



Consultation Paper
on
Mobile Number Migration

Pakistan Telecommunication Authority

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Introduction

- 1.1 For the proliferation of telecommunication services and development of an advanced information society based on a full range of modern telecommunications, multimedia services and expanding electronic business service applications needs to be supported by a range of operational frameworks. One of these frameworks, which operate as an enabler for the information age, relates to numbering and electronic addressing.
- 1.2 Numbers and electronic addresses are necessary resources to facilitate the development of new products and services and to provide the means of accessing them. As necessary resources, they must be made available in a fair, transparent and efficient manner within an acceptable time frame to the relevant users. Plans for the designation, reservation and assignment of numbers and electronic addresses need to be forward looking and to reflect not only current requirements but also to anticipate future requirements brought about by next generation services and market demands.
- 1.3 Plans that reflect outdated technologies and market structures, and attempt to solve problems using old methods and assuming old compromises, cannot facilitate transition to an information society based on an online economy served by advanced electronic services and applications. At best, outdated plans miss the potential opportunity to contribute to national goals; at worst they inhibit that development.
- 1.4 PTA takes the view that the National Numbering Plan (NNP) should provide telecom market in the country with a competitive advantage in the development of communications and multimedia services through clear and forward looking numbering and electronic addressing policies. National Numbering Plan as such is under review in PTA to align the numbering and electronic addressing system with the needs of the day.
- 1.5 With the full liberalization of telecom market in Pakistan cellular mobile sector has witnessed unprecedented growth putting the existing numbering plan under severe constraints leading to allocation of multiple access codes to mobile service providers, discussed in depth in later part of the paper.
- 1.6 Allocation of multiple Network Access Codes (NAC) to various mobile network operators has lead to definition of one network as many times as the number of identification codes, making the data base complex and inconvenient for the customers. Mobilink, the leading mobile operator, is presently operating five network access codes and asking for more. With the expansion of customer base more and more codes will be required by the operators making network management more complex for the operator and the interconnection partners besides creating inconvenience for the customers.
- 1.7 With the present growth rate more and more network access codes being introduced by the service providers makes the dialing plan difficult for the customer to remember. Although with the capability of mobile terminal to retain the number saved for subsequent calling, mobile customer does not need to remember the network access code for making calls still he is stripped of the convenience of

referring the name of his service provider while referring to his mobile number. Multiple access codes of one mobile operator needs multiple definitions in the partner network for interconnection purposes making the database of the interconnect partners all the more complex.

- 1.8 To resolve all these issues and to make the numbering plan forward looking PTA has decided to enhance the Subscriber Number (SN) from seven digits to eight digits. In PTA view the proposed solution will take care of mobile numbering issue for some years to come, saving the customers, service providers and PTA going through the hassle of new network access codes.
- 1.9 With the award of seventy plus licenses in the fixed line sector numbering resource has to be shared by all the licensees as opposed to mobile sector where access code differentiates various service providers while the whole chunk of numbering resource is available to each service provider individually.
- 1.10 Although fixed line sector has not witnessed phenomenal growth, sharing of the numbering resource has brought the numbering plan under strain, particularly in city like Karachi where spare capacity is presently available but not expected to last very long. Such a scenario necessitates review of the numbering plan for fixed line in near future.
- 1.11 Revision of numbering plan will put the service providers and customer in a position where all the service providers, fixed line as well as mobile, will have to modify their office data. Such an exercise translates into allocation of additional material resources, manpower as well as funds, to implement the change besides inconvenience to the customers.
- 1.12 To save the operators the cost of implementation and the telecom users the inconvenience and possible outages PTA plans to bunch the numbering for the fixed line and the mobile sector together and facilitate the operators to implement the change in one go, to take care of numbering issues for some years to come.

This consultation paper contains proposed policies, strategies and planned changes on the subject of numbering for the mobile services followed up with a similar paper on numbering for fixed line sector already circulated for comments from the stakeholders.

National Numbering Plan (NNP) is presently under review at PTA. The numbering for the fixed line and the mobile sector related to voice services, now under review will make part of the NNP as finalized at the conclusion of present public consultations for cellular mobile and fixed line sectors.

A. Need for Numbering Consultation Paper

- 1 This Consultation Paper on migration of Numbering from seven digits to eight digits for cellular mobile and fixed line services was necessitated;

- (a) to resolve the problem of frequent allocation of network access code to various mobile operators to meet the needs arising out of phenomenal growth in the cellular mobile sector
 - (b) to create more capacity in the Numbering Plan to facilitate service providers to expand their customer base without going into the hassle of introducing new access codes
 - (c) to make the dialing plan more customer friendly i.e. one access code for one operator and to prepare the capacity for next ten years and more, both for the mobile and fixed line markets
- 2 In all cases the objective is to ensure that proposed policies, intended developments and planned changes to the current numbering policies and conventions are articulated and made clear. A comprehensive and well considered strategy and policy on numbering will serve as a guide to ensure that the migration is coherent, consistent and holistic in its structure and approach.
- 3 Main purpose in publishing this consultation paper and to conduct this public consultation exercise is;
- (a) to facilitate open debate and to solicit feedback from the stakeholders on the migration from seven digits to eight digit numbering for mobile and fixed line services
 - (b) to provide advance warning of proposed changes planned which affect the fixed and mobile service providers including the customers

B. Time Horizon of the Plan

1. Proposed plan is based on assessment of demand for numbers on a 10 year time frame and will be further discussed in this consultation paper.
2. The options for ensuring adequacy of numbering resource, the basis for priorities and preferred options will be set out in this consultation paper.
3. The relatively long time frame of 10 years has been selected for the time horizon to ensure a certain measure of stability and planning requirements so as to minimize short term or knee jerk measures that may be disruptive and costly to both the end-users and service providers.

C. Review Plan and Revision

1. Notwithstanding the 10 year time frame of the Plan, it is proposed that the Plan be reviewed and amended from time to time, as required by the emergence of new services and the dynamic telecom environment in which it operates.
2. Pakistan Telecommunication Authority is in the process of reviewing the National Numbering Plan as a whole to provide enabling environment for the introduction of

new services in the telecom market in Pakistan which are already facilitating the telecom users in relatively mature markets.

D. Invitation for Public Comments

Comments are invited on

- i) Proposed migration of cellular and mobile numbering plan from seven digits to eight digits**
- ii) Proposed 10 year time frame for the Plan and the scheduled review of the same at intervals of no less than 3 years.**
- iii) Proposal to review the numbering for fixed line sector in tandem with mobile sector**

II. Current Status

- 2.1. Presently, one AMPS and six GSM operators are running cellular mobile operations in Pakistan and five GSM operations in AJK. Four out of five mobile operators in AJK are providing mobile services both in Pakistan and AJK with the same Network Access Code (NAC). There is no implication for access codes however SCO is the only mobile service provider with operations in AJK only, as such has a separate network access code allocated. As such there are seven mobile networks in Pakistan (including AJK) which need separate allocation of network access codes
- 2.2. Seven-digit mobile customer number can theoretically support ten million customers for each mobile operator. However no Subscriber Number (SN) starts with digits 0 and 1 since used for other network services leaving possibility for only eight million customers.
- 2.3. Presently, numbering is allocated in blocks of 10,000 SNs. If a mobile operator launches its service in a new town with small population the block allocated still caters for the provision of 10,000 customers even if only, say 1500 customers are cultivated by the operator. Remaining 8500 SNs cannot be allocated to another town outside the Numbering Plan Area (NPA) where these customers are located, reducing the capacity utilization drastically.
- 2.4. Numbering capacity, as such, is constrained by location based allocation of numbering series for mobile customers to facilitate long distance charging where calls from the fixed line are handed over at the far end.
- 2.5. It is estimated by Ufone, the 2nd largest mobile operator that overall utilization of numbering capacity ranges between 30 to 35% however it is observed that some 60% capacity utilization is possible under the present conditions. With a total capacity of

eight million with seven-digit SN only four to five million customers can be provisioned with one NAC under the present seven-digit numbering plan. The mobile operator needs another network access code to support a customer base exceeding roughly four to five million subscribers.

- 2.6 With near saturation of mobile market in big cities the operators are looking for green fields to cultivate more customers. This kind of market presents lower number of customers against a big chunk of numbering resource allocated in blocks of 10,000. The capacity utilization of numbering resource as such will be further compromised with the increase of customer base.
- 2.7. The observation is supported by ground realities where Mobilink, the leading service provider in cellular mobile sector is managing a customer base of more than 22 Million subscribers with five NAC and asking for more.
- 2.8. Mobilink is not the only operator using more than one NAC most of the mobile operators had to ask for additional NAC to support their customer base.
- 2.9. Allocation of more than one NAC beats the spirit of any numbering plan which is supposed to facilitate the customer in presenting harmony in the numbering resource for him to understand and remember the dialing plan and the call charges etc. More than one NIC makes the plan complex and thus inconvenient for the telecom user..
- 2.10. Handing over a PSTN call to mobile operator at the far end severely affects the utilization of numbering capacity for loss of flexibility where number series has to conform to the location of the customer (home location). The numbers available for allocation to customers in one Numbering Plan Area (NPA) cannot be allocated in another NPA for appropriate charging of the call.
- 2.11. If the Far End handing over regime is replaced with Near End regime the numbering capacity utilization can improve radically. However in such a scenario 100% capacity utilization (not achievable in practice) can support less than eight million customers - -- not enough to hold the existing customer base of the leading mobile operators.
- 2.12 PTA is planning to award licenses for the launch of third generation network. The new licensees in 3G will need separate NAC. Under the existing numbering plan the number of NAC will keep increasing for each mobile operator with the expansion of its customer base. With seven mobile service providers already in operation and most of them with multiple NAC, allocation of new NAC to 3G operators will make the whole plan cumbersome, to say the least, not only for the customer but also for the operators themselves.
- 2.14 Allocation of a specific leading digit in 8digit numbering scheme can differentiate 3G services from 2G for low number of customers expected in the short term in case network access code is reduced from existing 3-digit to 2-digit and subscriber number enhanced to 8 digits. If only existing operators opt for 3G operations, no new access code is required. However in case new operators are granted 3G licenses there are only three spare codes for such an allocation leaving no spare code for future cellular mobile services. The proposal to reduce NAC to two digits with expansion of SN to

eight digits can serve in the short run however such an arrangement can be termed as interim solution at its best with the present allocation of national levels.

- 2.15 PTA is working on the numbering plan for revision such that it caters the needs of the market for at least ten years whereas replacing far end hand over regime with near end regime does not take care of the present requirements. There is no contesting the fact that near end handing over will make the database of LDI operators a lot simpler and routing much easier eliminating all chances of call being handed over by the fixed line operator at far end only to be transported back by the mobile operator to the city of origination on its own network for delivery to its customer presently roaming in that city. However it does not address long term requirements where no spare codes are available for introduction of new technologies and services in mobile sector.
- 2.16 Similarly, 3G solution proposed above can work in the short term leading to another migration exercise in the near future.

Current situation warrants a long term solution of the problem to facilitate unhindered growth of telecommunication sector in the country.

A. Growth of Cellular Mobile Sector in Pakistan

1. Mobile Sector Growth History

There were a total of 34,573,624 mobile customers as of June 2006, following table traces growth of the sector in Pakistan and the graph depicts the whole picture

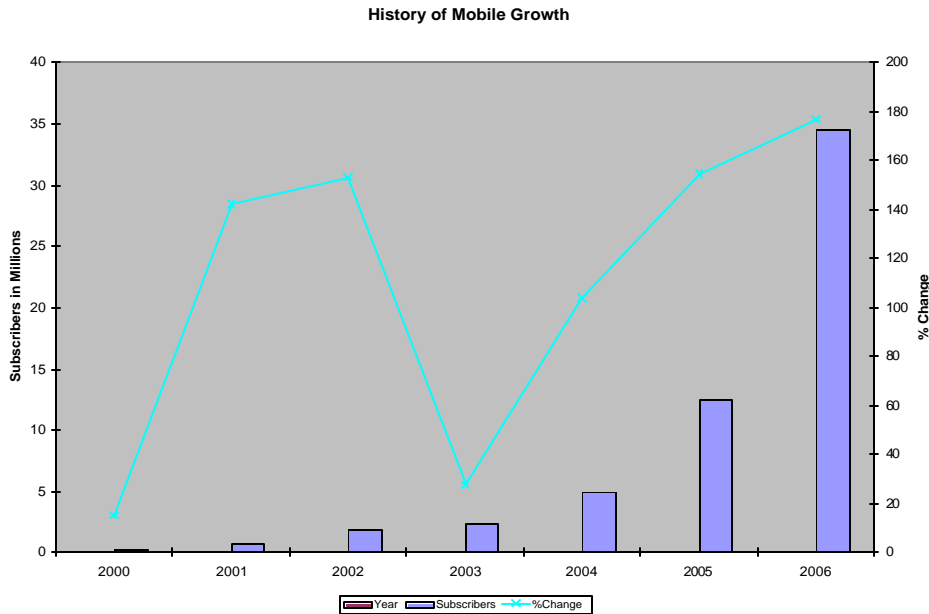


Table 2.1 Growth History of Cellular Mobile in Pakistan

Cellular Mobile Growth History							
Year	2000	2001	2002	2003	2004	2005	2006
Customers (000)	306	742	1880	2404	4903	1248	34573
% Change	15%	142%	153%	27%	103%	154%	176%

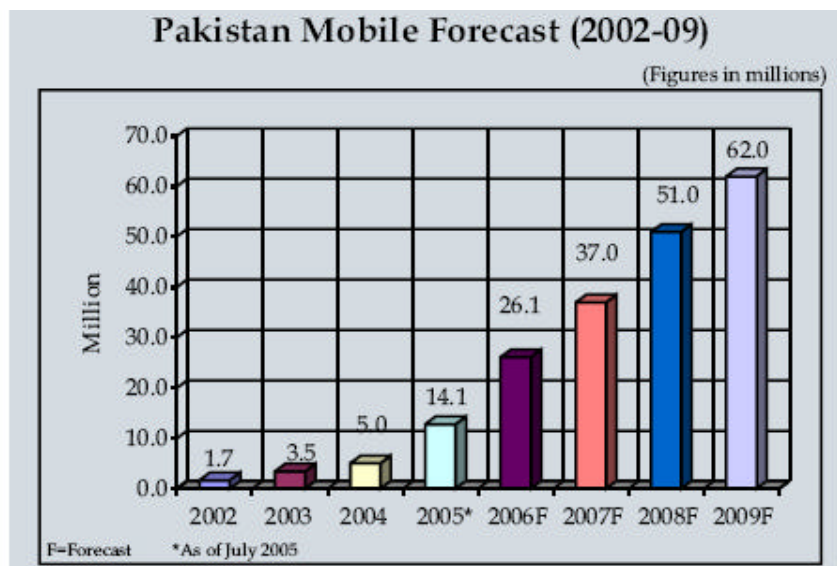
2. Mobile Sector Growth Forecast

The growth path of cellular mobile sector is still on the way up. Previous year was the best for the sector in terms of number of customer added, indicating potential of the market. BMI¹ research had depicted a customer base of 14.1 million at the end of fiscal 2005, an addition of 9.1 million customers however the actual growth was less than the forecast i.e. addition of 7.5 million customers in that year.

Mobile market has outperformed BMI forecast for the fiscal year 2005-06 where 26.1 million subscribers were depicted at the close of the year; a year-on-year increase of 12 million customers whereas the sector grew beyond the expectations and there was an addition of 19 million customers; way ahead of the estimated growth. It is evident from the growth pattern presently followed by the sector that BMI forecast for years ahead comes out as conservative. It is evident that no half measures will serve the market. Numbering capacity needs radical measures to meet the future needs of the sector.

The exhibit below depicts BMI forecast.

¹ Business Monitor International: Pakistan telecom Report Q2 &4, 2005



The forecast depicts a customer base of 62 million by the end of fiscal 2009, only three years from now. The numbering resource needs to be structured to meet market requirements for next ten years at the least, for smooth growth of the sector and the economy as a whole.

B. Existing Mobile Numbering Plan

Presently three digit code is allocated for mobile network identification with 0 as escape code while Subscriber Number (SN) consists of seven digits. With the present arrangement it is possible to allocate 100 network identification codes whereas one such code can provide a theoretical capacity of eight million customers.

Under the existing plan it is theoretically possible to hold a customer base of 800 million customers, enough to take care of 100% mobile penetration. With the existing efficiency of the numbering at 60% with the constraints discussed above the plan can practically hold 500 to 600 million mobile customers.

However with more and more network access codes required by the operator with expanding customer base, the database becomes more and more complex and dialing plan cumbersome for the customer.

1. Existing Structure and Numbering Capacity

Numbering resource has two basic functions

- i) Dialing information
- ii) Charging information

i) Dialing Information

Dialing information consists of two parts, Network Access Code (NAC) and Subscriber Number (SN)

Network Access Code (NAC): (0) 3xx;

0 is escape code for dialing mobile number from PSTN, three stands for the service i.e. cellular mobile service and xx specifies the mobile network. The three digits together make the network access code.

Subscriber Number (SN): Seven Digits (excluding 0&1)

Subscriber Number consists of seven digits i.e xxx xxxx where x can be any number except for the leading digit which can be 29. No SN can start with 1 since it is used within the system i.e. customer services like balance enquiry by the pre-paid customer etc. as well as for emergency public services like fire etc. Similarly 0 is used as an escape code i.e. with one network identification code the customer does not need to dial NAC as such has a possibility to use 0 as escape code thus no SN can start with 0.

With seven-digit scheme one million customers can be allocated directory number against one leading digit, for example 2xx xxxx can hold one million customer similarly 3xx xxxx can hold another million customers and so on as such a maximum of **eight million** SN can be defined against one NAC under this scheme.

Charging Information

For PSTN charging information is available in National Destination Code (NDC) prefixed with the SN. For accessing a PSTN customer in the same NPA with local call charges simple subscriber number needs to be dialed. However to access such a subscriber in another NPA, the calling party has to dial concerned NDC before dialing the directory number thus providing charging information.

Mobile subscriber number does not carry any such information. SN blocks with specific leading digits are therefore created in cellular mobile network for one NPA to facilitate charging long distance calls originating from other NPA from fixed line customers.

One number block created in a specific NPA with spare capacity for further expansion in the area leads to inefficient use of numbering resource reducing the overall resource capacity, substantially. This particular constraint can be resolved if Far End handing over of PSTN calls is replaced with Near End handing over regime. However such an arrangement will not solve even the immediate constraints on the numbering resource whereas PTA plans to resolve the issue for at least ten years.

2. Numbering Resource Allocated

Following table depicts the mobile operators running their operations in Pakistan and AJK and the network identification codes allocated. Customer base presents figures at the end of fiscal year 2005-06 except for SCO where latest figures are depicted.

Table 2.2 Mobile Customer Base with Network Access Codes

S. No	Mobile Operator	Number of Customers ***	Network Identification Code (NIC) already allocated			
1	Instaphone	340,000	320			
2	Paktel AMPS	29343**	303			
3	Paktel GSM	1011,160	304			
4	Mobilink	17,189,978	300	301	302	305 306
5	Ufone	7,487,005	333	334		
6	Telenor	3,653,000	345	346		
7	Warid	4,863,138	321	322		
8	SCO	49700*	335			
	Total	34,623,324	Total NICs used = 14			

*Present customer base ** M/S Paktel plans to wind up AMPS operations in next three months. NIC 303 will thus be spared. *** customer base is depicted as at the end of fiscal year 2004-05.

3. Future Requirements

Existing growth profile in the mobile sector indicates that BMI research had depicted a conservative growth pattern for the year ending June 2006. As against an estimated growth of 12 million in 2005-06 the actual growth was 19 million customers. Further the forecast goes as far as fiscal year 2008-09 whereas numbering plan is intended to serve the market for the next ten years i.e end of fiscal 2015-16. Mobile tele-density was 22.16 with an overall customer base of more than 34 million subscribers at the end of previous fiscal year while the population was 155.4 million.

BMI forecast, however conservative in the face of recent growth in mobile sector can be taken as base line for assessing the market potential for the next ten years. An estimated customer base of 62 million subscribers by June 2009 predicts hundred per cent market growth in the next three years. At an estimated population of 164.4, a customer base of 62 million translates into 37.71 tele-density, an increase of 15.55 %.

Recent trend supports the estimate, market slow down through saturation merits consideration, however there still is a large population, roughly 38%, which remains to be covered by the mobile operators. With cost of communication equipment and services plummeting, handset included, and the economy on the rise, it is safe to assume in the face of mobile take-up worldwide and at home, the market will retain the growth pattern over the next years.

Mobile tele-density has already crossed 100% in many developed markets. In step with the rest of the world mobile market in Pakistan is expected to grow. Population of the country is expected to touch 173.5 million at a growth rate of 1.8% by 2012.. Keeping in view the present trend mobile penetration is expected to grow to around 60% by the end of 2012. The market size with these assumptions will be 104 million customers.

By the end of fiscal 2016 with estimated population 185.6 million (growth rate assumed is 1.7%) and penetration touching 80% the market size would be around 150 million customers. In the light of above assumptions with leading mobile operator holding 40% market share as another assumption, will have to hold around 60 million customers alone.

With above scenario the numbering plan must have the capacity to hold some 70 to 80 million customers for one mobile operator without any constraints. With 8-digit SN each mobile operator will have the capability to hold 50-60 million customers under the far end handing over regime. However this regime is not going to last very long as also the NPA scheme is going to stay in the changing telecom landscape.

It can be assumed very safely that 8-digit numbering will be enough for 80 million customers by 2016 with only one NAC. With three-digit NAC numbering plan one mobile operator will have the capability to hold many more millions with the allocation of additional NAC, if ever required.

Allocation of more than one NAC brings back the existing scenario once more, it appears. However 2nd NIC will be required when the customer base touches eighty million and not on 4-5 million. Further room for any number of 3G networks in parallel with existing networks remains available. New technologies and services with different charging plans can also be introduced with separate NAC.

4. Conclusion

- a) The overall conclusion is that the present numbering arrangement is untenable and does not cater for the immediate requirements of the sector.
- b) In light of the conclusion reached, numbering plan for mobile sector needs immediate review to approach and address issues presently confronting the sector and make it forward looking where it can hold the customer base visualized for the next ten years without running around for interim measures. Further the customer is rid of the problems of so many network access codes to cope with.
- c) It is proposed that mobile subscriber number is changed from 7 digits to 8 digits. The migration will increase the number capacity for each mobile operator ten fold.

The approach to be adopted for migration path is discussed in the next part of this paper.

C. Invitation for Public Comments

Comments are invited on any of the following:

- a) ***the future of public cellular telephony services market and the impact on numbering resource;***
- b) ***the conclusion that mobile numbering plan merits review to make it forward looking and intervention from PTA is warranted; and***
- c) ***the migration to 8 digit numbering plan is the right approach to resolve the issue for the next foreseeable future.***

III. Benchmarking

Following sections examine the mobile numbering plan presently implemented in various countries of the world to benchmark home cellular mobile market for migration from 7-digit to 8-digit subscriber number in line with international best practices.

All the countries with a population of more than 100 million have been selected. The selection criteria brings in the countries with fully developed telecommunication markets as well as the markets recently liberalized as also the markets on the path from liberalization to deregulation of telecom market.

After examining the markets individually, a table summarizes subscriber number length for all the benchmarked countries in one table.

1. **Bangla Desh**

Country Code : 880

Mobile Network Numbering Plan

Network Access Code: 2 digits

Subscriber Number: 8 digits

+ 880 - Network Code - Customer Number

For Example: +880 18 9152 5347

2. **Brazil**

Country Code: 55

Mobile Network Numbering Plan

Network Access Code: 2 Digits

Subscriber Number: 8 digits

+ 55 - Network Code - Customer Number

For Example: +55 XX 4008 1000

Eight digit subscribers number both for fixed and mobile services.

3. China

Country Code: 86

Mobile Network Numbering Plan

Network Access Code: 3 Digits

Subscriber Number: 8 Digits

86 - Network Code - Customer Number

For Example: +86 139 5463 1342

4. India

Country Code: 91

Mobile Network Numbering Plan

PLMN Code: 2 Digits (94)

Subscriber Number: 8 Digits.

+ 91 - Network Code – Customer Number

For Example: +91 94 850 51354

5. Indonesia

Country Code: 62

Mobile Network Numbering Plan

Network Access Code: 3-4 Digits

Subscriber Number: 6-7 Digits

+ 62 - Network Code - Customer Number

For Example: +62 8115 48 1000

6. Japan

Country Code: 81

Mobile Network Numbering Plan

Network Access Code: 2 Digits

Subscriber Number: 8 digits

+ 81 - Network Code - Customer Number

For Example: +81 80 4008 1000

X0 (except 10 and 60) is reserved for non-geographic numbering i.e. 80 & 90 leads to cellular mobile services while 70 leads to Personal Handi-phone System Service. 50 is reserved for IP Telephony.

7. Mexico

Country Code: 52

Mobile Network Numbering Plan

Calling Party Pay Code: 1 Digits

Subscriber Number: 8 digits

+ 52 - Network Code - Customer Number

For Example: +52 1 4008 1000

8. Nigeria

Country Code: 234

Mobile Network Numbering Plan

Network Access Code: 3 Digits

Subscriber Number: 8 digits

+ 234 - Network Code - Customer Number

For Example: +234 80x 4008 1000

9. Pakistan

Country Code: 92

Mobile Network Numbering Plan

Network Access Code: 3 Digits Subscriber Number: 7 digits

+ 92 - Network Code - Customer Number

For Example: +92 3xx 523 1342

10. Russia

Country Code: 7

Mobile Network Numbering Plan

Network Access Code: 3 Digits Subscriber Number: 7 digits

+ 7 - Network Code - Customer Number

For Example: + 7 097 771 8734

11. USA

Country Code: 1

Mobile Network Numbering Plan

Area Code: 3 Digits Network Access Code: 3 Digits Subscriber Number: 5 digits

+ Area Code - Network Code - Customer Number

For Example: + 1 703 862 8897

United States has implemented closed numbering plan. It does not differentiate between fixed line and cellular mobile customer number.

12. Austria

Country Code: 43

Mobile Network Numbering Plan

Network Access Code: 3 Digits Subscriber Number: 10 digits

+ Area Code - Network Code - Customer Number

For Example: + 43 667 77 5463 6634

66X is used for Mobile Access, however 67 & 68 are also allocated to Mobile Service.

Even Bahrain has 8-digits mobile number 36 xxx xxx & 39 xxx xxx

France has a closed NNP

Germany

Country Code: 49

Mobile Network Numbering Plan

Service Code: 2 Digits Subscriber Number:9 digits (Block Code:2 Digits+ Terminal Number

Network Access Code - Customer Number

For Example: + 49 667 77 5463 6634

B. Benchmark Analysis

Numbering Plan of countries with population more than 100 Million (4Q05)

S. No	Country Name	Population (M)	Customer Base (M)	Mobile Penetration	NIC Length (Digits)	SN Length (Digits)	NSN Length (Digits)
1	Bangla Desh	145.68	10.3	7.07	2	8	10
2	Brazil	187.39	86.95	46.4	2	8	10
3	China	1310.63	375.76	28.67	3	8	11
4	India	1090.3	77.63	7.12	2	8	10
5	Indonesia	244.06	41.71	17.09	3	7	10
6	Japan	127.42	90.23	70.81	2	8	10
7	Mexico	106.90	46.62	43.61	2	8	10
8	Nigeria	127.83	18.37	14.37	3	8	11
9	Pakistan	164.06	21.64	13.19	3	7	10
10	Russia	142.58*	126.29	87.40	3	7	10
11	USA	288.36	207.72	72.03	3	7	10

Source: Global Mobile, ITU

Analysis

- 1) Out of 11 countries including Pakistan with a population of more than one hundred million, all countries with open numbering scheme have already migrated to 8-digit subscriber number except Indonesia and Pakistan. United States and Russia are operating under Closed Numbering Scheme where 3-digit network access code is implemented with 7-digit subscriber number.
- 2) All other countries with eight-digit SN have 2-digit network access code. Similar arrangement was recommended in the previous consultation paper. The proposal is workable with the existing number of mobile operators; however only two spare codes are available for future allocation.
- 3) With the proposals to issue 3G licenses in the near future such a migration proposal may come under a stringent test, leading to another migration access, if no spare national level is available for additional cellular mobile network access code to be created.
- 4) US model does not differentiate between fixed line and cellular mobile number. 3-digit network identification code in this case is the NDC. Whole of the eight million subscriber numbers are available to one NPA which includes fixed line as well as mobile customers.
- 5) Australia can be cited as a good example although not falling in the category chosen for benchmarking. With a total population of around **20 Million people** and estimated mobile penetration of 94 % Australian mobile numbering plan supports a National Significant Number (NSN) of **12 digits**. Analogue mobile service has three digit network access code and subscriber number length 9 digits. 14X, 15 and 17X are allocated as NAC (141-143 are allocated to Satellite Telephone Service). Whereas NAC for digital mobile service consists of two digits (4X) and subscriber number length is **10 digits**.
- 6) It may be noted that 100% mobile penetration will mean 20 million mobile customers whereas Pakistan already has a customer base of more than 45 Million (at the end of November 2006) and planning the numbering resource for future. Our present population is more than **155.4 Million**. It may further be noted that Australia has already implemented MNP.

It is evident from the above that migration to 8-digit is the right step to prepare the market for unhindered growth, methodology to implement the migration including the network access code is discussed in subsequent sections.

IV. Issues to be addressed

Enhancement of Numbering Capacity

A. Statement of the issue

From the previous discussion it is evident that mobile numbering plan needs immediate migration from 7 to 8 digit subscriber number. This section will examine the possible approaches to implement the plan and select the best option based on best international regulatory practices and minimum service disruptions and inconvenience to the customer.

The option should serve the sector at least for the next ten years.

B. Possible Solutions

Approaches for Expanding Number Supply

There are three approaches to increase numbering range for cellular mobile operations. Each option is discussed, separately, in the following sections.

1. Closed Numbering Scheme

The first approach of implementing closed numbering scheme consists of allocating 3 digit national destination code with 7-digit number to both the fixed and cellular mobile customer. With such an arrangement each NPA can hold a total of eight million subscribers. The arrangement is very efficient where one NPA can be created from a number of districts sparsely populated while a number of codes can be allocated to thickly populated urban districts.

Small number of subscribers in one NPA increases the efficiency of the numbering plan at the same time possibility of a large number of NPA retains the overall capacity of the numbering plan.

This approach has the **following advantages;**

- a) The length of subscriber number for cellular mobile customer remains the same.
- b) Mobile numbering plan can be merged into fixed line numbering plan.
- c) Numbering resource is utilized very efficiently since the number of NDC is increased ten fold and it is possible to divide the whole country into 800 geographic areas.
- d) The size of the geographic area becomes smaller while one NDC still holds eight million customers.
- e) Numbering capacity is increased ten folds.
- f) Number Portability (both LNP & MNP) becomes simpler for implementation across networks and segments (fixed line and wireless)

Closed numbering approach has the **following disadvantages;**

- a) This is an alien concept to the customer who is used to open numbering scheme since the start of telecommunication in this part of the world.
- b) Number of digits in the NDC increases from existing 2 to 3 digits for fixed line.
- c) Telecom user dials all the ten digits (3 digits for NDC & 7 for SN) in all cases. This is valid for fixed line to fixed line, mobile to mobile or fixed line to mobile or vice versa.
- d) Network identity is lost for fixed and mobile sectors as also the brands of the service providers. All subscriber numbers look alike.
- e) Customer dials ten digits even for local calls within the same network.
- (f) Closed numbering scheme does not favor the network operators since they lose their identity and the proposal will face opposition from the mobile operators. The scheme does not favor the customer either who will lose the network identity and associated charge information.

Due to the more disruptive nature of this approach, closed numbering scheme is not recommended.

2. Addition of a Leading Digit

Second approach adds a leading digit to the existing subscriber number thus increasing the total range of numbers available for assignment ten times while retaining 3-digit network access code. This approach has the **following advantages;**

- (a) The process is adaptable and can be timed to meet specific circumstances such as limited needs for sterilization and urgency factors;
- (b) The transition process to the new number allows a period of adaptation by end-users, through a period of parallel operation of old and new number ranges;
- (c) The process is readily understood, since the principle for converting an existing number into a 'new' one, can be readily explained and applied. End-users with records in the 'old' number format, can easily update them to the amended form
- (d) Subscriber Numbers are not substantially altered in the process; and
- (e) Numbering capacity increases ten fold.

The number addition approach has the **following disadvantages;**

- (a) The process adds an additional digit which increases the incidence of number recording, transcription and dialing errors; and

- (b) The process will typically require approximately 12 months before 'sterilized' old number ranges are available for further assignment (in the new expanded format). In some circumstances this lead time may not be available.

Although the arrangement will result in ample spare capacity even after 3G licensing and future use for customer base expansion as also for new mobile services not yet introduced/conceived. The capacity available can meet the needs of the market for the next ten to twenty years. However central database for Mobile Number Portability (MNP) will have to be modified for all the mobile customers (presently more than 45 million).

In view of the above this approach is not recommended.

3. Change in Network Access Code

Third approach of reducing the network access code from existing 3 to 2-digits and annexing the spared digit to the existing subscriber number subscriber to enhance numbering capacity has **following advantages;**

- (a) Length of National Significant Number NSN does not change. In the existing mobile numbering plan network access code consists of three digits while subscriber number consists of seven digits. Overall length of mobile number remains ten digits (excluding escape code 0). Conversion of network code to two digits renders one digit spare. The spared digit can be annexed to subscriber number thus converting SN from existing seven digits to eight digits keeping the length of NSN same.
- (b) Overall length of mobile number remains ten while the numbering capacity is multiplied by ten. Each mobile operator can thus hold a customer base of roughly **eighty million** with only one network identification code.
- (c) With the implementation of MNP the nature of numbering for cellular mobile changes from open numbering scheme to closed numbering scheme.
- (d) With the closed numbering scheme it is possible to start the subscriber number with '0' as well as '1' creating capacity for another twenty million subscriber numbers while services presently operating within the network can keep working as in the existing arrangement since network access code will make part of the mobile number.
- (e) National level "(0)1" presently being used by the incumbent for international booking and enquiry will be vacated by allocating short codes for the services which can provide unhindered access to these services in all digital environment. The level will be allocated to cellular mobile services creating room for another ten network access codes.
- (f) There is no change in the dialing plan for the bulk of the customers since the digit spared from the network access code will make part of the subscriber number.
- (g) Need for parallel operation of old and new subscriber number is done away with for bulk of the customers.

However this approach has a **following disadvantage;**

- a) It reduces the possibility of NAC from existing **100** to **20** only. However with seven mobile network operators already running their operations and every network having a separate NAC still leaves thirteen spare NAC for allocation against 3G and future mobile services and networks.
- (b) Subscriber number for more than one million customers will change radically i.e. both the network access code as well as subscriber number.

In view of the above advantages PTA has concluded that “Change of existing network access code from 3-digit to 2-digit” is the preferred approach

* Customer Base at the end of November 2006

4. Cost Implications of Number Changes

The expansion of number ranges and the migration process due to the number change will have a significant cost impact on both end-users and service providers and this is true for any migration approach adopted.

In the event the number range is expanded, end-users will have to notify their friends and relatives in the country and abroad regarding change in numbers.

Users of that affected end-user's number in the same numbering area, in other numbering areas and outside Pakistan will have to update to the number. These costs may be classified into 3 types:

- (a) Costs for business end-users;
- (b) Costs for residential end-users; and
- (c) Costs for service providers.

This overview is not intended to set out the quantum of costs which will be incurred in each of the categories of end-users, but instead, it will identify what are the items which will require cost expenditure due to number expansion. Any migration plans will have to take into account the costs highlighted above.

a) Costs for Business Users

Business end-users usually experience the cost impact of number changes most acutely because the changes would require them to make corresponding changes to the following equipment or items:

- (1) Changes in auto-dialing equipment;

- (2) Switchboard equipment;
- (3) Call barring and routing equipment;
- (4) Help line numbers;
- (5) Facsimile machine number identity numbers;
- (6) Programmed numbers stored in the memory of any telephone or facsimile machines;
- (7) Emergency instructions and documentation;
- (8) Stationery, letterheads, invoices, business cards;
- (9) Advertisements, company brochures, product brochures, internal directories, packaging, vehicle delivery signs, company signboards; and
- (10) Overseas contacts and personnel records.

While the above list is not exhaustive, all of the above items would result in direct costs to business end-users. The severity of the cost impact caused by number expansion on business end-users would depend on the size of its operations and the number of its customers and personnel. The migration period from the “old numbers” to the new numbers would inevitably generate some missed calls or facsimiles by the business’s existing and prospective customers and the unnecessary expenditure in time and money for calls which are made by parties who are unaware of the change in that number.

Nevertheless, such costs may be minimized if the number expansion is publicized well ahead of the time it is to take effect and if business users have the time to optimize the inevitable costs by timing the purchase of new material to coincide with the number change. The costs of notifying customers and business partners in publicizing the new numbers are reduced with the growing ubiquity in the usage of e-mail as a mode of communications by businesses.

b) Costs for Residential Users

In comparison with business users, the cost of number changes is substantially lower for residential users. In most cases, the cost of number changes to residential users would involve:

- (a) Updating his personal address books and pre-programmed numbers himself;
- (b) Obtaining the equipment supplier to do update pre-programmed number if the residential user is unable to do it; and
- (c) Notifying his contacts of the change in numbers.

c) Costs for Service Providers

Service providers of the affected end-users have to modify their networks at a local level and in their internal support systems. Service providers will also experience cost expenditure for the items set out below:

- (a) Changes in software;
- (b) Customer information, billing databases and directories; and
- (c) Publicity and advertisement of the new numbers caused by the number expansion.

5. MNP Implications

Number Portability mechanism is reproduced below to examine the impact of number migration from 7-digit to 8-digit SN.

Following description examines the issue

- 1) Mobile network tracks the location of every Mobile Station (MS) provisioned from the system. The location information is stored in two mobile databases, the Home Location Register (HLR) and the Visitor Location Register (VLR). To deliver a call to an MS, the databases are queried for routing information of the MSC where the MS resides. When the calling party dials the MSISDN of a mobile station MS2, the call is routed to the *gateway MSC* (GMSC) of MS2 using the *ISDN user part* (ISUP) initial address message (IAM).
- 2) In turn, the GMSC queries the HLR to obtain the mobile station roaming number (MSRN), the address of the terminating MSC where MS2 resides.
- 3) Based on the MSRN, the IAM message is routed to the destination MSC, and the call is eventually set up. The terminating network (where the MS resides) may be different from its subscription network. Call termination to the MS must be routed to the GMSC at the subscription network due to the following restrictions.
- 4) The GMSC must be in the call path for the provision of special features and services as well as for billing because the originating switch does not have the capability to query the HLR database, which must be done by the GMSC through the *mobile application part* (MAP) C protocol (the protocol between the GMSC and the HLR).
- 5) Different solutions are proposed to support number portability call routing: Indirect Routing, Direct Routing, Call Related and Non Call Related Messages, Intelligent Network (IN) based solutions.
- 6) All solutions utilize the *number portability database* (NPDB) that stores the records of the ported numbers. The record information includes the ported MSISDN (subscriber number of mobile station), the status (active or pending), the time stamps (when the ported number record is created, activated, disconnected, and modified), the NRH mobile operator, the subscription operator, and the routing information which includes several addresses to support applications such as switch-based services (i.e., CLASS), calling card, and short message service.

- 7) All the queries related to number portability are exchanged between the originating network and the *number portability database* over signaling channel in SS7 and call is directly routed to recipient network for connection to the ported mobile customer.
- 8) If one mobile network has migrated to 8-digit SN while the partner network is still working on 7-digit scheme, there is no implication for MNP the way calls from fixed line network are normally routed from metropolitan cities where NDC is 2-digit and SN is 7-digit to small towns where NDC is 3-digit and SN is 6-digit.

With the recommended approach to mobile number enhancement central database for MNP will require minimal changes since the overall subscriber number (NAC+SN) will remain the same for the bulk of the customers. There is no major implication for MNP except modification to a fraction of subscriber numbers.

6. Local Number Portability

Number Portability refers to the ability of subscribers to switch service provider or geographic location without the need to change telephone numbers. The service applies to all telephone numbers including 0800 (toll-free) calls and 0900 premium rate services. Local loop market in Pakistan showed sluggish growth during the first quarter of 2006. Out of 35 companies licensed for local loop services only 3 are operating, almost one year since the start of competition in the local loop segment.

Currently Worldcall Broadband, Worldcall Multimedia and Brain Limited have launched their operations in Karachi and Lahore. There was a net addition of only 26,379 customers in first quarter of 2006. This includes the addition of customers by the incumbent operator as well. Combined customer base of new licenses was only 12333 subscribers.

In view of the market conditions in the fixed line segment the issue of Fixed Number Portability appears too early to deliberate upon.

7. Invitation for Public Comments

Comments are invited on

- a) *the proposed approach for expanding number supply.*
- b) *the proposed migration process for number expansion.*
- c) *the conclusion that 7 -digit to 8 -digit number migrations has no implication for MNP*

V. Implementation Plan

1. Creation of room for additional codes

Under the preferred approach to number capacity enhancement, network access code is reduced to 2 digits with the enhancement of subscriber number from existing 7 to 8 digits. The proposal reduces the possibility of access codes from existing 100 to 10 only. With seven codes allocated and the networks already in operation only three codes are left for further allocation to mobile networks including 3G operations yet to be licensed.

However with the proposal to allocate only two national levels for geographic numbering, already circulated amongst the stakeholders for consultation, following exhibit depicts emerging scenario where three national levels are spared for subsequent allocation to future services besides allocation of an additional national level to cellular mobile operations.

National Level	Existing Geographic Zones	Proposed Geographic Zones
1	PTCL International Booking	Proposed for Cellular Mobile
2	Karachi & South Sind	Sind & Baluchistan
3	Cellular Mobile	Cellular Mobile
4	Mid Punjab	Punjab & NWFP
5	North Punjab & AJK/NA	Reserved
6	South Punjab	Reserved
7	Northern Sind	Reserved
8	Baluchistan & Freephone	Freephone & NNG
9	NWFP & Premier Rate Service	PRS & NNG
0	Escape Code for long distance dialing	No Change

NNG: New Non Geographic Services

Level (0)1 can become available even in the existing NNP by shifting PTCL international booking and inquiry services to other service codes. It was important for PTCL to allocate such numbering to international booking & inquiry when analogue exchanges were in operation. With digital exchanges any service code can route such calls to desired destination.

2. Proposed Network Access Codes

Following table depicts proposed 2 digit access codes for the existing cellular mobile networks.

S.No	Mobile Operator	Number of Customers*	Existing Access Codes	Proposed Access code
1	Instaphone	250,000	320	36
2	Paktel GSM	1,384,534	304	31
3	Mobilink	22,467,680	300 301 302 306	30
4	Ufone	9,559,944	333 334	33
5	Telenor	5,831,215	345 346	34
6	Warid	7,260,747	321 322	32
7	SCO	49700	335	35
	Total	46,803,820	Total NICs used = 13	

3. Implementation of new code

Following table depicts new network access codes along-with subscriber numbers for all the seven networks. It can be seen that there is no change in dialing plan for bulk of the customers.

Implementation of two digit network access code & eight digit subscriber number			
S.No	Operator	Existing mobile number	New mobile number
1	Mobilink	0300 xxx xxxx	030 0xxx xxxx
		0301 xxx xxxx	030 1xxx xxxx

		0302 xxx xxxx	030 2xxx xxxx
		0305 xxx xxxx	030 5xxx xxxx
		0306 xxx xxxx	030 6xxx xxxx
2	Ufone	0333 xxx xxxx	033 3xxx xxxx
		0334 xxx xxxx	033 4xxx xxxx
		0336 xxx xxxx	033 6xxx xxxx
3	Warid	0321 xxx xxxx	032 1xxx xxxx
		0322 xxx xxxx	032 2xxx xxxx
4	Telenor	0345 xxx xxxx	034 5xxx xxxx
		0346 xxx xxxx	034 6xxx xxxx
5	Paktel	0304 xxx xxxx	031 4xxx xxxx
6	Instaphone	0320 xxx xxxx	036 xxxx xxxx
7	SCO	0335 xxx xxxx	035 xxxx xxxx

Where X can be any digit 0-9

It is obvious from above that the migration process is simple in implementation.

Comments are invited on

Proposal to vacate national level (0)1 for allocation to mobile services

Proposal to allocate independent 2-digit network identification code to each mobile network

Proposed implementation Scheme

VI. Migration Process for Number Expansion

To mitigate inconvenience to the customer and minimize the cost impact for the network operators it is imperative that the transition is undertaken in a smooth and well planned manner. Following process will be undertaken unless there are good reasons to depart from the standard:

1. First Stage–Public Notice

This stage involves publicity of impending change of the end-user's existing number by way of mail notification and through advertisements in national dailies of all major languages at least three months prior to the Parallel Operation. Service providers may further undertake specific publicity efforts on their own.

2. Second Stage – Parallel Operation

This stage involves implementing the planned number expansion change annexing the last digit of the network access code to the existing subscriber number as leading digit. Depending on the situation, this stage may not be required for migration plans for most of the customers. Parallel operation should continue for three months for the customers whose number is changed in the process.

3. Third Stage – Recorded Voice Announcements

This stage involves terminating the service on the old numbers and applying recorded announcements when the old numbers are dialed. The recorded announcements should announce the change that has taken place (change announcements) or where this is not possible, the standard number-not-in-service announcement. Subject to any specific circumstances, change announcements should continue for a period of three months.

4. Fourth Stage – Sterilization

This stage involves a period in which the change announcements (if any) are removed and replaced with the number-not-in-service announcement. This stage in this particular numbering capacity enhancement is not applicable since the old numbering range is no more operative and as such does not require any sterilization period.

B. Invitation for Public Comments

Comments are invited on

- a) the proposed approach to migration process for number expansion .*
- b) the proposed time duration proposed for various stages involved .*