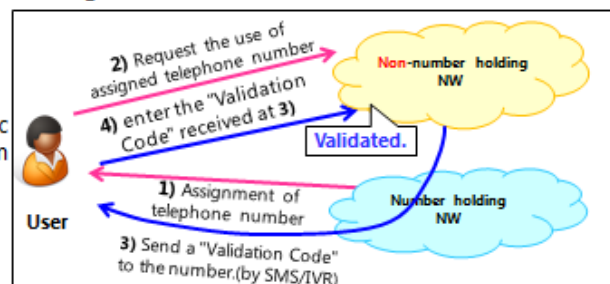


Figure 6.3: Image of "Automatic Validation"

7 Conclusion

The present document provides a technical report on interoperability and mapping of Internet domain names to E.164 numbers in order to allow interconnection between networks.

No issue is identified if a telecommunication service is analysed from the point of view of the message flows exchanged between networks.

However, when considering how E.164 numbers are assigned and validated the issue of the integrity of public E.164 numbering appears: the elements that may be defined through the structure and management of the numbering plan such as geographic location, unique user identification, nature of the service tariffs, anticipated quality, etc. are challenged by the way these new "services" or features use these numbers.

Especially it has to be underlined that in general the integrity of public E.164 numbering should continue to be guaranteed by national and international regulatory measures (such as National Numbering Plans, regional Telecommunications Regulatory Frameworks, Recommendations ITU-T like E.164 [i.1]).

History

Document history		
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