

Implementation Procedure for Mobile Number Portability

M. Vinod Kumar Reddy, S. Rajendra Prasad

Assistant Professor, Dept. of ECE

Annamacharya Institute of Technology & Sciences, Hyderabad, A.P, India

vinodreddy.488@gmail.com, rajendraprasad432@gmail.com

Abstract:- Increasing numbers of countries require mobile telephone networks to offer mobile number portability (MNP). The term MNP allows customers who wish to switch mobile operator to keep their mobile numbers, avoiding the costs of switching to new numbers. Customers are predominantly reluctant to switch their network operator if this means that they would have to change their telephone number. Changing one's telephone numbers can be a major inconvenience and a potential barrier preventing the general public from taking advantage of the options available in a developed competitive telecommunications market. The implementation of number portability initiatives in many key markets created new opportunities and improved the consumer's experience, but terminating calls into number-portability countries became more difficult, confusing and expensive as a result. The absence of number portability may therefore give the incumbent operators a significant competitive advantage over new entrants into the market. Recently, the government of India approved New Telecom Policy-2012, which aims to abolish roaming charges across the country and facilitate nationwide mobile number portability. This paper discusses what mobile number portability is and how it works. This paper explains the underlying MNP technology and its impact to the telephony ecosystem.

Keywords - Donor Operator, Recipient operator, Number portability database, Routing number, Number Portability.

I. INTRODUCTION

There has been rapid growth in the penetration of telephony services in the last few years. But the growth has not been exponential in the quality of service offered or openness of business. Consumers are not satisfied with the operators' services and schemes. Traditionally, consumers are required to give up their mobile number on changing service providers. As a result, they are hugely inconvenienced by having to inform everyone about the change in their number. Besides there is likelihood of important calls (from people who didn't have the new number) being missed out, and so on.

The picture has now changed dramatically with the introduction of mobile number portability (MNP). A significant technical aspect of implementing number portability is related to the routing of calls or mobile messages (SMS, MMS) to a number once it is ported to some other network. Portability benefits subscribers and increases the level of competition between service providers, rewarding service providers with the best customer service, network coverage, and service quality. Given the growth of telecom services in India, and enhanced competition in the mobile sector, it is pertinent to deliberate about the issue of mobile number portability at this time. Operator portability both for fixed and mobile services, and service portability have been implemented in different parts of the world. It might be thought that number portability would have the greatest impact in maturing markets when service demand growth has eased and the market structure has become more rationalized. However, the decision to introduce number portability could be taken well before that. The Netherlands decided to provide mobile number portability (MNP) when mobile penetration was 10%, and Pakistan, with 6.9% cellular penetration, is planning to introduce MNP shortly. This suggests that it is not too early for India to discuss number portability, so that it could be implemented by the time that the market has further expanded in the next few years. In mobile networks, Number Portability involves only the MSISDN number, and not the IMSI. A subscriber who switches to another mobile network operator will be allocated a new IMSI (together with a new SIM card) while retaining his MSISDN.

Consequently Number Portability could affect all functionalities and services in mobile networks that are based on the MSISDN number, e.g.

- All mobile terminated calls
- All mobile originated calls
- Short Messages within the Short Message Service (SMS) and MMS
- Prepaid services
- Any service based on MSISDN

The portability information of subscribers resides in a database called NPDB (Number Portability Database). Every operator will have to build a “local portability database” which will download the data from NPDB on a pre defined interval and will be involved in call routing by doing a query to this database for routing information. It is believed that when fully and nationally implemented by both wire line and wireless service providers, number portability will remove one of the most significant switching costs for consumers and will encourage competition in the telecommunications industry.

This paper discusses: Types of number portability, various call routing schemes for service provider number portability, comparisons among various routing schemes, challenges of implementing number portability, best solution in terms of complexity of implementation, use of network resources, and scalability.

II. MOBILE NUMBER PORTABILITY TYPES

The various types of number portability are:

A. Provider Number Portability: Subscribers can change the service provider while retaining the same phone number. It is also called operator portability.

1. *Local Number Portability*: The subscriber retains its number when changing from one operator/service provider to another. E.g. the porting of existing directory number between fixed operators.

2. *Mobile Number Portability*: Porting of mobile telephone numbers between wireless operators.

3. *Non-geographical Number Portability*: Porting of ‘service’ numbers, e.g. ‘800’- numbers.

B. Location Number Portability: Subscribers can change their service location while keeping the same telephone number.

C. Service Portability: Subscribers can change the subscribed services while retaining the same telephone number. Service portability allows the subscribers to enjoy the subscribed services in the same way when they roam outside their home networks. The subscriber retains its number when changing service type. E.g. from POTS to ISDN, mobile to fixed, fixed to mobile.

A combination of different kinds of portability options can also be used, which enables customers to retain their mobile number across different service providers, service technologies, geographical regions and national boundaries.

Many regulatory authorities have made number portability mandatory or are about to introduce it so as to ensure better quality of service to customers. The world’s first country to introduce mobile number portability was Singapore (1997). It was followed by the UK, Hong Kong and the Netherlands (1999), Spain (2000) and Australia (2001). As of today, there are many countries (including India) that have introduced number portability.

This paper discusses service provider number portability (SPNP), as SPNP is the primary form of number portability that promotes competition among the mobile service providers.

III. IMPLEMENTATION OF MOBILE NUMBER PORTABILITY

Mobile number portability can be implemented using either decentralized database or centralized database approach (Fig. 1). Decentralized database solution requires each operator to maintain its own number portability database. It is useful if there are few operators. If there are many operators, centralized database solution is better. Signaling relay approach. This approach is based on decentralized database solution. In this implementation, the donor operator identifies the correct terminating network (recipient operator) and routes the call to that network. The originating network receives a call from the caller and routes the call to the donor operator. Upon receiving the call, the donor operator network identifies that the dialed number has been ported out. Now the donor operator routes the call to the recipient operator network.

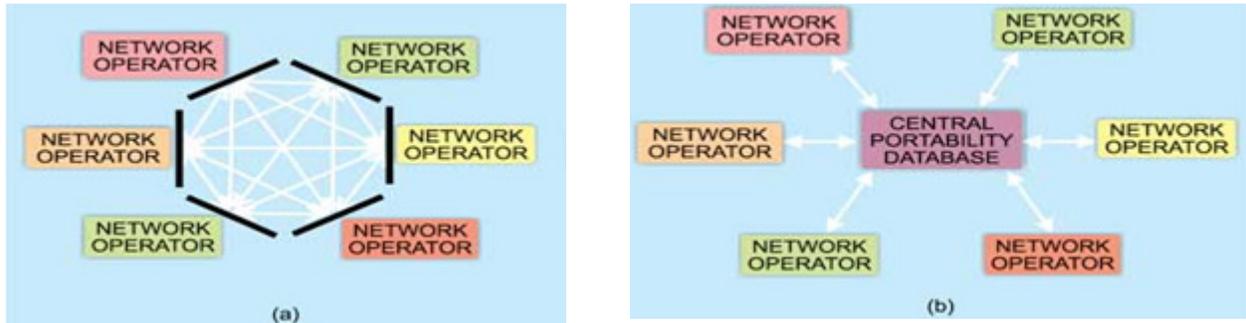


Fig. 1: (a) Decentralized and (b) centralized database solution

In this routing scheme, there is no need of a central database, and only the donor and recipient operators need to know about the porting of a number. Direct relay. In this approach, the originating network contacts the gateway mobile switching centre to establish a call. The gateway mobile switching centre detects that the dialed number is ported out and relays signaling information to the home location register to get the mobile station routing number. After getting the mobile station routing number, the gateway mobile switching centre sets up trunk to the serving mobile switching centre to establish the call (Fig.2).

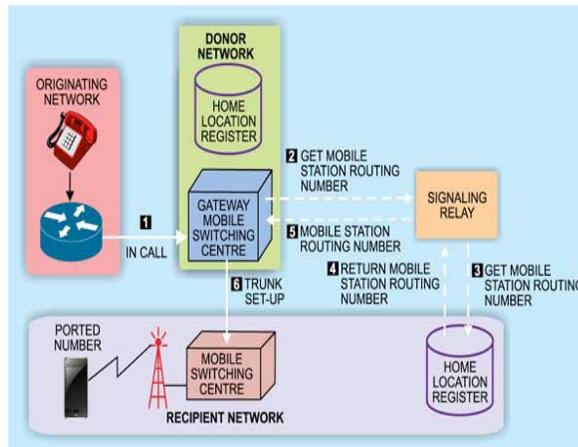


Fig. 2: Signaling relay approach

In this routing approach, the originating, donor and recipient operators are kept busy to establish a call. So it may not be considered as an efficient mobile number portability scheme. Relay using location routing number. In this scheme, a location routing number is used to route the call to the correct terminating network. The call flow is shown in Fig. 3. Again, in this method of number portability, all the network elements of originating, donor and

recipient networks are kept busy for the entire duration of call. Further, this approach is susceptible to establishing a trombone call set-up when the originating network is also a recipient network (Fig.4).

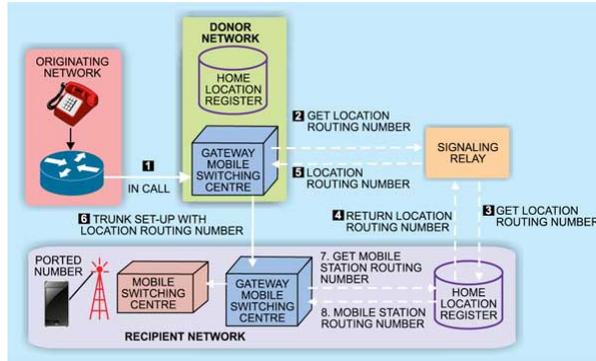


Fig. 3: Signaling relay using LRN

Basically, trombone is where a call originates at a certain point, and follows a path out into the network and back to a destination close to where the call originated. In this way, several networks and their entities are kept busy unnecessarily. So this mobile number portability scheme is not recommended.

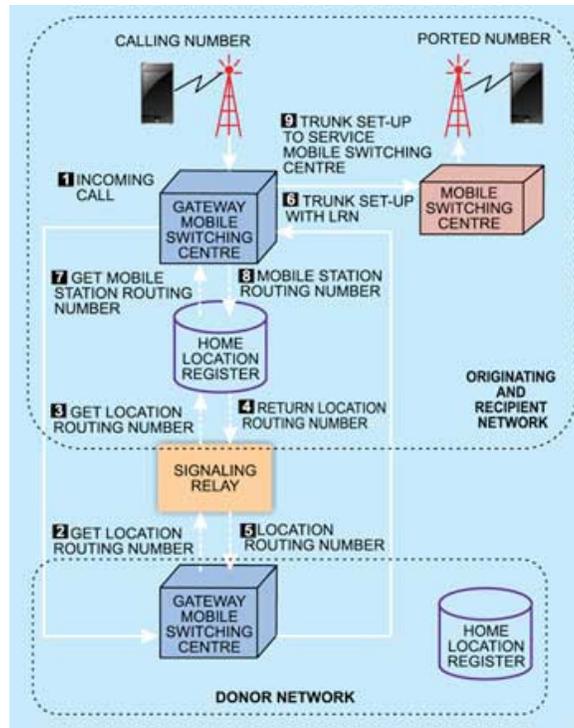


Fig. 4: Tromboning call set-up

All-call-query approach. This is a direct routing scheme that utilizes a centralized ported database. In this scheme, the originating network directly queries the central ported database to determine the routing number required to transfer the call to the recipient operator. After determining the routing number, the call from the originating

network is directly routed to the recipient operator network. In this way, the involvement of donor operator is eliminated.

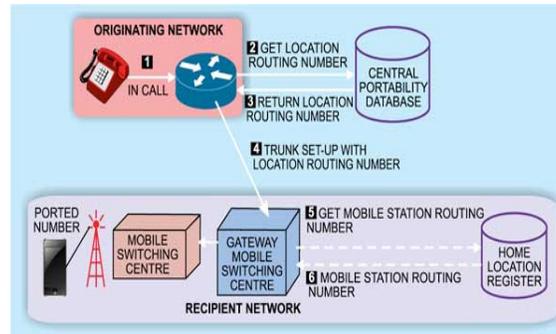


Fig. 5: All-call-query approach for MNP

In this approach, the originating network directly queries a central portability database to get the location routing number in order to route the call to the gateway mobile switching centre of the correct terminating network. Further, the gateway mobile switching centre sets up trunk to the serving mobile switching centre to establish the call (Fig. 5).

The donor network does not take part in the call process and utilizes network resources most efficiently to route a call. Thus this scheme is considered to be the most efficient routing scheme for large interconnected networks and a large number of ported numbers.

IV. MOBILE NUMBER PORTABILITY IN INDIA

On March 8, 2006, the Telecom Regulatory Authority of India (TRAI) issued draft regulations to facilitate mobile number portability in India and submitted its recommendations to the Department of Telecommunication (DoT). Finally, the DoT recommended service provider number portability including service portability (portability between GSM and CDMA) for all mobile service operators. It was decided to implement the all-call-query approach for mobile number portability.

The DoT has divided the whole country into two zones for MNP—north-west zone and south-east zone—and awarded licenses to two vendors to work as MNP clearing house administrators. The north-west zone comprises Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Maharashtra, Punjab, and Rajasthan, UP (East), UP (West), Delhi and Mumbai. The south-east zone comprises Andhra Pradesh, Bihar, Assam, Karnataka, Kerala, Madhya Pradesh, North East, Orissa, Tamil Nadu, West Bengal, and Kolkata. MNP clearing house administrators manage a central mobile number portability database that keeps record of all ported-in and ported-out numbers. Further, the operators also maintain their own MNP database called local number portability database. The originating network will perform number portability database query to get the location routing number to route the call directly to the recipient network. Location routing number is a 4-digit unique number allotted by DoT to all mobile operators for each circle to identify individual networks. All ported number calls are routed on the basis of location routing number. So when the MNP database receives a query for a given mobile station international subscriber directory number (MSISDN), the database returns the MSISDN prefixed with Location routing number. Mobile number portability was started as a pilot project in Haryana on November 25, 2010 and has been implemented across the nation from January 20, 2011. The detailed MNP process is shown in Fig. 6. At present, the only restriction is that mobile number portability is allowed within the same circle (intracircle operators). Recently, the government of India approved New Telecom Policy-2012 (NTP), which aims to abolish roaming charges across the country and facilitate nationwide (inter-circle) mobile number portability, i.e., one-nation-one-number with free roaming. This will allow users to change the operator without changing their mobile number even if they move from one circle to another. DoT has been asked to start nationwide MNP implementation and it is expected that the inter-circle MNP will start very soon.

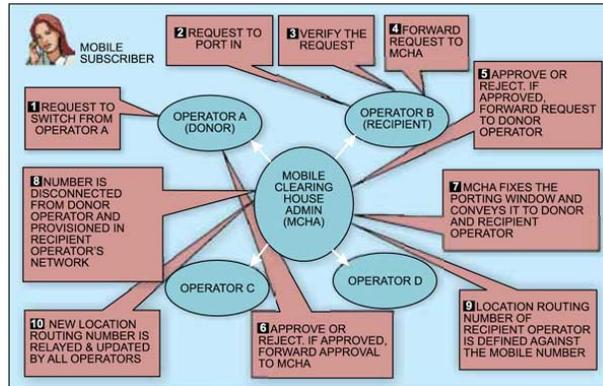


Fig. 6: MNP process

Applicable only for Mobile Numbers: Number Portability is only applicable to Mobile Numbers (GSM & CDMA) not for the Fixed/Land Line Numbers. Applicable only in intra licensed area A mobile subscriber can switch from one service provide to another within the same license area. Portability is applicable only in intra-circle; it is not applicable in inter-circle. Applicable irrespective of Technology: Portability is Possible irrespective of Mobile Technology used by Service Provider. A mobile subscriber can change its operator from CDMA to GSM/UMTS and vice-versa. MNPDB query & Routing Method:

All call query and direct routing method has been chosen for the MNP in India. MNPDB contains all ported in and ported out numbers. Originating network performs MNPDB query for all originating calls and directly routes to Subscription network. MNP Zones and LSA (Circle) LRN based routing: DoT has allocated 4 digits unique routing number called LRN (Location Routing Number) to all Mobile Operators for each circle to identify individual network. Post MNP calls (Voice/Non Voice) will be routed on the basis of LRN. Ported numbers are prefixed with a LRN identifying the new service provider for the number. So when MNP database receives a query for a given MSISDN, the data base will return the MSISDN prefixed with the LRN of the MNO to which it (MSISDN) belongs. MNP database always responds to a query with “LRN+B Number”. In case of Ported Number LRN belongs to new service provider and in case of Non – Ported Number LRN belongs to same service provider. Delhi circle LRN for different operators as follows: India Terminating International Calls/SMS: ILDOs/IGPs are responsible for MNP dip for the International calls and SMS terminating to Indian subscribers. ILDOs/IGPs supposed to be an originating network for the Indian terminating international calls/SMS. ILDOs/IGPs perform MNP dip and route calls/SMS directly to the subscription network.

Table 1: LRN BASED LICENSED COMPANIES IN INDIA

Name of Licensee Company	Service Area	Type of Mobile	Network of LRN Revised
Arcel	Delhi	GSM	2103
Artel	Delhi	GSM	2727
Etisalat	Delhi	GSM	3209
Idea	Delhi	GSM	3066
Loop	Delhi	GSM	3088
MTNL	Delhi	GSM	3106
MTNL	Delhi	CDMA	3108
MTS	Delhi	CDMA	3163
RCOM	Delhi	CDMA	3112
RCOM	Delhi	GSM	3131
Spice	Delhi	GSM	3203
TTSL	Delhi	GSM	3287
TTSL	Delhi	CDMA	3440
Uninor	Delhi	GSM	3497
Videocon	Delhi	GSM	3030
Voda fone	Delhi	GSM	4108

TABLE 2: LSAS AND ZONES FOR MNP SERVICE

MNP ZONES		
S. No.	ZONE 1 – Licensed Service Area	ZONE 2 – Licensed Service Area
1	Gujarat	Andhra Pradesh
2	Haryana	Assam
3	Himachal Pradesh	Bihar
4	Jammu & Kashmir	Karnataka
5	Maharashtra	Kerala
6	Punjab	Madhya Pradesh
7	Rajasthan	North East
8	Uttar Pradesh (E)	Orissa
9	Uttar Pradesh (W)	Tamil Nadu including Chennai
10	Delhi	West Bengal
11	Mumbai	Kolkata

V. NETWORK ARCHITECTURE FOR MNP

Network architecture for MNP is shown in Fig. 7. The network is deployed in a redundant and synchronized way in two different geographical areas—one as a production site and the other as a disaster recovery site—to avoid interruption in service due to failure of one site.

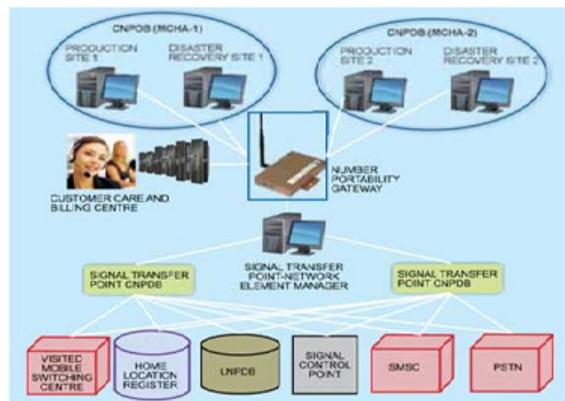


Fig. 7: Network architecture for MNP

Depending upon the requirement and network topology, the service provider can either directly connect to the central number portability database (CNPDB) or deploy separate local number portability database (LNPDB) and connect it to the CNPDB through its number portability gateway. The CNPDB and LNPDB should be synchronized. When a call is originated, the visited mobile switching centre interrogates an internal (LNPDB) or external database (CNPDB) to get the location routing number of the correct terminating network. The CNPDB can be integrated with the signaling transfer point and accessed via an application programming interface locally, or a query can be made to

a remote CNPDB through number portability gateway using protocols like simple object access protocol and extensible markup language. Here MNP translations are performed by the signaling transfer points.

The signaling transfer point receives the location routing number query from the visited mobile switching centre and routes it to the appropriate signal control point.

The signal control point is a high-transaction-oriented server that receives number portability requests from the visited mobile switching centre and passes on the mobile station routing number information to the gateway mobile switching centre handling the call. The gateway mobile switching centre then routes the call to the currently serving visited mobile switching centre of the recipient operator.

VI. CONCLUSION

To implement number portability, the best solution is to implement the centralized system, maintain a common number porting database, and use the All Call Query (ACQ) call routing scheme to route the calls to a ported number. A trusted 3rd party, which typically reports to the telecom regulatory authority, can maintain the centralized number porting database. The number portability gives freedom to subscriber to choose best service provider. Also service provider has to be competitive to attract the customer. This will encourage competition among the service providers, and in turn will reduce the tariff. From subscribers point of view it reduces cost, time and money. From service providers point of view specific network maintenance activities need to be done to ensure proper operation of the number portability service over time.

REFERENCES

- [1] Yi-Bing Lin, "Mobile Number Portability", IEEE – Network
- [2] Young Sic Jeong, Whan Woo Kim, "The Realization of Mobile Number Portability in Korea", IEEE –Network
- [3] Jonathan Rosenberg, Henning Schulzrinne, "Internet Telephony Gateway Location", INFOCOM '98, Seventeenth Annual Joint Conference of the IEEE Computer and Communications Societies. Proceedings, IEEE, Volume 2, March 29 – April 2, 1998, pp. 488-496
- [3] Rajeev Ranjan Kumar, Amrita Singh, A. Damodaram, "Phone Number Portability in GSM networks", CSI Vol. 32, Issue-7, Oct.2008.
- [4] Telecommunication N/W Management – Haojin Wang
- [5] <http://www.mobilein.com/MNP.htm>
- [6] <http://previewcareers.aricent.com/in/whitepapers/mobile-services/mnp.pdf>
- [7] http://www.stockmarketsreview.com/news/mobile_number_portability_in_india_20090626