TEC
TELECOMMUNICATION ENGINEERING CENTRE

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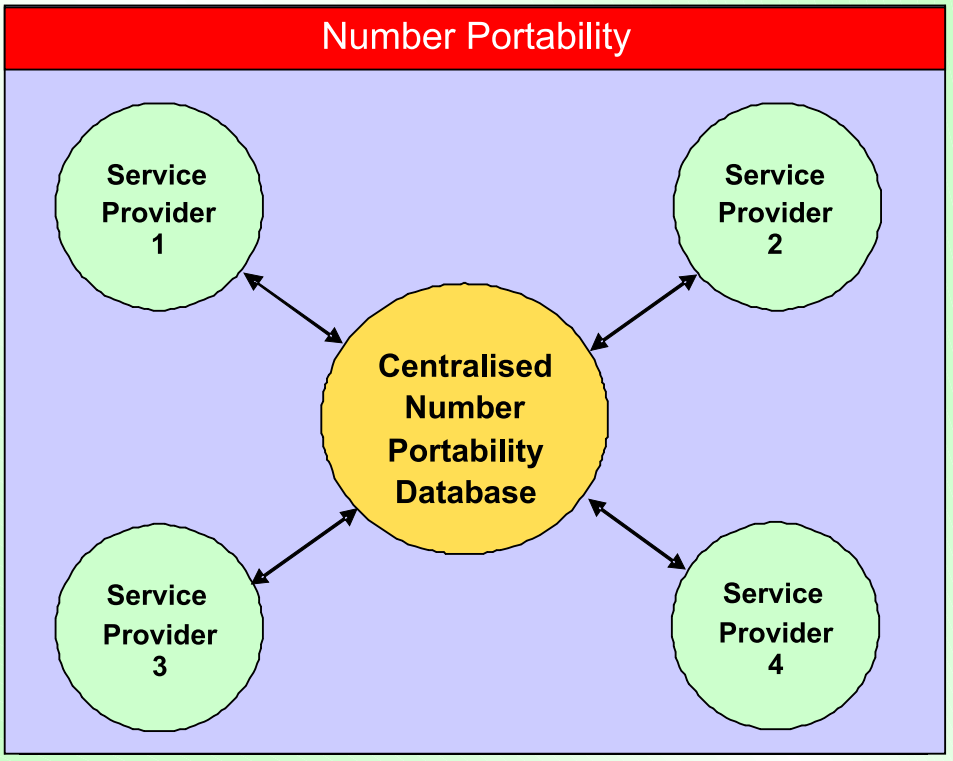

IN THIS ISSUE

Number Portability (NP)

Introduction

Since the invention of telephone by Graham Bell in 1876, incredible technological advances over the years have transformed the world of telecommunications. The Internet and mobile communications have revolutionised the way we communicate, work, play and learn.

Number Portability (NP) is one of the value added services in telecom network which has been introduced in many countries world over. Today NP is essential to maximise the benefits of a competitive telecommunications market. In India, Telecom Regulatory Authority of India (TRAI) has suggested a phased manner implementation of number portability to reduce the cost implications. Government of India has decided to introduce Mobile Number Portability in Phase-I in the four Metros cities i.e. Delhi, Mumbai, Kolkata and Chennai by the fourth quarter of 2008. Introduction of Mobile Number Portability for 'A' circles will be reviewed in April, 2008.

Benefits of Number Portability

- for the porting users, it eliminates the cost of informing others of a number change;
- it eliminates the need for callers to consult directory enquiries and/or change entries in their address books or computer systems;
- It increases competition, with significant benefits for all users, by lowering the cost to users of switching operator or service provider.

Types of Number Portabilities

- **Service Provider Portability:** Service provider portability is the ability of an end user to retain the same directory number when changing from one service provider to another.
- **Location Portability:** Location portability is the ability of an end user of telephone service to retain the same directory number when moving from one physical location to another.
- **Service portability:** Service portability is the ability of an end user of telephone service to retain the same directory number when changing from one type of service to another. (e.g. PSTN to ISDN, or fixed to mobile service).

Terms used in Number Portability

- **Donor Network:** The subscription network from which a number is ported.
- **Originating Network:** The network where the calling party is located.
- **Recipient Network:** The network that receives the ported number and serves it.

Standards

- ITU Recommendations Q.769.1 for CCS7 ISUP and Q1228 for INAP signalling to support number portability for switched circuit network.
- 3GPP TS 23.066, 3rd Generation Partnership Project, Technical Specification for Mobile Number Portability (MNP).

Technical solutions for providing Number Portability

There are two stages involved in number portability.

1. Interception stage: It is the recognition that the call is towards a ported number. It can be performed at:

- donor switch (local exchange where the subscriber line was initially connected before being ported),
- transit switch,
- Originating switch (the switch from which the calling party's call originates).

2. Routing stage: It is the rerouting stage of the call from the intercepting switch to the new terminating switch.

There are various methods for providing number portability in TDM switches, such as

- On-switch solutions based on rerouting of call
- IN solutions which might involve all-call query, query on release, onward routing or call drop back techniques
- SIP-based NGN solution using Number Portability Application Server

On-switch solutions based on rerouting rely on information in the donor local exchange (i.e. the exchange where the subscriber was initially located). On-switch solutions involve call forwarding in the signalling phase, as shown in figure 1.

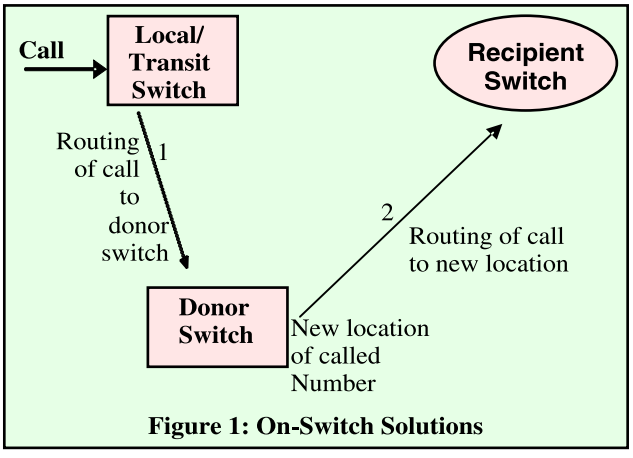

Figure 1: On-Switch Solutions

Advantages of on-switch solutions are:

- redirect has no effect on calls to non-ported numbers, which will comprise the vast majority of calls in the early days of number portability;
- the effects of introduction of redirect on network capacity utilization and operational support systems are more easily understood;
- it is relatively easer and cheaper to implement; and
- unlike call forwarding, it provides for Calling Line Identification.

However, it is generally felt that solutions such as redirect are not long-term solutions, because as the volume of ported numbers rises:

- additional switch capacity may be required as existing switches may suffer loss of performance such as call set-up delays and greater network congestion;
- significant additional transmission capacity may be required
- solutions involving redirection do not easily deal with numbers that are ported more than once.

Intelligent Network (IN) solutions provide the number portability information into one or more external databases that can be accessed by all network switches for query.

All-Call Query: In all call query method for all the outgoing calls, Service Switching Point (SSP) is queried for Number Portability. The Switching Control Point (SCP) sends routing information in case of ported numbers. The routing information points out the location, where the ported directory number belongs and the call is routed accordingly. If the number is not ported, the SCP sends not ported information and the call is put through as normal call.

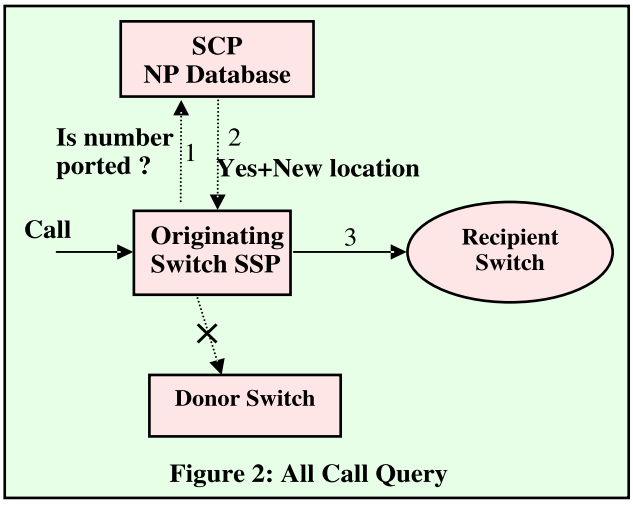

Figure 2: All Call Query

Query on Release (QOR): In this method, when it is detected at the donor switch that the number is ported, the donor network returns a message to the originating network that the number has been ported. The originating network queries the central data base to obtain information about the ported number.

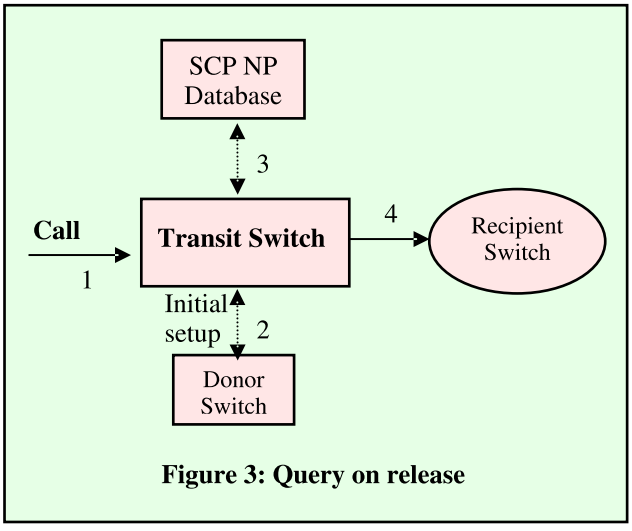

Figure 3: Query on release

Onward Routing

In this method when it is detected that the called number is ported, a query from donor switch is sent to SCP. The SCP gives back routing information of ported number and the call is rerouted from the donor switch.

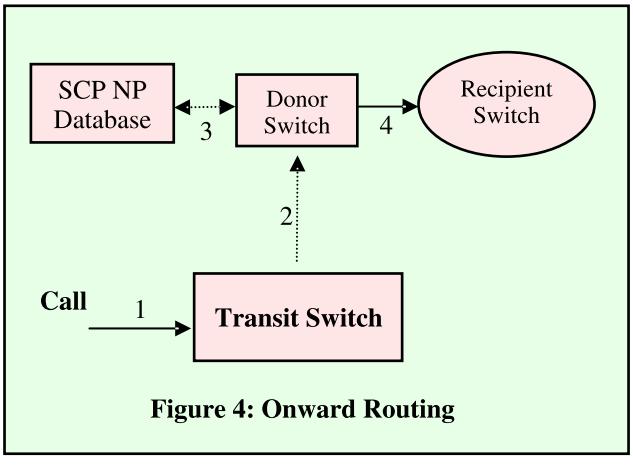

Figure 4: Onward Routing

Call Drop Back

In this method, when it is detected that the called number is ported, a query from donor switch is sent to SCP. The SCP gives back routing information of ported number to donor switch. The donor switch passes the routing information of ported number to transit switch and releases the call back. The transit switch reroutes the call to recipient switch. Drop back function must be deployed in all the local exchanges before any porting can occur.

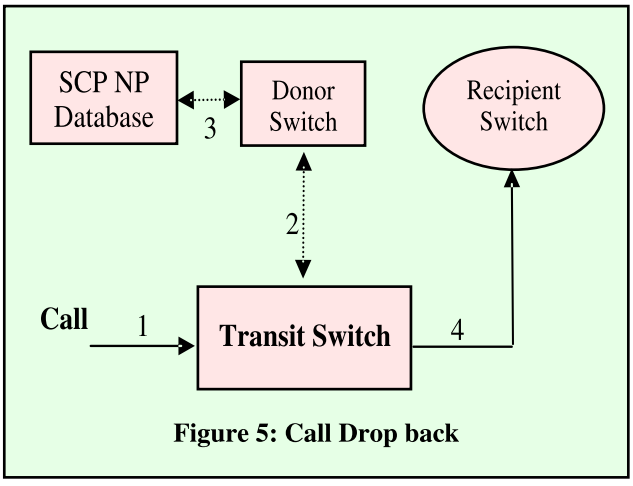

Figure 5: Call Drop back

Comparison between different methods

In the process of routing of call, earlier the database is interrogated; more efficient will be the routing of the call. However, the earlier the database is interrogated; more calls to non-ported numbers are interrogated in the database. Onward routing is often considered the simplest method to implement and all call query as the most complex, with others lying between these two.

The benefits of an IN approach are:

- Provides fully efficient network routing, meaning that minimum network resources are used in the course of the call;
- Ensures no adverse interaction between number portability and other customer features; and
- There is no deterioration in network resources as more numbers are ported.

Disadvantages of IN solution are:

- Requires a major investment in network architecture, including upgrading of local switches and the signalling network while databases need to be installed; and

- The approach affects all calls and would typically create a one-second delay on call set-up.

Mobile Number Portability (MNP)

MNP refers to mobile service operator portability where subscribers are not only allowed to move from one operator to another within the Global System for Mobile communication (GSM) but also from GSM to CDMA (in that case mobile hand set has to be changed). For call related functions the following two solutions are widely accepted:

- IN based solutions;
- Signalling Relay Function (SRF) based solutions.

For non-call-related functions (e.g. SMS), solutions based on SRF have been identified as the most appropriate.

IN based solutions and SRF based solutions differ in terms of network capabilities and equipment to be deployed. SRF based solutions are considered to be simpler to implement compared to the IN solutions. The call handling in the switch does not need to be modified. On the other hand, the use of IN based solutions requires the introduction of new functionality in the switches and some changes to the call handling. This appears to suggest that, at present, IN based solutions would be more costly and complex than SRF solutions. However, IN solutions are considered as long-term solutions.

The database management for MNP can be categorised as centralised database model and distributed database model. The centralised model involves a single reference database containing data for all ported mobile numbers. A consortium of network operators or a third party may manage the centralised database.

Distributed model involves multiple databases containing subsets of total data. Each operator may maintain the ported number database of his own network.

The centralised database solution is perceived as a long-term target solution for number portability. It supports optimal call routing and is adapted to an environment where all operators share number information. However, it is technically much more complicated to implement, as it involves significant investment and requires considerable national coordination. Alternatively, distributed database solutions might need less coordination because every operator will have to handle the information only of his ported-out or ported-in numbers.

SIP-based NGN solution

SIP based NGN solution for number portability uses NP Application Sever which verifies the actual location of the dialled phone number by sending SIP queries to the NP database. It utilizes the returned information to connect the ported subscriber. The Number Portability database contains information for ported numbers.

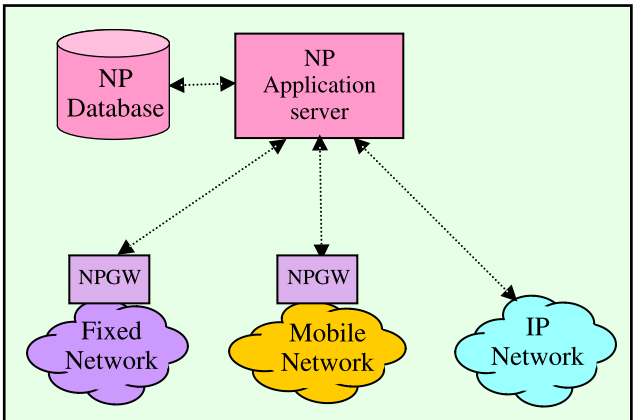

Figure 6: SIP based NGN Solution for Number Portability

Advantages of SIP based NGN solution:

- Easy and cost effective implementation and compliance
- High programmability allows faster responses to constantly changing regulatory mandates
- Seamless number transfers using disparate networks

- Enables efficient transition to a service-rich IMS architecture supporting Number Portability.

Other important issues

There are some other important issues that will greatly affect the implementation of number portability.

Operational aspects: Designing of efficient, simple, secure and practical porting procedures for number portability will involve issues such as the role of retailers, need to change SIM cards or handsets, authentication of customers request for porting, communication arrangements between entities during the porting process, refusal to port, time to port and procedures for porting large quantities of numbers at a given time. These issues must be addressed properly for successful implementation of number portability.

Economic aspects: The success of number portability in telecom network depends on how cost-effective it is to the end users, and the cost burden it imposes on the concerned service operators for its implementation.

The system requires a significant investment from service providers to establish the capacity to provide number portability on their networks and its associated operational support and administration. Administrative costs include the costs incurred by service providers in closing an existing account, setting up a new account and

Coordinating the network operators in switchover of the mobile number and routing of the calls, and costs of new handsets or SIM cards.

National numbering plan: Since the database query returns the routing information in the form of a re-routing number, it is necessary that this re-routing number complies to the National Numbering Plan. Additionally, the National Numbering Plan may need modification after introduction of number portability.

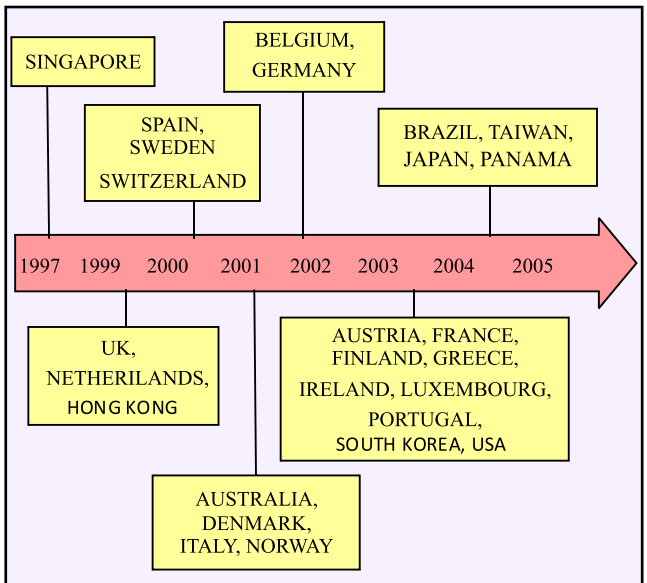

Figure 7: Year of Number portability in various countries

According to TRAI, India is ready to introduce mobile number portability. Subscribers and operators would benefit from the introduction of the number portability system.

All countries, where cost benefit analysis has been done, showed a net benefit from the introduction of number portability. Some might suggest that number portability should be introduced in a more mature market. However, Netherlands introduced number portability when cellular penetration was under 10 per cent.

TRAI has also suggested phased implementation of the system to lessen the cost implications in introducing number portability. The regulator said that Indian mobile networks matched global standards, and therefore, there was no unusual requirement for the implementation of mobile number portability. It, however, recognised that there were technical and financial issues that would have to be addressed

The consultation paper raises a number of issues pertaining to number portability including national numbering plan, interconnection and the impact on value-added services such as SMS and voice mail. The paper explains its different

types, the technical, operational and economic issues and international experiences.

In most service areas in India, subscribers have a choice of operators, however, the subscriber's inability to retain his telephone number when changing operators is an obstacle to competition. Therefore, MNP will benefit subscribers and increase the level of competition, rewarding operators with the best customer service, coverage, and service quality.

Further reading:

- ITU-T Rec. E.164 Supplement 2 Number Portability
- RFC 3482 - Number Portability in the Global Switched Telephone Network (GSTN): An Overview

Compendium on NGN by TEC

Next Generation Network (NGN) is the future of telecom technology where all telecom infrastructures will be IP driven. To ensure that the products and services follow an accepted standard, there must be country specific standardization of products and services at the primary stage itself.

TEC's vision is to leverage its capability as a "Centre of Excellence" in Telecom to position India as a "lead Telecom Knowledge and Manufacturing Hub" of Asia Pacific nations, by driving Telecom Standards, Manufacturing support and Network building skill-sets in the interests of this region and market.

TEC believes that NGN has a vital role to play in the growth of the Indian economy. It recognizes its own role in standardization, tests and certification to make the implementation of NGN a success. In this context TEC has published a compendium of articles on NGN.

The Objective of the Compendium is to focus attention of all NGN stakeholders on issues essential for the success of NGN not only in India but globally.

The topics in compendium are arranged in four parts and serialized in logical sequence so as to facilitate easy access to readers interested in specific topics.

Part I gives an overview of NGN to familiarise the reader with NGN concept, architecture, services, etc. based on the work done by ITU-T Focus Group on NGN. Chapter 1 titled "An overview of NGN", and Chapter 2 titled "Evolution from networks to NGN" are introductory chapters. They also provide links to detailed analysis of the key topics covered subsequently in the document. NGN Functional architecture, Quality of Service (QoS) and Network Security aspects are discussed in different chapters.

Part II contains current initiatives on the NGN front. Initiatives taken by Telecom Regulatory Authority of India (TRAI), Department of Telecom (DoT)/Telecom Engineering Centre (TEC) and Service providers are explained. International Standardisation activities are also presented.

Part III covers roadmap for migration of Indian network to NGN. Technologies, services and other aspects of migration of IP network, PSTN, Mobile network, Migration of IPv4 to IPv6 are discussed in different chapters.

Part IV contains technical papers on various focus areas of NGN. Status of international standards and key issues are highlighted that underline the need to formulate national standards, testing and certification to realise seamlessly interoperable, QoS enabled and secured NGN in the country. Topics in this part include Softswitch, IMS, IPv6, WiMax, Fibre-To-The-Home (FTTH), IPTV, QoS, Fixed-mobile convergence, Rural ICT infrastructure, etc.

It is hoped that this compendium on NGN will be useful to all stakeholders in the field of Telecom and IT.

Compendium on NGN by TEC can be obtained from TEC, K.L. Bhawan, New Delhi.

Important Activities of TEC during December 2007 to February 2008

New GRs/IRs

- IMS TISPAN Architecture
- Wi-Fi Hotspot
- Softswitch for Local and Transit Application
- Element Management System
- SIP Application Server
- Service Description for NGN Subscribers
- Centralized Monitoring System (CMS)

Revised GRs/IRs

- IR for Charge Indicator
- Wireless Local Area Network (WLAN)
- 18 GHz 16x2 Mbps Integrated Digital Microwave Equipment
- Electromagnetic Compatibility for Telecommunication Equipment
- Trunk Media Gateway
- Session Border Controller
- Line Media Gateway
- Interface Requirement of Switching Node with Network-Network-Interface at 2048Kbit/s
- Interface Requirement of Switching Node with Network-Network-Interface at STM-1

Tests and Field trials

- Testing of Juniper Router for IPv6
- Testing of PMRTS at Bangalore

Technical White Papers

- NGN Services
- Migration of PSTN to NGN
- Migration of Softswitch to IMS
- SIP Application Server
- Interconnect Exchanges for NGN
- IMS TISPAN Architecture
- VoIP Phone System
- FMC
- All IP CDMA networks
- Service Delivery Platform (SDP) for NGN

Manufacturers' Forum conducted for

- 13 GHz M/W Radio Manufacturing

Other Activities

- Technical Comments to DoT on PMTTS
- Technical Comments to DoT on proposal of BSNL for setting up gateway using IP Star Satellite
- Technical feedback to VTM cell of DoT regarding bypass of National Long Distance Traffic
- Allotment of ISP codes to M/s VSNL and Vodaphone Essar South Ltd.
- Technical feedback to Ministry of Science and Technology regarding recognition of In-house R&D units of M/s OnMobile Global Ltd. Bangatore

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