Mobile Number Portability in INDIA

Ashish Siwach
Assistant Professor
Electronics & Inst. Deptt.
TIT&S, Bhiwani, India

Shweta Khullar
Research Scholar
ECE Deptt.
Lingaya's Uni., Fdb, India

ABSTRACT
After a prolonged deliberation, the Mobile Number Portability has been tabled on the Indian Telecom space and it is set to liberalize the final frontiers of competition in the Telephony space. Subscribers have been unwillingly tied on to service providers irrespective of deteriorating service standards, thanks to locked in number series per provider. Now MNP is going to change that all for good. This paper explains the underlying MNP technology and its impact to the telephony ecosystem. This paper introduces the concept of number portability, explains its different types and benefits, and the technical, operational, and economic issues that might arise out of its implementation in India. The specific issues such as ensuring tariff transparency, the National Numbering Plan, and regulating porting charges, etc. have been raised and will need careful consideration. 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

General Terms
Number portability

Keywords
Number portability, mobile, IMSI, MSISDN

1. INTRODUCTION
The much awaited MNP (Mobile Number Portability) finally launched on 20th Jan 2011 in India, empowering mobile phone consumers to change service provider conveniently. Mobile Number Portability (MNP) allows the mobile subscribers to retain the existing mobile phone number when the subscriber switches from one access service provider (Operator) to another irrespective of mobile technology or from one technology to another of the same or any other access service provider, in a licensed service area. Mobile Number portability (MNP) enables mobile subscribers to change their service providers or their location without having to change their existing phone numbers. If the subscribers are not satisfied with the services of their service provider, they can change their service provider while retaining the existing phone number. 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.

2. SERVICE REQUIREMENTS
2.1 Regulatory
Before Number Portability can be implemented in a network, there either has to be a general requirement for introduction of Number Portability from the national regulator or a mutual agreement has to be made between network operators and service provider
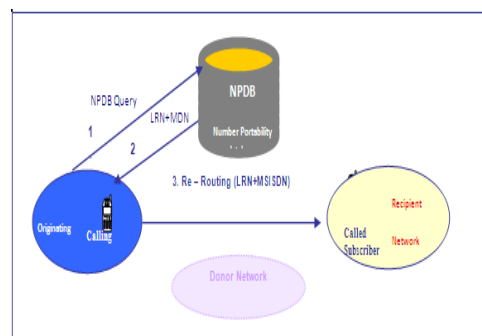
2.2 Trai Guidelines

1) TRAI has recommended mobile to mobile Number Portability within the service area (License Circle) only. The MNP is mandatory for mobile operators of India.

2) Subscriber shall approach recipient with a porting request & the Recipient shall approach the Donor for porting process completion via Central clearing house (CCH).

3) TRAI recommended Porting Mechanism is a 'Break before Make' (Subscriber service shall be deactivated by the donor operator first & then activated by the Recipient operator) & Porting Duration shall not exceed 3 business days, with a service 'break Period' of less than 2 Hrs.

4) TRAI proposed to play an announcement to the calling party during 'No Service period' stating that called party under porting process. The 'No Service Period' is the time period during which subscriber services are not activated in the recipient end however his services at donor operator network are terminated. As per the SLA, this period should not be more than 2 hrs.

5) In respect of porting charges, only recipient operator shall permit to charge a fee for porting.

6) Donor shall not use the ported-out number (Unless Subscriber Chooses to Surrender) & ported number shall be reverted back to the Original Number Range Holder once surrendered by the subscriber. CCH shall govern this activity.

7) The recommended solution for the routing of call is All Call Query (ACQ) by switch based on direct routing without the involvement of donor network.

8) Licensor shall provide unique location routing number (LRN) to enable routing to ported number. LRN is a 4 digit uniquely identify the operator, circle & technology as well.

9) Regarding calls from fixed network to Mobile network, fixed operators, are required to perform MNP query before terminating the call.

10) MNP solution has a Central (common for all operators) & an Operator Part (Specific to Operator). Central zone is divided into two zones – North-west & South-east. SYNIVERSE is the MCH provider in the North-West Zone & MITS will serve the South-East Zone.

11) All Mobile Operators are required to connect with both the MCHs via a Number portability gateway.

2.3 Connection to the number database

Generally for Number Portability, there is a need either for a central reference number database (CRDB) or a system of networked databases (similar to the model of HLRs and VLRs in mobile networks). Normally the national regulator or a consortium of national operators decides which of these solutions shall be used in a country. So far, directives for Number Portability are not crossing country boundaries. In order to install and implement
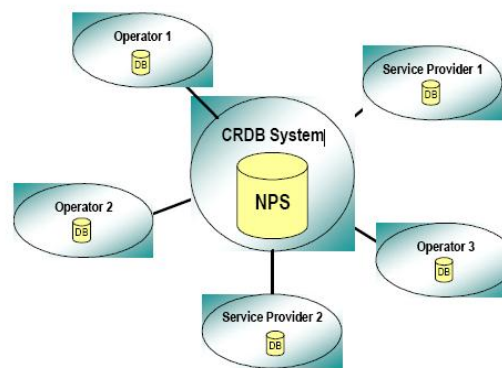

Fig 1: Connection to the number database

Number Portability, the network provider needs an agreement with the provider of the central database and/or the other national operators. This agreement gives access to database updates and the possibility for administrative information exchange with other operators. The incumbent will most likely also offer a solution in each country that other operators and service providers may subscribe to.

2.4 Network Requirements

The switching network needs the ability to route and bill calls to ported numbers based on information stored either directly in the switches or in online databases external to the switch itself, typically some type of IN architecture. A number portability service based on IN makes use of the INAP signaling protocol towards the network provider's switch(es). It is a requirement that the switches have been equipped with Service Switching Functionality from the switch vendor – including the INAP protocol.

3. CALL ROUTING

3.1 Types of Number Portability

The various types of number portability are:-

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

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

3.2 Service Provided Number Portability call routing Schemes

The Internet Engineering Task Force (IETF) has defined four flavors of call routing that support number portability. These schemes are :-
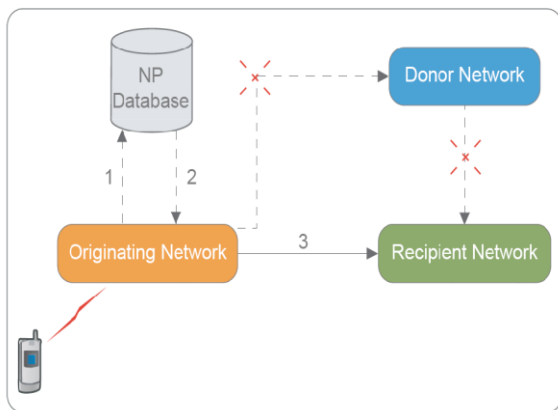
- All Call Query (ACQ)
- Query on Release (QoR)
- Call Dropback.
- Onward Routing (OR)

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(1") from the top of the page and ending with 2.54 cm (1") from the bottom. The right and left margins should be 1.9 cm (.75"). The text should be in two 8.45 cm (3.33") columns with a .83 cm (.33") gutter.

4. ALL CALL QUERY (ACQ).

- The Originating Network receives a call from the caller and sends a query to a centrally administered Number Portability Database (NPDB) also called central database (CDB).
- Network operators generally keep local copies of the CDB, which is hosted on either a network element within their network or a third party network element.
- The NPDB returns the routing information of the dialed number. The Originating Network uses the routing information to route the call to the new serving network.

Illustration1: All-Call-Query Scheme

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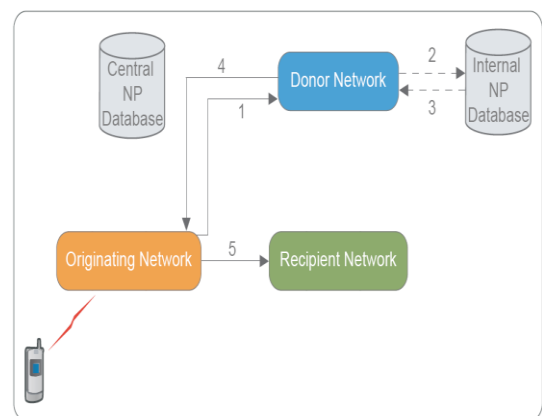
5. QUERY ON RELEASE (QoR).

- The Originating Network receives a call from the caller and routes the call to the donor network.
- The donor network releases the call and indicates that the dialed number has been ported out of that network.
- The Originating Network sends a query to its copy of the centrally administered NPDB. The NPDB returns the routing information of the dialed number.
- The Originating Network uses the routing information to route the call to the new serving network.
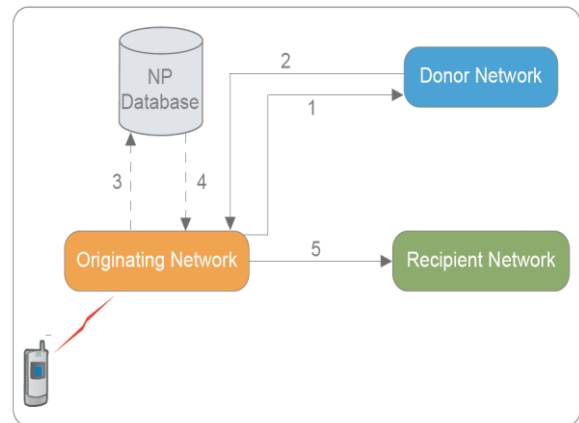
Illustration2: Query-On-Release Scheme

6. CALL DROPBACK

- This scheme is also known as "Return to Pivot (RTP)." The call steps are as follows:-
- The Originating Network receives a call from the caller and routes the call to the donor network.
- The donor network detects that the dialed directory number has been ported out of the donor switch and checks with an internal network-specific NPDB.
- The internal NPDB returns the routing number associated with the dialed directory number.
- The donor network releases the call by providing the routing number.
- The Originating Network uses the routing number to route the call to the new serving network.

Illustration3: Query-On-Release Scheme

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7. ONWARD ROUTING (OR)

- The Originating Network receives a call from the caller and routes the call to the donor network.

- The donor network detects that the dialed directory number has been ported out of the donor switch and checks with an internal network-specific NPDB.

- The internal NPDB returns the routing number associated with the dialed directory number.

- The donor network uses the routing number to route the call to the new serving network. This method of routing calls is also known as Call Forwarding.

8. COMPARISONS OF THE NUMBER PORTABILITY SCHEMES

Out of the four number portability call routing implementations discussed above, the ACQ is the only implementation that does not involve the donor network when routing the call to a new serving network. Thus, the ACQ scheme is the most efficient in terms of using the network resources for routing the call to a ported number. The OR scheme requires to setup two physical calls - one from the originating network to the donor network and the other from the donor network to the new serving network. This increases the usage of network resources and hence is the least efficient in terms of using the network transmission facilities. The QoR and Call Dropback schemes set up calls to the donor network first but release the call back to the originating network that then initiates a new call to the Current Serving Network. In the QoR and Dropback schemes, dedicated signaling circuits are set up between the originating network and the donor network when the originating network sets up the call towards the donor network. This complexity increases the signaling between the networks and hence the cost of the call to a ported number increases.
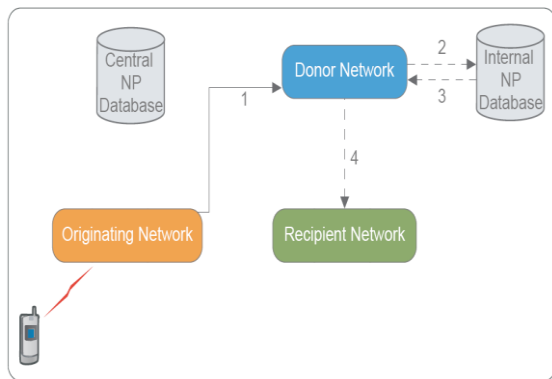

Illustration4: Onward Routing Scheme

9. IMPLEMENTATION

There are two fundamental issues that need to be considered in implementing number portability in a country.

- Number Porting Process: This applies to the policies and processes for porting the numbers.
- Call Routing: This applies to the scheme of routing a call to a ported number.

9.1.1 Number Porting Process

Number porting process involves a set of parties, which includes donor (or current serving SP), recipient (new SP) and many participants (other service providers not related to the number that is being ported). The basic requirement of the porting process is that a subscriber needs to initiate a request to the service provider. The request can be initiated to either of the service providers (current serving SP or the new SP). This depends on the regulatory policies of the country.

There are two approaches by which the number porting database can be maintained and implemented.

- Peer-to-Peer approach.
- Centralized approach

A. Peer-to-Peer approach

In this approach, there is a bilateral agreement between two service providers. The two service providers agree on their implementation of number portability based on proprietary interface. With this non-standard approach, there can be multiple commercial agreements between the service providers, which make it difficult to manage the terms of each agreement, and track the porting requests. This approach is very complex, and the complexity is further increased with increasing number of service providers.
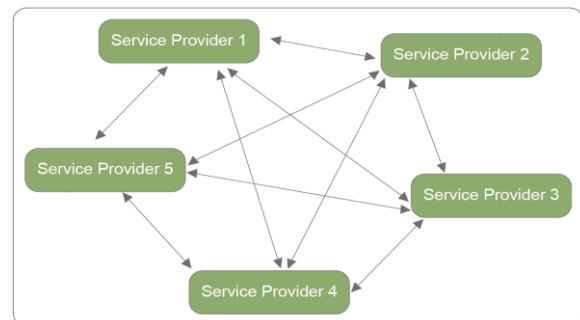

Illustration5: Peer-to-Peer Approach

B. Centralized approach

In this approach, the regulatory authority of the country sets up the guidelines, policies and processes for number portability. All the service providers in the country have a shared and well-defined interface with a centralized NP administration center for processing the porting request of a number. This adheres to a clear set of service level agreements for each of the steps involved in the process and it is mandatory for the service providers to follow them.

Any porting request from any of the service providers is sent to the NP administration center first, to which all the service providers' number portability solutions are integrated with. A request that comes from the new SP to the NP administration center is sent to the present serving SP for clearance and once this is done the central NP administration center broadcasts the porting information to all the service providers in the country. As specified above, the porting request can be initiated by either of the current serving SP or the new SP (recipient). This is decided by the regulatory body of the country.
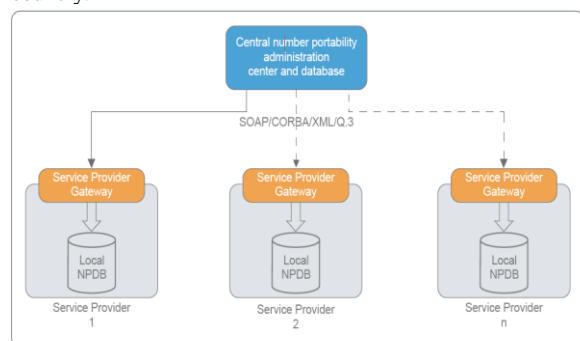

Illustration6: Centralized Approach

10. MPN IN INDIA

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)

Name of Licensee Company	Service Area	Type of Mobile	Network LRN Revised
Aircel	Delhi	GSM	2103
Airtel	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
Vodafone	Delhi	GSM	4108

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.

Below tables represents LSAs and zones for MNP service.

S. No.	ZONE 1 – Licensed Service Area	ZONE 2 – Licensed Service Area
	MNP ZONES	
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	UttarPradesh (E)	Orissa
9	Uttar Pradesh (W)	Tamil Nadu including Chennai
10	Delhi	West Bengal
11	Mumbai	Kolkata

All India MNP Port-in / Port-out Data

DONOR Operator	AIRCEL	AIRTEL	Loop	BSNL	Videocon	Idea Cellular	MTNL	Reliance GSM	Reliance CDMA	STEL	VODAFONE	HFCL GSM	HFCL CDMA	MTS	Etisalat	Tata Tele GSM	Tata Tele CDMA	Uninor	Total
Aircel	0	4197	5	686	16	3281	51	23	2	26	4017	0	0	4	0	1965	34	267	14574
Airtel	7952	0	18	2637	163	18169	98	146	25	29	22374	2	0	158	0	8235	170	794	60970
BSNL	3540	15330	5	0	238	13982	0	103	32	23	21796	1	0	13	1	5786	114	351	61315
HFCL_CDMA	0	92	0	2	0	39	0	0	0	0	41	1	0	0	0	9	3	0	187
HFCL_GSM	0	0	0	3	0	14	0	0	0	0	47	0	0	0	0	8	6	0	78
Idea Cellular	5353	11945	6	2043	172	0	41	128	20	20	17091	5	0	49	0	5609	137	392	43011
Loop	4	93	0	0	0	175	4	3	1	0	162	0	0	1	0	26	0	10	479
MTNL	111	517	10	0	3	470	0	9	1	0	958	0	0	2	0	22	3	14	2120
MTS	179	552	0	50	11	302	11	9	11	1	363	0	0	0	0	336	188	5	2018
Reliance CDMA	1715	5923	11	717	44	4868	40	963	0	15	6171	1	0	14	0	2093	422	267	23264
Reliance GSM	3992	8215	9	2148	104	7246	89	0	89	34	8285	9	0	47	0	4729	158	509	35663
STEL	23	38	0	3	0	16	0	0	0	0	20	0	0	0	0	5	0	2	107
Etisalat	19	52	0	3	0	52	0	1	0	0	41	0	0	0	0	26	1	0	195
Tata Tele CDMA	1726	5422	7	811	78	4835	48	70	116	5	6312	0	1	378	0	6254	0	188	26251
Tata Tele GSM	4645	6679	12	1839	103	6112	28	86	8	12	5358	3	0	21	1	0	111	342	25360
Uninor	534	1119	2	148	3	700	4	13	1	5	995	0	0	0	0	488	14	0	4026
Videocon	1270	1022	2	548	0	706	1	6	2	0	716	0	0	5	1	705	25	5	5014
Vodafone	5587	16044	31	1884	154	14011	93	104	35	11	0	1	0	88	0	5152	187	659	44041
Total	36650	77240	118	13522	1089	74978	508	1664	343	181	94747	23	1	780	3	41448	1573	3805	348673

11. CONCLUSION & BENEFITS

The main advantages of the Number Portability service are: For the Network Provider it makes it possible to offer service subscribers a direct access to their network without need for changing the telephone number giving, More inbound traffic, Higher customer loyalty, Higher company value. Makes way for true competition by making it possible to offer new services also for incoming calls to the service subscribers. Gives the network operator a better view of all traffic related to his customers. Gives the network operator better control over the quality of routing. For the Service Subscriber, Makes it possible to change network provider without changing telephone number. Makes it possible to change geographic location without changing telephone number. Makes it possible to change service mix without changing telephone number. Makes it possible to choose new service providers also for incoming traffic as the same time as preserving the telephone number.

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