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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Network Aspects (NA).

Introduction

A lack of even the modern telephone network is, that a user has to dial a number of a telephone set instead of having to address the person, he expects to lift the receiver of that telephone set. Often, when we have build a link in our brain between a number to dial to address a person, that person moves and we have to remember a new number for that person.

For firms it is also a economical aspect, when they have to change their phone numbers in brochures, on cars etc. and also have to tell all their customers the new number.

One solution to this is, to use only non-geographical numbers, also called service numbers or personal numbers, but at present the use of such numbers is more expensive.

Location portability could solve the problem, but up to now, telephone numbers used to be associated to switches. The introduction of service provider portability made it necessary, to find technical solutions to release the association between numbers and switches. This technical solution can also be used for location portability, but there are a lot of impacts on location portability, one of the most important is the charging.

1 Scope

The present Working Package of the NPTF has the responsibility to study the issue of Location Portability utilizing to the greatest possible degree the work already done in the NPTF on Service Provider Portability.

The different variants of Location Portability [1] should be investigated against a representative choice of scenarios for numbering scheme, charging structure, and regulation, e.g. to show the consequences for tariff and geographical information in the Directory Numbers.

The combination of location portability together with Service Provider Portability should be considered.

The present document should evaluate the need for further standardization.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] TR 101 119: "Network Aspects (NA); High level description of number portability".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in Working Package 0 [1] and the following apply.

exchange area: Area served by one specific exchange. The exchange area may be different for different operators.

numbering area: Area where a specific part of a number, mostly called area code, is recognized by the user to be specific for a certain area. The numbering area may be different for different operators.

charging area: Geographic area where calls to and from a customer from and to any location within this area are charged the same. The charging area may be different for different operators. More details are shown as an example in the annex.

location portability domain: A certain geographic area, where a customer is allowed to retain his directory number, when changing his premises within this area and when this service is provided by the network operator. This domain may or may not be a exchange area, a numbering area, or a charge area or any combination of that. It also can be something to be defined by the network operator.

open numbering: If dialling a number, having the same area code as the own number, the area code need not to be dialled. Modern systems in many cases accept the area code to be dialled, even if it is not necessary.

closed numbering: The full national number always has to be dialled. Area codes may not exist or have to be dialled always in conjunction with the subscriber number.

servicing a numbering range: A service provider, network operator or exchange is able to handle a single number or a block of numbers out of that numbering range to connect a call to a own line or customer.

3.2 Abbreviations

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

CLI	Calling Line Identification
GSM	Global System for Mobile communications
ISDN	Integrated Services Digital Network

4 Aspects on location portability

4.1 Number types

4.1.1 Non-geographic numbers

The nature of non-geographic numbers is to have no geographic meaning. This can be service numbers, mobile numbers or other non-geographic numbers. Service numbers are, mostly in an IN-System, translated to a certain geographic number. This routing can be depending on the weekday and the time of day and also some other conditions, like the traffic to the service-number. So the service-number by itself has no geographic meaning.

Mobile numbers of modern mobile networks like GSM are considered as being non-geographic.

For non-geographic numbers, being independent of the location by nature, location portability does not apply.

4.1.2 Geographic numbers

Geographic numbers consist of an area code and a following subscriber number. Beside the area code, the subscriber number can also consist of one part, the first few digits, standing for a geographic area, mostly the serving area of an exchange, and the other part, identifying a certain customer located in that area, or speaking technical, identifying a specific line of that exchange, which is connected to that customer.

In some countries area codes have already lost their geographic meaning. This could also happen, when location portability is introduced.

When numbers lose their geographic meaning, the CLI can no longer be used to identify the location of a caller, for example for emergency reasons. If information of the geographic location of a caller is necessary, a new method has to be implemented in to the network, to provide this information.

Location portability has to be provided, if the customer moves. When moving to another location the boundary of certain areas could be crossed. What areas this could be, is described in the following paragraph.

4.2 Areas of location portability

4.2.1 Exchange area

Location portability within an area served by the same exchange has been provided by most of the network providers since the beginning. Exceptions may exist, where plans for division of the exchange area are prepared, or one of the following aspects apply.

Modern network architecture may centralize control of several exchanges in one centre-exchange, including the numbering database. This will reduce the importance of the exchange area and raise the importance of the following aspects.

4.2.2 Numbering area

Where numbering areas exist recognized by the user, location portability outside a specific numbering area may confuse the user, what to dial. If a user recognizes a specific part of a number, mostly called area code, to be specific for a certain area, he may be confused to have to dial a foreign area code to call a person or firm, which has been ported to his neighbourhood.

This confuses the user in countries, where open numbering is used. In such countries the user always puts the area code of the specific area, mostly the city, the called party is located in, in front of the subscriber number. If a user has to put a foreign area code in front of the subscriber number of his neighbour, when dialling him, he could be confused. This confusion could lead to a large amount of wrong dialling.

4.2.3 Charge area

For the definition of what a charge area is in this respect, see the paragraph definitions.

Location portability within one charge area has no impact on the charging. There is no difference in the charging between calls to ported lines and calls to non-ported lines. When location portability leaves the charge area, there will be a difference. How to deal with that charging difference is discussed later on.

4.2.4 Anywhere

Location portability anywhere means, that no restriction applies.

To get an overview of all technical and non-technical impacts on location portability without restrictions, this has to be examined issue by issue. The known issues to be examined are the exchange area, the numbering area and the charging area. One of the most important issue on location portability seems to be the charge area, but all this issues are examined in the next paragraph.

4.3 Problems and solutions when leaving certain areas

4.3.1 Leaving exchange area

Portability leaving the serving area of a specific exchange is widely discussed under the issue of service provider portability. Service provider portability is mostly understood as network operator portability. This kind of portability is in a poorly technical description the portability between different exchanges of different operators serving the same numbering range.

When only leaving the exchange area, location portability is the portability between different exchanges of the same operator serving the same numbering range.

For portability leaving the exchange area, when changing the network operator, it is called Service provider portability, when keeping the network operator, it is called location portability.

Location portability leaving the exchange area can be provided with the same mechanism as service provider portability. The only difference is another numbering plan for addressing exchanges instead of networks or, if necessary, another addressing scheme.

4.3.2 Leaving numbering area

Where location portability leaves certain numbering areas, the only technical impact is how many digits of the called party number have to be taken into account to address the call to a new destination.

This is more an issue of establishing an appropriate numbering plan for ported numbers than an issue of a specific technical solution. Most of the methods of service provider portability are independent of the numbering scheme and can also be used for location portability outside specific numbering areas. But, as described earlier, location portability leaving well known numbering areas, especially where open numbering is used, can confuse users and result in wrong dialling.

If location portability outside numbering areas is forced without any reason and without any respect of the above described problems, there have to be developed mechanisms to protect the networks from overload by wrong dialling of users, not understanding the new numbering plan.

4.3.3 Leaving charge area

This seems to be the most difficult to examine, and probably also to realize, issue on location portability. For the definition of a what a charge area is in this respect, see the paragraph definitions.

Location portability, that leaves the charge area means, that the costs of phoning a ported line differs from phoning this line not having been ported.

The major questions raising at this point are:

- Who pays for the charge difference or has the benefit of?
- How will the charged party, mostly the calling party, be informed, if he has to pay for the difference?

4.3.3.1 Charge difference

It would be the technical simplest solution, if nobody would take care of the charge difference and the differential costs of a call would be left to the network operator. This however is neither the most economical nor the most customer orientated solution. When a call to the ported number has a longer distance than before being ported, this is an economical disadvantage to the network operator and a benefit to the customer. When a call to the ported number has a shorter distance than before being ported, it is vice versa, and the customer pays more than the tariff for the real distance would be.

If the called party would have to pay the charge difference, it would be the most fair solution, because he is the reason for the difference by having moved. This can be done by a normal call forwarding-charge from the former location to the new. The charge for that is easy to recognize for the called party, because ever being fix, and also to the calling party, because the charge is the normal charge for the specific call to a specific distance.

An advanced technical solution could find a shorter route to the new destination than the simple call forwarding.. For the shorter distance, the called party could be paid back or the calling party be charged less. This makes necessary not only a complex technical solution for the routing but also for the billing system.

However, for such a solution to work in a multi-operator environment, in order for an originating operator to efficiently route and correctly bill for calls to the customer that has relocated, it would be necessary to develop processes to exchange information between operators about the customer's location after portability. This information would have to incorporate both geographic data (to correctly bill) and network location data (to efficiently route the call). For the latter, processes similar to those for service provider portability could be utilized.

Such a complex solution probably would lead to more expensive calls, than the simple existing billing system when the call is billed in two parts, one to the calling party by means of the dialled number and another to the moved called party similar as it is done for call forwarding.

If only the calling party should pay the charge difference or have the benefit of, this also would require the network operator to implement new features for tariffing the customer,. Nowadays the distance sensitive part of the charge is done by examining the called number. The distance of the call can be seen by the distance of the geographic areas, the numbers stands for. If this information cannot be used, a new method is necessary, providing information about the actual geographic location of the called party. A way out of the problems of implementing a new method would be to implement a distance independent tariff within the location portability area, as large this area ever may be. This also means, that the charge area may be extended to fit with the location portability area. In certain countries, the numbering plan may not easily allow the customer to determine the charge of a call from the called number. In this case, customers will not be used to looking at the called number for the charge of the call, but will know the charge from knowing the location of the called customer. In this case, location portability leaving charge area may be introduced without taking care that the called number gives an indication of the charge of call.

In other countries the customer may be used to have information of the charge of a call before the call. There the calling party has to be informed about the real tariff before being charged.

4.3.3.2 Informing the charged party

Most users want to know, what the tariff of a certain telephone call is. Except of service-numbers, the tariff depends on the geographic distance to the called party. In tables the user can find out the valid tariff for a certain area code. The area code is often the only information, the user has about the location of the party, he wants to call. For local calls the tariff is almost known.

When this tariff changes, because the party, he wants to call, has moved and the number has been ported, the user has to be informed about the new tariff. This could be done by:

- announcement;
- advice of charge on setup;
- advice of charge during the call;
- information service, he has to call before dialling.

If the information service is used, the customer has to ring this service before establishing a phone call. This is not very comfortable to do and may often be forgotten.

The use of advice of charge needs special equipped Telephone-terminals and a network providing ISDN or at least Advanced Display Services. Beside this, the customer may not be used to look at the display, to find out, what the actual tariff is. Advice of charge during the call is even not very useful, because the customer is already charged, when he knows the tariff and may have difficulties to tell the called party, why he wants to stop the call. Advice of charge on setup time is not implemented in many networks and costs the network many resources, when it has to wait, until the user has decided, if he wants to pay the tariff or cancel the call. Also there is no standard available up to now, allowing advice of charge, when carrier selection is used.

The only way of informing the customer, which seems to be a bit reasonable, is a announcement during call setup, telling the user the actual tariff. This can be restricted to calls, not having the expected tariff, that means to calls which are more or less expensive than expected. But the announcement may not be heard, if the user sends a fax or does a data-connection. For customers phoning the same ported party very often, this way of information will become annoying, always having to wait for the information being told.

4.4 Service provider portability and location portability

While service provider portability is forced by the regulation in many countries, it is up to the service provider, to provide the service of location portability. Also it is up to the service provider in which domains he provides location portability, but in many countries it is regulated, where location portability is allowed to be provided. For this reason, the location portability domain and the service provider portability domain may differ. Also the location portability domains of different service providers in a specific service provider portability domain may differ or not all of that service providers may provide the service of location portability.

4.4.1 Congruent domains

When location portability domains and service provider portability domains are congruent (the same), there are no restrictions on porting the same number several times by either type of porting. Any location porting is possible, because all service providers of the specific service provider portability domain also provide location portability within that domain.

4.4.2 Different domains

Addressing schemes or the serving areas of the exchanges in the networks of different network operators may differ. Therefore the location portability domains also may differ. This means, that after a location porting a service provider porting may not be possible, because the new service provider (so called recipient) may not be able to serve the numbering range, the requested number is in, in the new location of the customer.

Conversely if service provider portability is followed by location portability, the customer may not be able to return to the donor as this network may not be able to serve the number at the new location.

5 Conclusions

Location portability can be examined in three areas, exchange area, numbering area and charge area. There are different implications for each area, but there is no link between the implications. If location portability is provided by leaving more than one of that areas, the implications apply just in sum.

Portability leaving the exchange area means changing to another exchange. This can be done by changing the location inside a network, what is called location portability, or by changing the network, what is called service provider portability. The only difference may be another addressing scheme. There is no standard for the addressing scheme of service provider portability, so there is no need for a standard for the addressing scheme of location portability leaving the exchange area.

Location portability leaving the numbering area in an open numbering plan can cause irritations of the user ending in a large amount of wrong dialling. Beside numbering restrictions of exchanges the only technical implication could be the need of a system for preventing wrong dialling, but this is not a number portability issue.

Location portability leaving the charge area has many very considerable implications to charging, billing and advice of charge. There are no technical principles to support this kind of location portability being easy to understand by the customer, easy to implement by the network operator or even fulfilling all necessary requirements. Therefore it is not preferred, to provide location portability leaving the charge area. Alternatively the charge area could be adjusted to the location portability domain.

This all leads to the conclusion, that location portability in principle does not need an specific standardization beside the standardization for service provider portability. In some cases, where the CLI is used to determine the geographic location of a caller, a new method is required to provide this information. This is not only a number portability issue, and should be developed in respect of the specific demand. Other implications of location portability apply to the number plan and general charging mechanism. Both are no special number portability issues.

Annex A (informative): Charging area

example: Areas A-B-C are close together, as shown in the figure. B has direct boundaries to A and C; A and C have no direct boundaries. A call within B is charged as a local call. Calls from B to A and A to B are charged the same as local calls, also calls from B to C and from C to B. Calls from A to C or from C to A are charged as long distance calls. In this respect A and B are not the same charge area, because the definition "calls to and from anywhere inside the call area are the same" is not true. This is because calls from A to B and A to C are charged different.

If a line is ported from B to C, there would be impact on the charging, because the tariff for calls from A changes after porting. This is discussed in the paragraph "leaving charge area".

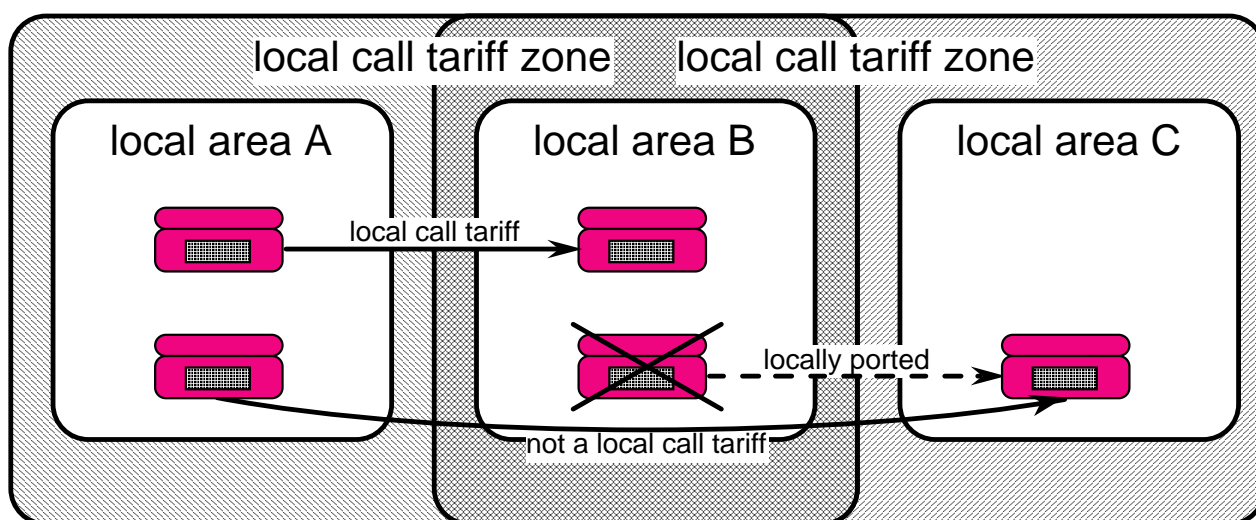


Figure A.1

Mobile networks in many cases are one single charging area.

Bibliography

The following material, though not specifically referenced in the body of the present document (or not publicly available), gives supporting information.

TR 101 118: "Network Aspects (NA); High level network architecture and solutions to support number portability".

TR 101 122: "Network Aspects (NA); Numbering and addressing for Number Portability".

TR 101 073: "Number Portability for pan-European services".

ITU-T Recommendation E.164: "The international public telecommunication numbering plan".

History

Document history		
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