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# Non-Geographic Number Portability Task Force
# PT2 : Network Architecture and Signalling Mechanisms

***BIPT***

# Contents

# 1 Scope

The purpose of the document is to define the Network architecture and the Signalling mechanisms needed for the support of Non-geographic Number Portability in Belgium.
The scope of Number Portability in this document is limited to Non-Geographic Number Portability

# 2 References

[ 1 ] ETSI TR 101 118 High Level Network Architectures and Solutions to Support NP
[ 2 ] ETSI TR 101 122 Numbering and Addressing for Number Portability
[ 3 ] ETSI EN 302 097 (Draft) ISDN, SS7, ISUP Enhancements for the support of NP
[ 4 ] ETSI TR 102 081 Signalling Requirements for Number Portability
[ 5 ] ITU-T Rec. E.164 The International Public Telecommunication Plan

# 3 Definitions and Abbreviations

## 3.1 Definitions

For definitions, please refer to NG-NPTF PT1 document entitled “Service Description Number Portability for Non-Geographic Numbers”, section 4.1.

## 3.2 Abbreviations

For abbreviations, please refer to NG-NPTF PT1 document entitled “Service Description Number Portability for Non-Geographic Numbers”, section 4.2.

# 4 Technical solutions to provide number portability

In the following sections, the technical solutions that have been selected to provide number portability are described and analyzed. Two solutions on the interface between the operators are examined:

- Onward Routeing
- All call query

Each operator should be able to decide about its own network architecture, network functions and design within its network, as long as external requirements (on the interface between operators) are fulfilled. Solutions to support non-geographic number portability should allow migrations between the technical solutions.

A Network Operator may perform several network functions as described in this document.

In this respect ‘Onward Routeing’ and ‘All call query’ solutions can seamlessly interwork on the interfaces between the Serving Network and the Recipient Platform. Both approaches imply the transfer of the same signalling information elements in the forward direction only.

The following routing translation principles may be used to deliver the call to the recipient service provider:

- One step routing translation:

The one step routing translation approach requires only one number portability query during call set-up. The NG NP query performed by the serving network will either determine that the called number is not ported or it will return a Routeing Number (RN) that can be used to route the call. The RN identifies the recipient network that provides service to the ported number (see section 5).

- Multiple routing translation:

In this approach every network through which a call passes must perform a query to ensure correct routeing of the call. This approach requires no special addressing arrangements across points of interconnect between networks, i.e. no routeing information is exchanged over the network interface.

The following chapters describe models of technical solutions that can be used to offer Non-Geographic Number Portability. The emphasis on placing the NP DB in the figures is from where the DB access is performed and what triggered the DB access. Despite the figures show the location of the DB within the domain of a particular Network it shall be understood that the DB might very well be located outside that domain (e.g. a DB commonly used by several service providers). The DB mentioned here is the real-time DB used for the call handling of the calls to ported numbers.

The figures in section 4 correspond to a one step routing translation principle. Also the service provider responsibilities and the impacts on the interfaces are related to the one step number translation principle.

The scenarios, service provider responsibilities and impacts on the interfaces for the other number translation principles are not described in this document. Four main types of Networks/platforms are described and identified as involved (depending on the level of NP evolution in the Networks concerned) in setting up a call to a ported non-geographic number:

- Originating Network,
- Transit Network,
- Donor Platform,
- Recipient Platform.

Notes:

In the described models, the different types of networks are clearly identified as separate entities. The interfaces between these entities are to be considered as “functional interfaces”. In practice, however, Network Operators may play the role of several types of networks. In this case, the interfaces between Network Operators have to support the different “functional interfaces” requirements involved.

## 4.1 Onward Routeing

### 4.1.1 General Description

With the onward routeing principle, the call to a ported number is routed to the Donor Service Provider by the Originating and possibly Transit Network. The onward routeing principle is illustrated in figure 1.

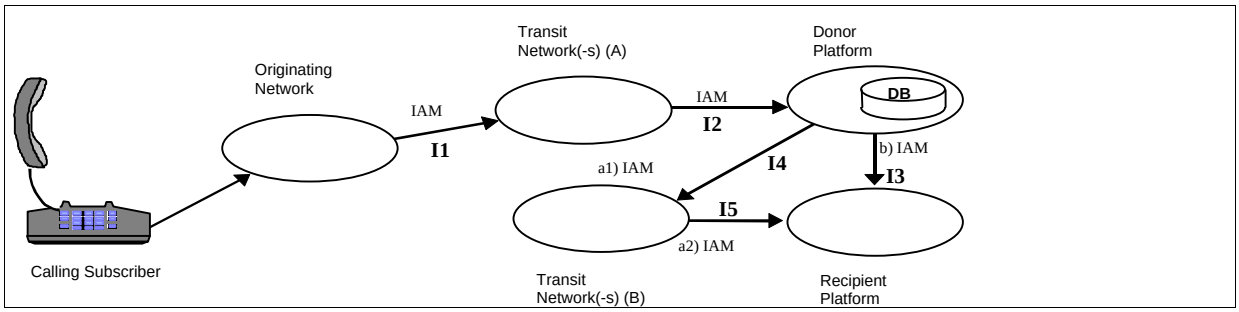



***Figure 1 Call Rerouteing to Recipient Platform by Onward Routeing principles from Donor Platform***

In figure 1, the Donor Service Provider receives an incoming call. It then detects that the called number has been ported-out to another network and retrieves the Routeing Number (RN). It thereafter reroutes the call onward towards the Recipient Service Provider using retrieved Routeing information.

Option a1 and a2 is valid when Donor Platform either has no direct interconnection to Recipient Platform or when overflow traffic is placed via Transit Network B.

The option b is valid when direct interconnection exists between Donor Platform and Recipient Platform.

Please note that the Transit Network(s) are optional, i.e. direct interconnections connections between Originating Network and Donor Platform might very well exist and the same also between Donor Platform and Recipient Platform. Note also that the Transit Network(s) A and B can be the same depending on network structure and call case.

### 4.1.2 Network Operators and Service Providers responsibilities

In terms of responsibilities, we refer to section 7.1 of document NG NPTF - PT1.

| | |
|---|---|
| Originating Network | no impact |
| Transit Network (A) | no impact |
| Donor Platform | performs the functions of the Serving functionality |
| Transit Network (B) | must have the capability to analyse and route the call to the Recipient Service Provider based on address layout and template of the RN . (Range Analysis function on the Routeing Information) |
| Recipient Platform | performs the functions of the Service Provider |

### 4.1.3 Impact on the interfaces

| | |
|---|---|
| I1 | no impact |
| I2 | no impact |
| I3 | must support the address layout and template of the RN |
| I4 | must support the address layout and template of the RN |
| I5 | must support the address layout and template of the RN |

## 4.2 All Call Query (one step)

### 4.2.1 All call query by Transit

#### 4.2.1.1 General Description

A second option is the principle of always query a Data Base prior to Routeing the call towards Donor/Recipient Platform, i.e. routeing according to ”all call query one step” principles as outlined in figure 2 below.

In this scenario the Transit Network (A) has access to a DB to retrieve the Routeing Information corresponding to the ported number.

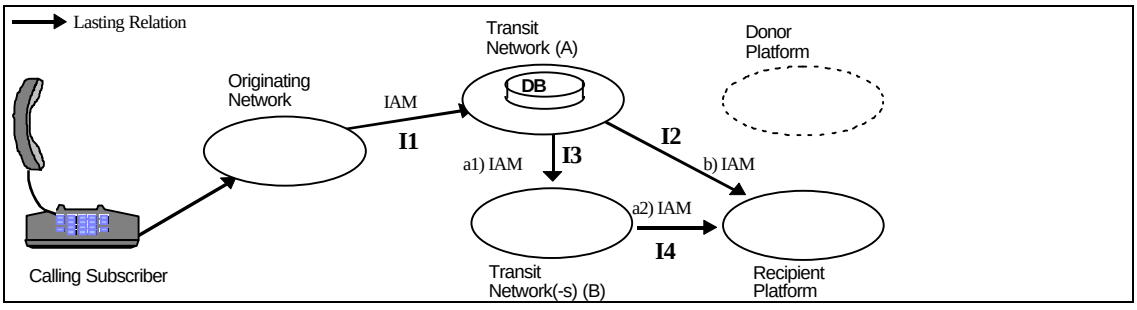



*Figure 2 "All call Query" by Transit Network*

As can be seen from the figure 2 above the Donor Platform is not involved at all in the call set up to the ported non-geographic number. Calls might be routed back from Transit A, to Originating network in the case that Originating and Recipient Service Providers are the same.

4.2.1.2 Network Operators and Service providers responsibilities

In terms of responsibilities, we refer to section 7.1 of document NG-NPTF - PT1.

| | |
|---|---|
| Originating Network | No impact |
| Transit Network (A) | Performs the functions of the Serving Network |
| Donor Platform | Not involved |
| Transit Network (B) | Must have the capability to analyse and route the call to the Recipient Service Provider based on address layout and template of the RN . (Range Analysis function on the Routeing Information) |
| Recipient Platform | Performs the functions of the Service Provider |

4.2.1.3 Impact on the interfaces

| | |
|---|---|
| I1 | : no impact |
| I2 | : must support the address layout and template of the RN |
| I3 | : must support the address layout and template of the RN |
| I4 | : must support the address layout and template of the RN |

### 4.2.2 All call query by Originating Network

4.2.2.1 General Description

The same principles, as described in section 4.1.1, are valid but with the difference here that the query is performed by the Originating Network having access to a DB to retrieve the Routeing Information.

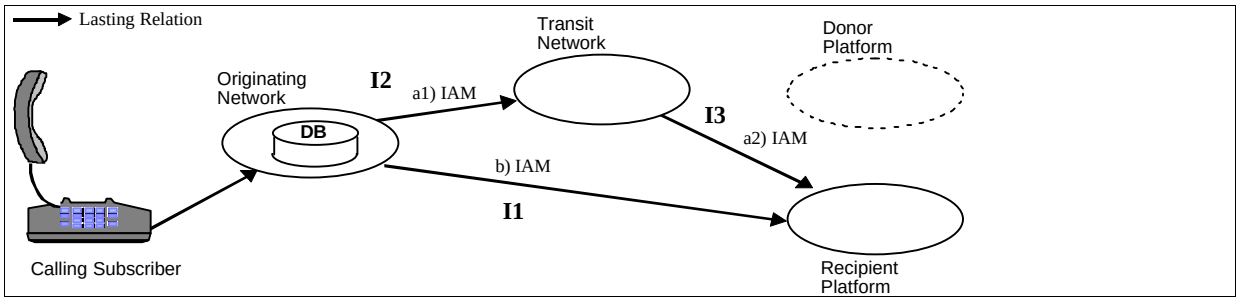



*Figure 3 All call Query by Originating Network*

As can be seen in the figure 3, the Donor Platform is not involved in the call set-up at all, however optionally the Transit Network (see case a1 and a2 above) might be transiting the call to the Recipient Platform.

4.2.2.2 Network Operator and Service provider responsibilities

In terms of responsibilities, we refer to section 7.1 of document NPTF - PT1.

| | |
|---|---|
| Originating Network | No Impact |
| Transit Network (A) | Performs the functions of the Serving Functionality |
| Donor Platform | Not involved |
| Transit Network (B) | Must have the capability to analyse and route the call to the Recipient Service Provider based on address Layout and template of the RN . (Range Analysis function on the Routeing Information) |
| Recipient Platform | performs all the functions of the Service Provider |

4.2.2.3 Impact on the interfaces

| | |
|---|---|
| I1 | must support the address layout and template of the RN |
| I2 | must support the address layout and template of the RN |
| I3 | must support the address layout and template of the RN |

# 5 Numbering, Addressing and Routing

On the interface between two service providers or a service provider and a network operator, or two network operators, two methods can be supported for the exchange of information once the Database Query Function has been carried out by one service provider or network operator:

1°) No routeing information is exchanged on the interface between both network operators/service providers. This solution consists in sending the “DN only” on the interface. No distinction is made between ported and non-ported numbers on the interface.

2°) Routeing information is exchanged on the interface between both network operators/service providers for ported numbers.

The following sections describe the numbering, addressing and routing principles to be applied in this case. The short-term solution selected uses a concatenated addressing layout as described in sections 5.2.1 and 5.2.2.1. The possible long-term solutions consist of a concatenated addressing layout as described in section 5.2.1and 5.2.2.2 or a separated addressing layout as described in sections 5.2.3 and 5.2.4

## 5.1 Addressable entities for routeing purposes

Entities which need to be addressed by a routeing number (RN) in one or more routeing solutions are identified in this section.

**Recipient Service Provider** is identified by its routeing number.

## 5.2 Types of addresses and numbers.

With service provider portability it is no longer possible to use the Directory Number, dialed by the calling party, to route the call to the customer. Additional information, the Routeing Number (RN), is needed to be able to route the call. The Routeing Information may have one of the following formats:

- concatenated address (sections 5.2.1, 5.2.2);
- separated address (sections 5.2.3, 5.2.4);

### 5.2.1 Concatenated address layout

In this type of address, two numbers are concatenated in the same signalling field (the Called Party Number) which is used to route the call. The field has the following format:

| RN | DN |
|---|---|

RN is a Routeing Number prefixed for routeing purpose.

### 5.2.2 Concatenated address template

5.2.2.1 Short-term solution

The use of the concatenated address format shall be identified with the hexadecimal digit ‘C’ for the RN, because:

- it avoids National Numbering Plan capacities consumption
- it is already used on the interface between Belgacom and the operators for the carrier selection calls to avoid clashes with normal cells (NSN format).[1]

The coding of the RN shall be:

- **Recipient Service Provider: 'C'00XX**

With XX: identifier of a particular Recipient Service Provider, XX is the only identifier to be used by all operators involved nationwide to indicate this particular "Recipient Service Provider".

The value XX for each Service Provider concerned will be allocated by the BIPT.

5.2.2.2 Long-term solution

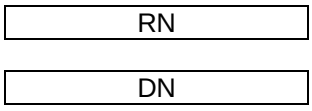
The long-term solution is to abandon the hexadecimal 'C' and to use the ITU-T standard NoA (Nature of Address) value.

The use of the concatenated address format shall be identified with the standard ITU-T Nature of address value 0001000 "Network Routing Number concatenated with Called Directory Number".

The migration to this solution has to be analysed in detail when the ITU-T/ETSI documents will be stable.

### 5.2.3 Separated addresses layout

In this address type, the Routeing Number and the Directory Number are carried in two different fields in the signalling messages. The address identifying the destination of the ported call, Routeing Number, is used to route the call. DN is transparently carried in a separate signalling parameter and is only used at the called side to set up the call.




If the routeing number is a plain E.164 number from the range usually handled by the addressed exchange, no specific addressing scheme (for identifying the exchanges) is needed. This solution does not waste any numbering resources since the dialed number and routeing number are carried in separate fields. The numbering space for routeing numbers will always be sufficient, as all numbers from the national numbering plan can be used as routeing numbers. Contrary to prefix based solutions, no special treatment of Routeing Numbers needs to be provided by the routeing mechanism of the exchange. But such a separated address solution requires, by definition, that signalling systems used are able to carry both RN and DN in separate signalling parameters.

### 5.2.4 Separated Address template

This will be studied in detail when ETSI / ITU-T documents will be stable.

# 6 Signalling impacts

The aim is to mention here the deltas (if any) specifically due to the Number Portability support between service providers. This will be analyzed for the two technical solutions that have been selected:

- Onward Routeing
- All call Query

## 6.1 Onward Routeing

As long as the call has not reached the Donor Platform, there is no impact on the interfaces between service providers. When receiving an incoming call, the Donor Platform detects that the called number has been

[1] For carrier selection, the format used is 'C' 05XX and 'C'06XX

ported-out to another network. It then retrieves the Routeing Number (RN) to re-route the call onward to the Recipient Platform. On the further interfaces involved in the call, the signalling impacts are given hereafter:

### 6.1.1 Concatenated address

*Short-term solution*

No impact except that overdecadic digits must be supported as the RN will begin with the hexadecimal digit 'C'.

*Long-term solution*

No impact except that the concatenated address format with RN has to be indicated with the standard ITU-T Nature of address value 0001000 " Network Routing Number concatenated with Called Directory Number"

### 6.1.2 Separated address

Signalling impact will be according to decisions to be taken by ITU-T and ETSI.

## 6.2 All call Query

There is no signalling impact as long as the Query is not performed. Once the Query has been performed (by the Originating or Transit Network), the call is further routed including the Routeing Information. On the further interfaces involved in the call, the signalling impacts are given hereafter:

### 6.2.1 Concatenated address

*Short-term solution*

No impact except that overdecadic digits must be supported as the RN will begin with the hexadecimal digit 'C'.

*Long-term solution*

No impact except that the concatenated address format with RN has to be indicated with the standard ITU-T Nature of address value 0001000 " Network Routing Number concatenated with Called Directory Number"

### 6.2.2 Separated address

Signalling impact will be according to decisions to be taken by ITU-T and ETSI.

## 6.3 Migration between solutions

Since the Onward Routeing and All call query solutions can seamless interwork, no migration problems are identified when an operator migrates from an Onward Routing solution towards an All call query solution.

# 7 Interworking with other services

The following sections are focused on the interworking with other services for calls towards ported numbers.

## 7.1 CLI based services

The working of services based on CLI (e.g. CLASS, CLIP/CLIR) should not be affected by the porting operation.

## 7.2 COLP/COLR

COLP/COLR shall not be affected by the porting operation.

## 7.3 Originally Called Number

This parameter must contain the original called number (in case of call forwarding or number translation). Precautions should be taken as to avoid that the Routing Information appears in this parameter.

## 7.4 CCBS/CCNR

Today this functionality is not supported on the interface between network operators/service providers. The number portability will not change the situation.

## 7.5 Explosive traffic

In order to avoid traffic overload problems, it seems logical to implement the Onward Routeing solution in combination with the use of HTR (Hard To Reach) trunks.

If the ACQ solution is to be implemented, actions will be necessary to avoid that the traffic to the ported explosive number(s) is mixed with the normal traffic.

## 7.6 Interworking with Geographic Number Portability

Assume a ported non-geographic number is translated in a geographic number. If this geographic number is also ported, both porting operations will be treated separately.

- End -