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# ALCATEL NUMBER PORTABILITY SOLUTIONS

## 1 INTRODUCTION

IDA published a consultation paper on the implementation of number portability (NP) of fixed and mobile telecommunications services in Singapore. IDA seeks in this public consultation paper to obtain views from the industry and members of the public on:

- a) The existing implementation of NP for both fixed and mobile lines
- b) The proposed approach to improve NP in Singapore.

The focus of this paper is service provider NP covering mobile, fixed, IP telephony and inter-modal porting.

Alcatel adores these efforts which aim to raise the competitiveness of telecommunications industry in Singapore. We fully agree that this would result in stimulating more innovative service offering to users and retain Singapore as one of the most advanced telecommunication markets in the world.

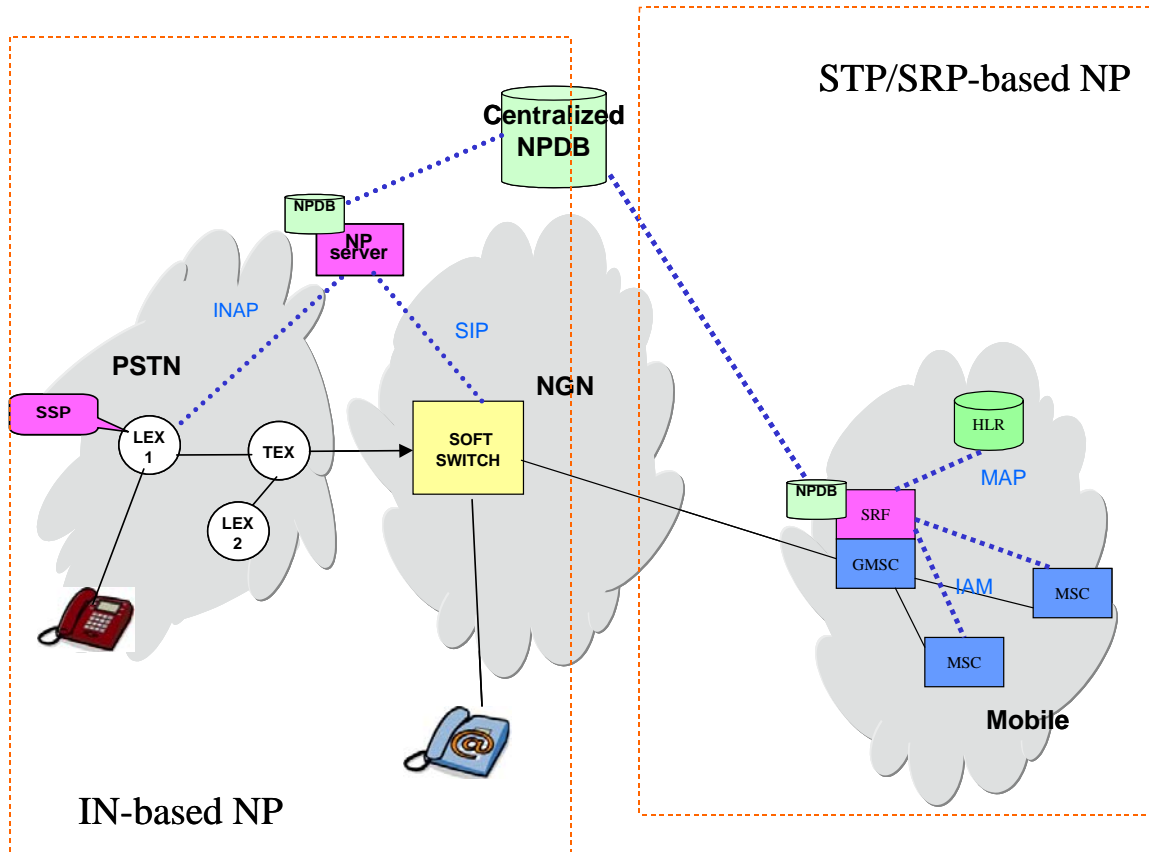
Alcatel is happy to share with IDA its experience as provider for NP solutions to several operators worldwide. For example, in the North America, number portability is managed by a third party organization Neustar which administrate the number porting process from current service provider to new service provider. The NPAC consists of SOA hierarchy of initiating number port change order and SMS (Service Management System) hierarchy for auditing and updating the change. Typically regional SMS in NPAC works with the LSMS (Local Service Management System). It is the LSMS that works with the individual service provider number portability (NP) applications to update the NP database.

Alcatel NP applications can be provided via server based or via STP/SRF approach. In particular, Alcatel works with Evolving System in North America market for an integrated NP and LSMS approach. Until now, service providers were faced with limited choices to ensure local number portability (LNP). They could either buy an LNP element from one vendor and the LSMS from another vendor or settle for a proprietary, limited solution. With the availability of a single solution from Alcatel and Evolving Systems, carriers can now take advantage of a best-of-breed, standards-based solution that combines the Alcatel 5070 SSG for LNP capabilities and the Evolving Systems Number Manager LSMS to address all networks needs from a single supplier

Alcatel has also been working closely with major operators in Singapore on their PSTN and NGN networking, providing NP applications in some of the cases. We would like to contribute to the effort in Singapore for a nation wide number portability effort. Alcatel is very interested in discussing on the realisation details and supporting all related parties with our experience.

In below we briefly describe our NP approaches, the first one being server based and the second one being STP/SPF based. The diagram below shows the two approaches under a centralized database approach.

Alcatel solutions realised in several networks are based on two approaches: IN-based NP solution and STP-based solution. Both solutions can be implemented to provide full NP, that is fixed to fixed (FNP), mobile to mobile (MNP) and inter-modal NP, supporting a centralized database model as proposed in the IDA paper. Below figure depicts the two solutions as example.



This paper gives an overview of these two approaches from technical point of view. Business models, cost allocation mechanisms and the like can be evaluated in dedicated papers.

## 2 OVERALL ARCHITECTURE OF NP

Alcatel has developed a Number Portability (NP) Service for both fixed and mobile networks. The NP service operates on the Alcatel Open Service Platform (A8690 OSP). There are two modules dedicated to fixed and mobile NP which are hosted on Alcatel OPS platform.

The characteristics of Alcatel OSP are:

- Agnostic to the overall NP scenario (direct routing, indirect routing, etc...)
- Available to any application
  - Mobile, Fixed
  - Postpaid, Prepaid
  - Voice, SMS, MMS, etc...

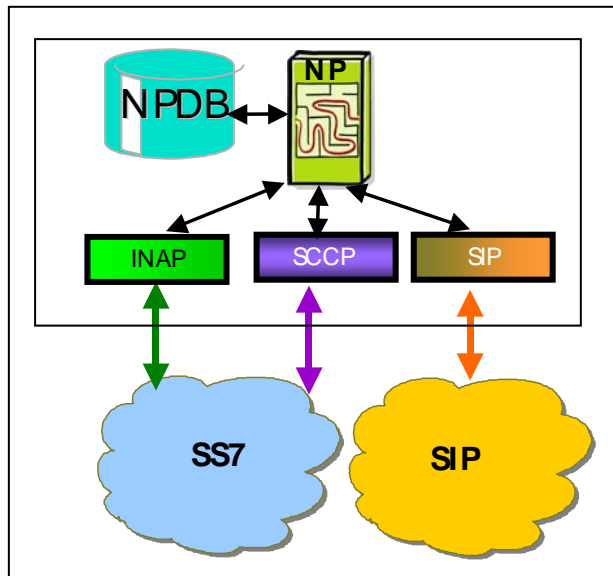
- Fully modular to support any business model and long term requirements
- Flexible operational environment
  - Centralised management and provisioning
  - Statistics, alarms & Call tickets>Unique database
- Scalable
- Carrier Grade Platform

In the IN-based NP, all calls are routed to SCP which does a local NP database lookup.

Centralized NPDB can be hosted on the OSP or separately managed by third party. In the latter case, the third party managed centralized NPDP updates the local database in the NP periodically on new numbers ported

## 2.1 IN-based NP for Fixed Networks

The main components of the NP Service are depicted in the following figure:



As shown in the figure above, the NP service is centered on a real-time database. This database contains routing information related to numbers that have been ported. This information is made available to three front-end applications: INAP, SCCP and SIP. The purpose of these modules is to make the NPDB information available to the network. The INAP/SIP modules are concerned with bearer-related calls while SCCP deals with bearer-unrelated calls. OSP system hosts the database, executes the service logic and performs the translation.

The Alcatel NP solution has been developed as a generic service that:

- Minimizes the impact on the existing network and services,
- Provides the flexibility to support long-term regulatory requirements and environmental changes (migration towards NGN...).

### 2.1.1 Supported portability methods

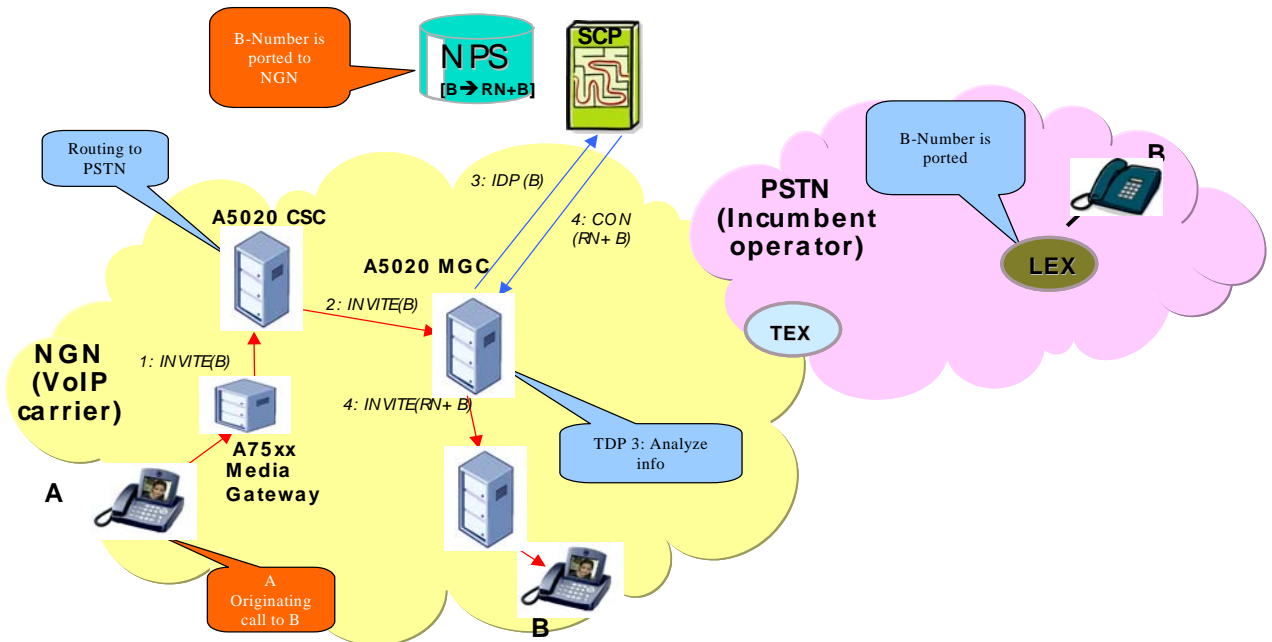
NP supports location, service provider and access equipment portability types. Depending on the type of portability the service provides wants to implement, different triggering methods can be used to trigger the NP service, as described in the table below:

| Triggering method<br>Portability type      | AcQ       | QoR                                  | Onward    | Prefix<br>Numbering      | Unregistr<br>ed SIP user |
|--|-----------|--------------------------------------|-----------|--------------------------|--------------------------|
| Location portability                       | Supported | Supported<br>Recommended for<br>INAP | Supported | --                       | --                       |
| (Incoming) service<br>provider portability | --        | --                                   | --        | Supported<br>Recommended | --                       |
| (Outgoing) service<br>provider portability | Supported | Supported<br>Recommended for<br>INAP | Supported | --                       | Supported                |
| Access equipment<br>portability            | Supported | Supported                            | --        | --                       | --                       |

### 2.1.2 FNP Example Scenarios

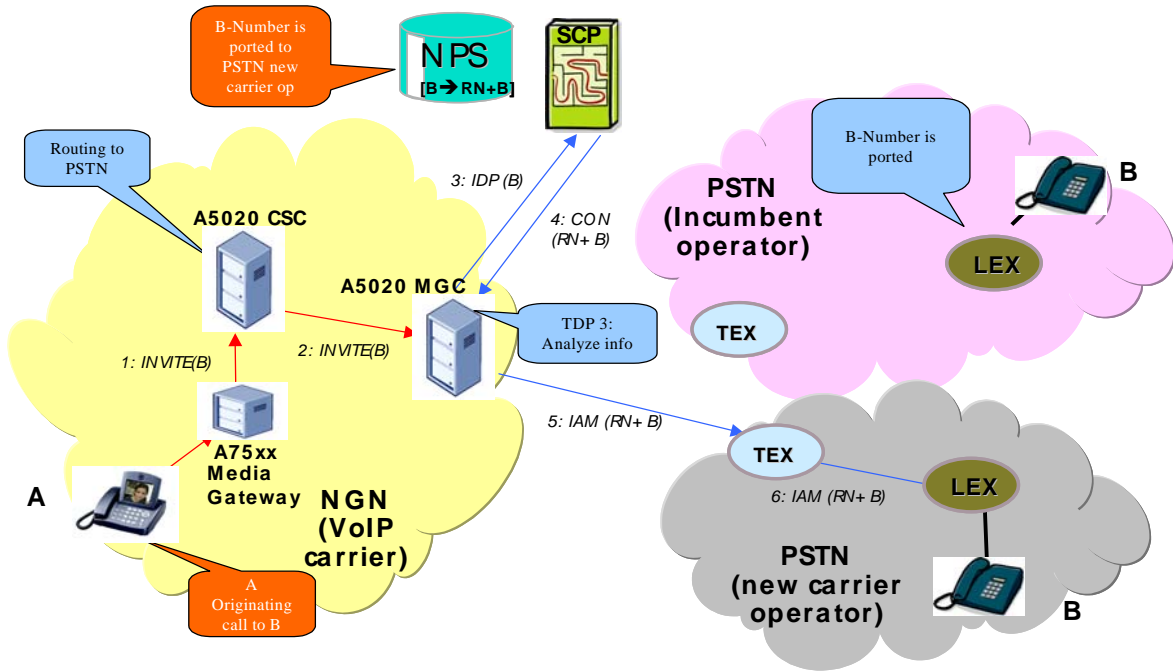
#### 1.1.1.1 PSTN Number Ported to NGN

A VoIP subscriber calls a PSTN subscriber that has moved to NGN. ACQ method is used.



#### 1.1.1.2 PSTN number Ported to PSTN

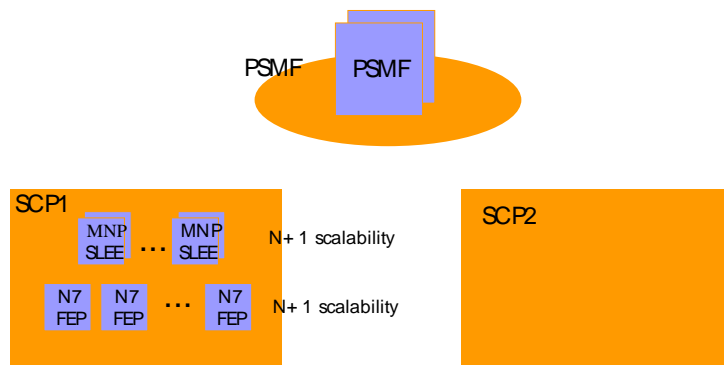
A SIP user calls a PSTN subscriber that has moved from one PSTN operator to a new PSTN operator. ACQ method is used.



## 2.2 IN-based NP for Mobile Networks

Alcatel provides a MNP service on which particular triggering specific to the mobile network are performed. As stated earlier, NP and MNP can be hosted on the same OSP platform.

The offered MNP Solution is mapped on the OSP architecture and consists of 2 basic Functions: the PSMF (running management functions) and SCP (running NMP service). SCP performs all MTP and SCCP/GTT routing and processes the MAP, respectively INAP/CAP queries, to check the location of the included directory number.



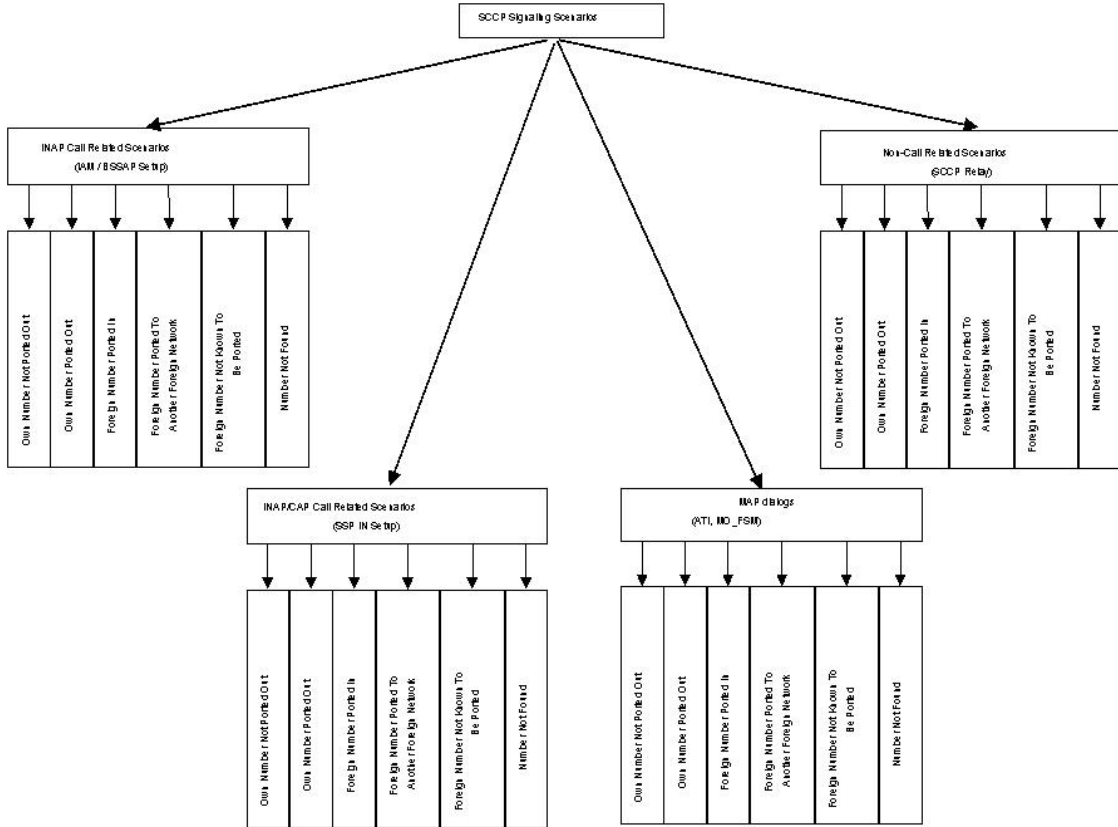
The solution supports:

- SCCP Triggering scenarios
- TCAP Application Scenarios
- SCCP Application Scenarios
- Used protocols are SCCP, INAP CS1, CAMEL and MAP.

### 2.2.1 Mobile Number portability Scenarios for a representation of the Signaling

## Scenarios

Below picture provides an overview. For each MNP application on the OSP, the inbound and outbound addresses of the relevant protocol parameters are specified in terms of Digit String, Nature of Address Indicator (NoAI), and Numbering Plan (NP).



### 2.2.2 SCCP Triggering Scenarios

Basically, the SCCP signalling layer invokes the different Mobile Number Portability processing applications depending on what parameter criteria are met. The message discrimination is done on the OSP by using the Global Title Translation mechanism.

There are two types of applications:

- 1) TCAP Applications: MNP is seen as an endpoint. SCCP routing is based on Global Title + SSN.
- 2) SCCP Applications: MNP relays the first message to the real destination entry. SCCP routing is based on Global Title + SSN.

### 2.2.3 Call Related Scenarios

In-based MNP supports two different call related scenarios: for contractual subscribers and for IN-Subscribers and other IN services.

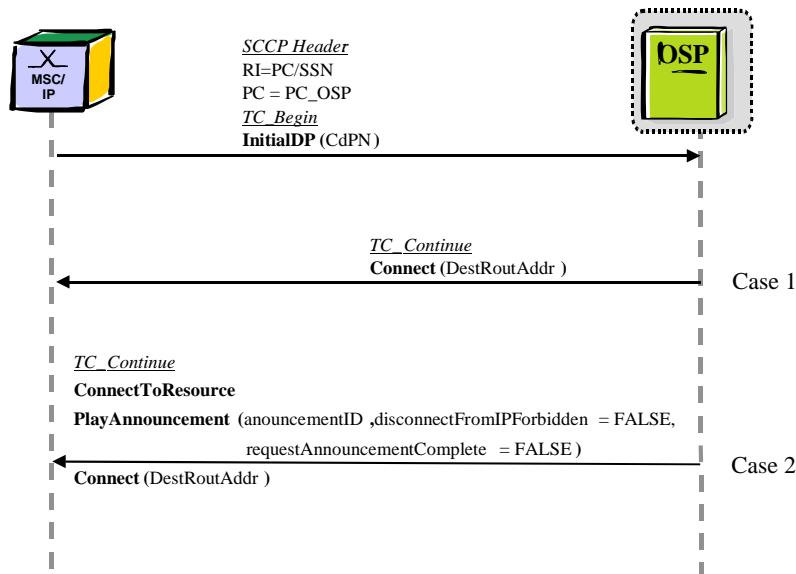
For call scenarios that are related to contractual subscribers the actual tariff information shall be indicated to the subscriber prior to the call set-up. Playing an announcement prior to the call set-up can do the indication of the actual tariff rate.

For call scenarios related to IN-Subscribers and other IN services the offered MNP solution shall intercept the query launched from the MSC to the SCP and shall insert the terminating network information directly into the query message.

Furthermore, for both call scenarios the information to which terminating network a dialled number belongs is also required for routing purposes in the originating network.

### 1.1.1.3 For Contractual Subscribers

For call scenarios related to contractual subscribers the MNP acts as Service Control Function (SCF) in order to manage an announcement and provides routing information to the interrogating MSC. Figure below shows the message flow:



Used protocols are INAP, CAMEL and MAP SRI.

### 1.1.1.4 For IN-Subscribers and Other IN Services

For call scenarios related to IN-Subscribers and other IN services, the MNP solution intercepts InitialDP messages in order to add the terminating network information into the query launched from the switch to the SCP. In case the received called party number is ported, OSP modifies the called party number and appends a prefix that identifies the destination network or node. Figure below shows the SS7 message flow between the MSC and SCP for an originated call in general.

## 2.2.4 Non-Call Related Scenarios

IN-based MNP supports the following non-call related scenarios.

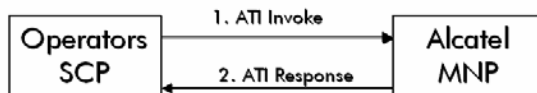
1) Generic database interrogation method for IN-services: MNP supports MAP based on “Any Time Interrogation” (ATI). The purpose is to provide a generic NMP database interrogation method for IN services or other VAS services.

> MNP Role :

- Reception of the MAP-AnyTimeInterrogation message from an IN service (NTS, VPN, Prepaid)
- Insertion of the porting information in the “VLR Number” parameter of MAP-ATI response

> MAP Protocol

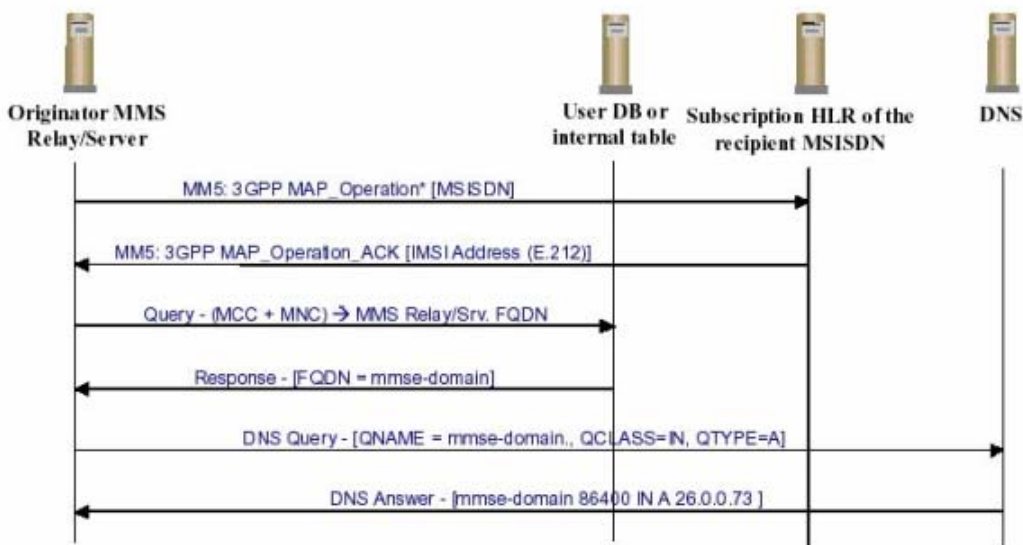
- AnyTimeInterrogation operation



2) SCCP relay function: provided for all messages that are routed towards the HLR with an E.164 based SCCP Called Party Address.

3) Access screening function for mobile originated short messages: In order to protect against fraud SMSC validates if the originator of an incoming short message belongs to the home network. However, within MNP environment, the MSISDN no longer indicates the home network of the subscriber since this number could now belong to any mobile network operator. Therefore, OSP provides a screening function based on the mobile number portability status of the originator’s MSISDN.

4) For MMS, the MNP can support the Recipient MSISDN address resolution based on IMSI. IMSI determination enable the MMS application to determine the MCC + MNC so that the DNS query can be formatted properly.



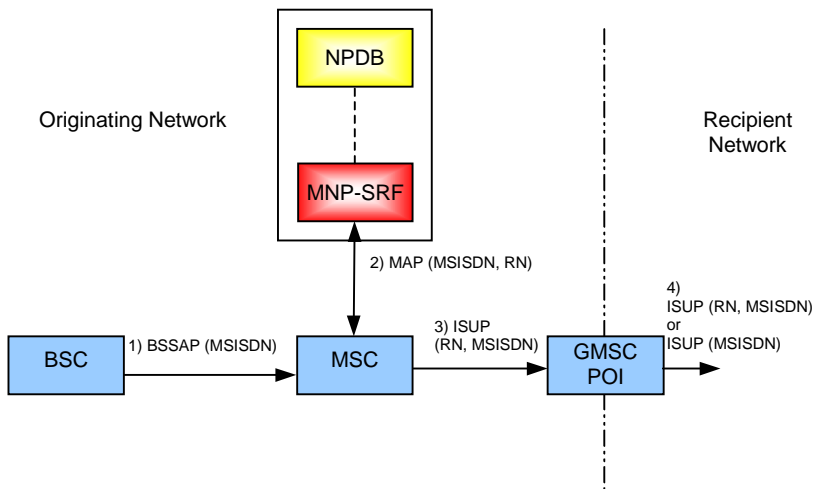
\* Where Operation = Send\_IMSI or SRI\_for\_SM



### 3 ALCATEL NP BASED ON STP/SRF FOR CALL RELATED MESSAGES

All calls, including the ones within the same exchange are routed via STP/SRF network. The STP does the database lookup. An upgrade of existing network is not required (only SS7 routing). Direct and indirect routing are supported. This section explains mainly the MNP. The FNP is considered to be a subset of MNP.

For call related messages the application relay functionality in the Alcatel 5070 Signalling Server Global (SSG) shall be used (MNP-SRF). The MNP-SRF has the capability to look into the MAP operation to check if the MSISDN is ported. One solution is the direct routing solution based on the SRF with Application relay. This solution is depicted here:



### 4 ALCATEL NP BASED ON SRF FOR NON-CALL RELATED MESSAGES

For non-call related connections, i.e. only the routing of signalling system No.7 messages through the network without establishment of a bearer the STP shall be enhanced with an extended SCCP mechanism. In all MNP scenarios where the MSISDN is used in a signalling system No.7 message, e.g. SCCP message for CCBS request, to route and deliver the message to the exported mobile subscriber, the message shall be routed and analysed in the SRF either on SCCP level or on Application level and the NPDB shall be queried. Delivery of a SCCP message for an exported MSISDN - SCCP relay, direct routing is as follows:

