



Consultation Paper
on
Fixed Line Number Migration

Pakistan Telecommunication Authority

Table of Contents

I. Introduction	5
A. Need for Numbering Consultation Paper.....	7
B. Time Horizon of the Plan.....	8
C. Invitation for Public Comments.....	9
II. Current Status	10
A. Growth of Fixed Line Sector	11
1. Wireless Local Loop Growth.....	11
2. Overall Fixed Line Growth.....	11
3. Existing Structure and Numbering Capacity	12
4. Numbering Resource Allocated.....	13
5. Future Requirements.....	15
6. IP based Network Implications.....	19
7. Conclusion	22
B. Invitation for Public Comments.....	24
III. Benchmarking	25
1. Bangla Desh.....	25
2. Brazil.....	25
3. China.....	25
4. India	26
5. Indonesia.....	26
6. Japan	26
7. Mexico	26
8. Nigeria	27
9. Pakistan.....	27
10. Russia.....	27
11. USA	28
B. Benchmark Analysis	28
C. Invitation for Public Comments.....	29
IV. Issues to be addressed	29
A. Statement of the issue	29
B. Possible Solutions	31
1. Approaches for Expanding Number Supply.....	32
2. LNP Implications.....	35
3. Cost Implications of Number Changes.....	37
4. Invitation for Public Comments.....	39
V. Migration Process for Number Expansion	40
1. First Stage –Public Notice	40
2. Second Stage – Parallel Operation	40
3. Third Stage – Recorded Voice Announcements.....	40
4. Fourth Stage – Sterilization	40

B. Invitation for Public Comments.....	41
VI. ANNEX-I	41

I. 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 need 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- 1.3 Plans that reflect outdated technologies and market structures, and which attempt to solve problems using old methods and assuming old compromises, cannot facilitate transition to an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 relevant paper already circulated for public consultation.
- 1.6 With the award of fifty-five 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.

- 1.7 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 sector.
- 1.8 Cost effective IP based technologies are leading the way to new services such as IP Telephony, VoB, WiMAX, ENUM etc. Although all these services need IP address for delivery of service to the end user, E.164 number is allocated to each customer for service provision, IP addresses being difficult to remember and the fact that telecommunication users are very familiar with E.164 number for its ubiquitous nature. The system uses IP addresses, hidden from the customer, converts into E.164 number and back into IP address as the situation demands, for end to end delivery of service. The subject is further discussed in detail in other sections of this paper.
- 1.9 Competition with enabling regulatory framework is driving the market and innovative cost effective services are hitting the market with greater frequency. IP is taking over gradually but surely- at least in the core. It is a matter of time when end to end IP based services hit the local market. All new services will require numbering resource.
- 1.10 Present numbering plan cannot withstand the onslaught of numbering demand once all the licensees launch their services. All these operators will need number ranges for allocation to their customers. With thirty-eight licensees in fixed local loop and seventeen licensees in wireless local loop a lot of number ranges are required to be allocated for start of operations. It appears that numbering plan will run out of capacity sooner than the available capacity suggests. It is evident that revision is inevitable.
- 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 intends to bunch the numbering for the fixed line and the mobile sector to-gather 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 fixed line services as a follow up. PTA has recently circulated a similar paper on numbering for cellular mobile segment for public consultation.

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 consultation.

A. Need for Numbering Consultation Paper

Consultation Papers on migration of Numbering from seven to eight digits for cellular mobile and fixed line services were necessitated under the following circumstances:

Telecom Sector, at this point in time, is undergoing transformation from circuit switching to packet switching. New technologies promise cost effective roll out solutions leading the way to cheaper solution for the end user, providing an edge to the operators to launch the services with comparatively small CAPEX and lower operational costs. The scenario presents good business opportunity where operator can offer low cost solutions with innovative services to attract the customers and create a big customer base.

Low telecommunication cost promises to bring large strata of the society into affordability net, presently not subscribing to any telecommunication services merely for cost reasons. New cost effective services will provide impetus to overall tele-density improvement putting the numbering resource under increased pressure.

Consultation papers were 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) 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) 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
- d) enhance numbering plan capacity to create enabling environment for new local loop licensees to share the numbering resource without any constraints.
- e) to create new number ranges for local loop operators to launch distinct innovative countrywide services with special charging plan easily recognized by the customer from the leading digit.
- f) to create resilient numbering resource to accommodate new services and technologies without change in existing numbering arrangement and to create enough spare number ranges for introduction of new services, both geographic and non geographic.

- 2 Telecommunication market in Pakistan is presently going through expansion phase particularly in cellular mobile sector. Local loop sector is waiting in the wings to take off as soon as environments are favorable. This growth phase will be followed by market stabilization when operators will realize that they have

invested more than the market can take. Such a scenario will need more efforts to sell the capacity already installed. That is the time when MVNO and Reseller services will come in. These MVNOs/ Resellers may like to sell the services under their own Brand and thus a separate number range to distinguish their service from original operators, putting more pressure on the numbering resource.

- 3 In both cases the objective of consultation papers 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.
- 4 The main purposes in publishing these papers and to conduct this public consultation exercise are to:
 - (a) facilitate open debate and to solicit public feedback on the migration from seven-digit 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

Historically National Numbering Plans (NNP) were prepared to take care of the numbering resource on the basis of 50 years timeframe. However rapid technological development and gradual migration from circuit switching to packet switching has placed telecommunication sector in a state of flux. It is very difficult to predict upcoming services and technologies with a good measure of certainty

NNP are being revised prematurely by most of the regulators around the world to create room for upcoming technologies and IP based nomadic services. In view of the ground realities;

1. Proposed plan is based on assessment of demand for numbers on a 10 year time frame.
2. The relatively long time frame of 10 years has been selected 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.
3. 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.
4. 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.

C. Invitation for Public Comments

Comments are invited on

- i) Proposed expansion of numbering capacity for fixed line sector***
- 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 implement the numbering migration for fixed line sector in tandem with mobile sector***

II. Current Status

Presently whole country is divided into seven national plan areas and each area allocated a separate geographic number (levels 2, 4, 5, 6, 7, 8 & 9). Geographic number “3” is allocated to cellular mobile services and remaining two levels i.e. “0 & 1” are presently used as escape code for long distance dialing and services respectively. As such all the ten national levels are used and there is no spare level available for new non geographic services except a few part levels i.e. 0400, 0500, 0600 etc. reserved for the purpose.

Following table captures the full picture.

National Level	Geographic Zone
1	PTCL International Booking
2	Karachi & Southern Sind
3	Cellular Mobile
4	Central Punjab
5	Northern Punjab & AJK/NA
6	Southern Punjab
7	Northern Sind
8	Baluchistan
9	NWFP
0	Escape Code for long distance dialing

It is evident from above that a separate level cannot be allocated to new non geographic services while there are **38** licenses in the fixed local loop and **17** licenses in wireless local loop. All these operators will need numbering resource and a distinct number series for proper routing of calls. There is not enough capacity available in the existing numbering plan to take care of fixed line sector alone for a longer period of time.

Enough capacity for new non geographic services is also not available. Experience in IP based services across the globe has shown that low CAPEX with very small operational cost as compared to circuit switching infrastructure has proved very attractive solution for service providers and a lot of small operators have launched their services. These services are equally popular and accepted by the customer for the economy of telecommunication services especially long distance and international communication.

The trend is evident in LDI sector in Pakistan where all the new licensees have installed NGN including the incumbent and the cost of long distance communication has come down drastically. In such environment it can be assumed that there will be a tremendous demand for numbering resource as soon as IP based services make their way in local market existing numbering plan is not ready to meet such a demand on number ranges.

A. Growth of Fixed Line Sector

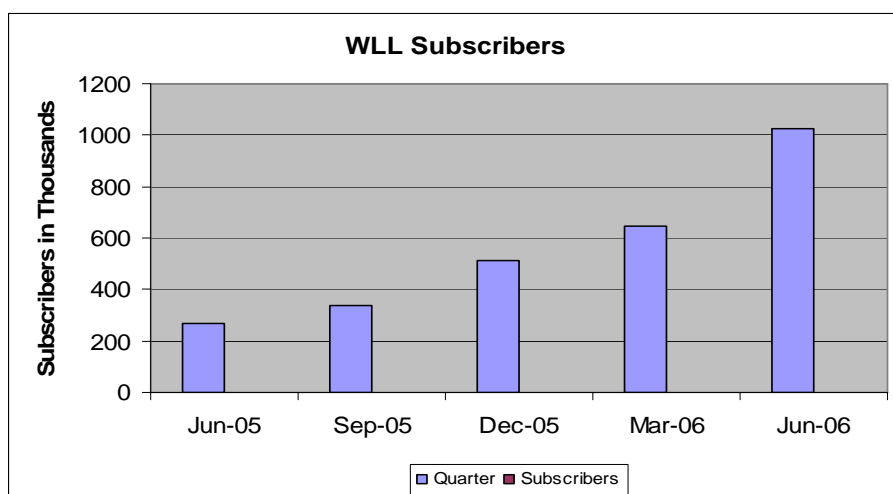
1. Wireless Local Loop Growth

Following graph traces the growth of Wireless Local Loop with the liberalization of Fixed Line market in Pakistan. It is evident that there is a steady growth although not as pronounced as that of cellular mobile segment. Local loop sector which was growing at a steady pace through addition of four to five hundred thousand customers in a year witnessed addition of more than one million customers in the first year of opening of the fixed line sector. This kind of growth is visible despite the fact that only four out of a total of seventeen licensees in wireless local loop segment have launched their services.

Growth in the preceding year was not as good as the previous year but still better than the normal growth witnessed under the monopoly in the sector mainly due to two reasons.

- a) Quite a number of local loop licensees have positioned themselves for launch of services through introduction of new technologies such as WiMAX, learning from the CDMA (WLL) experience which has not impressed the customer for the charges and the internet speeds offered.
- b) Spectrum charges for WLL are too high including the licensing cost for the spectrum putting the licensees under financial constraints. New technologies are expected to use the cost effective spectrum making the business viable with better internet speeds.

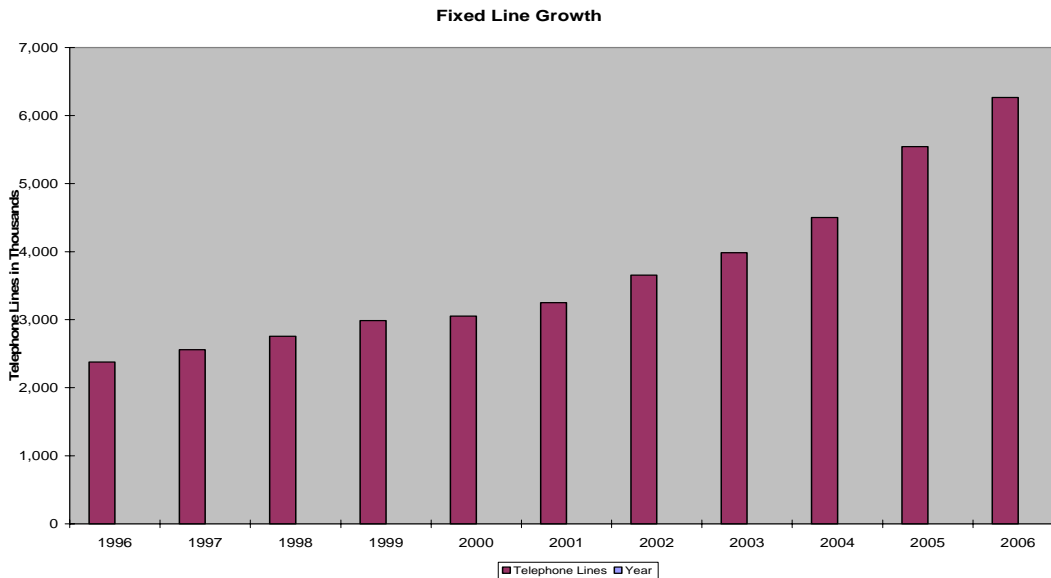
Following graph traces the growth of WLL sector in the preceding year.



Local loop market, it can safely be assumed, will take off with cost effective spectrum and associated high speeds internet browsing possibilities.

2. Overall Fixed Line Growth

Following graph traces the history of land line growth in Pakistan. It appears that the growth is picking up with the introduction of new market players in the segment through liberalization of the



sector. Although most of the new operators have not yet launched their services mere opening of the sector coupled with cautious service launch by a few new licensees have worked as a catalyst for the growth of the sector. Competition in the fixed line sector as such has not yet hit the market place. The growth will pick up when a host of local loop operators launch their services and the real competition sets in.

The new operators in a quest to allure the customers bring the costs down with introduction of innovative services. Lower costs will bring large strata of society in the affordability range fueling the demand further- the phenomena witnessed in the mobile sector.

3. 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, National Destination Code (NDC) and Subscriber Number (SN)

National Destination Code (NDC);

Whole country is divided into seven geographic areas; each such area is called National Plan Area (NPA) and a separate 2-digit code allotted to each area. Such a code is called National Destination Code (NDC).

A national plan area can further be subdivided into ten codes for allocation to smaller geographic areas. In such a case NDC is extended to 3 digits, however the length of subscriber number is reduced to 6 digits while length of National Significant Number remains the same. The numbering resource can be deployed more efficiently through sub division.

0 is escape code for dialing long distance and cellular mobile number from PSTN.

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 2-9. No SN can start with 1 since it is used as leading digit for short codes, carrier select codes and emergency public services like fire, police etc. Similarly 0 is used as escape code from local dialing.

With seven-digit scheme one million customers can be allocated directory number against one leading digit. A maximum of **eight million** SN can be defined against one NDC under this scheme.

Charging Information

For fixed line numbering plan charging information is available in National Destination Code (NDC) preceding the Subscriber Number (SN). For access to a fixed line 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.

4. Numbering Resource Allocated.

With the existing numbering structure where two digit NDC and seven digit Subscriber Number constitute a full geographic number, one NDC can hold a maximum of 10 million geographic numbers.

However all of these numbers cannot be allocated to the customers since digit “0” is used as escape code for long distance dialing and digit “1” is used for emergency & customer services as such no subscriber number can start with these leading digits, leaving eight digits to play with.

Again digit 3 is used for cellular mobile service and as such cannot make part of geographic numbers leaving 7 digits in all. With seven digit subscriber number and seven national levels maximum geographic number capacity which can be realized is 56 million geographic numbers.

a) Countrywide Numbering Capacity Availabbe

Present allocation of various levels

Overall Capacity of Present Numbering Plan	
Number of National Plan Areas	7 NPAs
Subscriber Number Length	7 Digits
Number Capacity of Each NPA	10 Million
Effective Capacity for each NPA	8 Million
Countrywide Number Capacity	56* Million

* Maximum utilization ranges between 35 to 50%

With the present arrangement i.e. 2 digit NDC and 7 digit SN a maximum of 56 million geographic numbers are available for nationwide allocation.

Spare subscriber numbers available in one geographic area cannot be allocated to another geographic area, the scheme is inherently inefficient. On the average maximum utilization of the numbering plan at national level varies from 35 to 50%.

Karachi city with one area code i.e. (0)21 can hold a maximum of eight million customers. Level 9 is allocated to NTC leaving seven levels for allocation to all the local loop operators in Karachi city, including the incumbent operator. With present population of more than ten million and wire-line customers more than 1.5 million already in service, only two levels i.e. level “7” &”8” are available for allocation to all the WLL operators including PTCL for wireless operations in Karachi city. It is evident that present numbering resource will run out of capacity as soon as all the Twenty-one local loop operators (FLL=12 & WLL=9) launch their services.

Upcoming technologies and services are another fact which cannot be ignored. IP Telephony, WiMAX and other IP based offerings need E.164 number to give a face to the service. With a number of operators starting their services separate number ranges will have to be allocated rendering the numbering resource more inefficient leading to revision sooner than later.

Following table displays spare numbering capacity available for fixed line sector in Karachi city. Each level can hold a maximum of one million customers, theoretically. Directory number blocks are issued in a block of ten thousand numbers. Numbering block size has been reduced to five thousand for allocation to WLL operators.

While the subdivision of a block has no routing implications for remote line unit, subdivision of a block for allocation to two main exchanges (MSU) or network operators presents call routing problems, although possible. Directory number blocks as such should not be sub divided, although it leads to inefficient use of the numbering resource.

Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (0) 21 (available directoty number blocks)										Spare Blocks
	1	2	3	4	5	6	7	8	9	0	
1	Emergency Services, Carrier Selection Codes, short codes etc.										0
2	10	2	8	2	2	6	2	5	10	10	57
3	Reserved for Migration to 8-digit numbering (as leading digit)										0
4	6	10	10	6	0	3	7	5	1	8	47
5	8	7	3	10	10	4	10	0	10	1	63
6	10	10	2	9	10	0	5	6	0	10	62
7	7	8	7	10	10	10	10	10	10	9	84
8	10	0	0	9	10	10	10	10	10	10	79
9	0	0	0	0	0	0	0	0	0	0	0
0	Escape code for mobile and long distance calling										0
Number of Spare 10K Numbering Blocks available for Allocation											392

Details of numbering blocks allocated to various fixed line service providers is laid out in the tables, separate for each level, in the annexure-1 attached with this document.

5. Future Requirements

There is a general perception that land line is being substituted with cellular mobile telephone all over the world. The perception appears correct to some extent as is shown in the table below.

- Substitution of cellular mobile is visible in well matured markets.
- Peculiar local socio-economics conditions in Pakistan coupled with speech quality of the mobile and WLL, customer still opts for wire line telephone; that is, if he has a choice.
- Above is true despite the fact that land line is costlier as compared to mobile connection where customer uses it for incoming calls only, for affordability reasons. It may be assumed true for all the developing countries.
- Huge unmet demand registered with PTCL for land line in urban cities, where all sorts of telecom facilities (Mobile, WLL and Cable TV with telephone) are readily available is witness to above argument.

Following table with data from eleven most populous countries of the world (Population more than 100 Million people) summarizes the tele-densities for the benchmarked countries in fixed line and mobile sector in years 2002, 2003 and 2006 to see extent of

fixed line substitution with mobile i.e. increase in mobile penetration characterized with decrease in fixed line tele-density

Cellular Mobile and Fixed Line Teledensity Trends

S.No	Country Name	Population (Millions)	Fixed Tele-density (2003)	Fixed Tele-density (2004)	Fixed Tele-density (2006)*	Mobile Tele-density (2003)	Mobile Tele-density (2004)	Mobile Tele-density (2006)*
1	Bangla Desh		0.46	0.55	1.2	0.81	1.01	7.8
2	Brazil	176.39	22.32	22.23	26.3	20.06	26.29	47.2
3	China	1221.19	16.69	20.33	27	16.09	20.89	30
4	Indonesia	215.09	3.65	3.94	5.3	5.52	8.74	17.1
5	India	1056.89	3.98	3.97	4.7	1.22	2.47	8.1
6	Japan	127.61	55.83	47.19	45.8	63.65	67.9	70.8
7	Mexico	102.12	14.67	15.99	20.1	25.45	29.47	38.8
8	Nigeria	123.31	0.58	0.72	1.1	1.34	2.55	18
9	Pakistan	149.57	2.5	2.66	4.03	0.85	1.61	22.2
10	Russia	146.41	24.22	25.27	30.3	12.01	24.93	95
11	USA	290.8	64.58	62.94	56.1	48.81	54.58	100

* Projected Tele-density (Economic Affairs PTA)

A comparison of tele-density trend for fixed line and cellular mobile sector reveals that there is an evidence of fixed line substitution through cellular mobile but only for the fully mature telecommunication markets. The markets recently liberalized suffering from low tele-density are slowly but surely picking up the pace in fixed line sector side by side with mobile tele-density.

Following table presents a picture to display the perceived impact of increased mobile penetration on fixed line tele-density in the benchmarked countries.

Fixed Line and Cellular Mobile Teledensity Analysis

Benchmark Analysis- Fixed Line Teledensity				
S.No	Country Name	Fixed Line Penetration	Fixed Line Trend	Mobile Trend
1	Bangla Desh	1.2	Increased	Increased
2	Brazil	26.3	Increased	Increased
3	China	27	Increased	Increased
4	Indonesia	5.3	Increased	Increased
5	India	4.7	Increased	Increased
6	Japan	45.8	Decreased	Increased
7	Mexico	20.1	Increased	Increased
8	Nigeria	1.1	Increased	Increased
9	Pakistan	4.03	Increased	Increased
10	Russia	30.3	Increased	Increased
11	USA	56.1	Decreased	Increased

It is obvious from the table that fixed line tele-density is increasing in tandem with mobile tele-density in nine out of eleven countries. For two countries, it appears mobile is substituting fixed line. For those two countries fixed line tele-density is far ahead of most of the countries i.e. Japan 47.19% and USA 62.94% (2003) as against 4.03% in Pakistan (2006) and around 1% for Bangla Desh & Nigeria.

However if we take a closer look at the following table the last column indicates number of internet users per hundred inhabitants, it is obvious that the internet penetration both in Japan and United States is very high as compared to rest of the benchmarked countries. In fact it is four times the highest penetration in the rest of the countries.

Another factor which is not included in the table is the fact that IP Telephony is widely deployed and used by the customers which is much cheaper and supports many services not possible in circuit switching. The substitution of fixed line, in fact, is not through cellular mobile take up. It is the IP Telephony which is being substituted in place of fixed line connection. Customers moving to broadband can make very cheap voice calls from the same service besides surfing the net and enjoying all other services only possible on the internet.

Voice calls to PSTN and the mobile number are also possible through such a service as is discussed in the following section. Telecommunication user subscribing to VoB also needs E.164 number. The need for additional numbering resource is still there even with the fixed line churn.

S.No	Country Name	Population (Millions)	Fixed Tele-density (2003)	Fixed Tele-density (2004)	Fixed Tele-density (2006)*	Mobile Tele-density (2003)	Mobile Tele-density (2004)	Mobile Tele-density (2006)*	Internet Users per 100 inhabitants (2003)
1	Bangla Desh		0.46	0.55	1.2	0.81	1.01	7.8	0.18
2	Brazil	176.39	22.32	22.23	26.3	20.06	26.29	47.2	10.20
3	China	1221.19	16.69	20.33	27	16.09	20.89	30	6.15
4	Indonesia	215.09	3.65	3.94	5.3	5.52	8.74	17.1	3.76
5	India	1056.89	3.98	3.97	4.7	1.22	2.47	8.1	1.75
6	Japan	127.61	55.83	47.19	45.8	63.65	67.9	70.8	48.27
7	Mexico	102.12	14.67	15.99	20.1	25.45	29.47	38.8	11.96
8	Nigeria	123.31	0.58	0.72	1.1	1.34	2.55	18	0.61
9	Pakistan	149.57	2.5	2.66	4.03	0.85	1.61	22.2	0.80
10	Russia	146.41	24.22	25.27	30.3	12.01	24.93	95	6.83
11	USA	290.8	64.58	62.94	56.1	48.81	54.58	100	55.58

Source: ITU

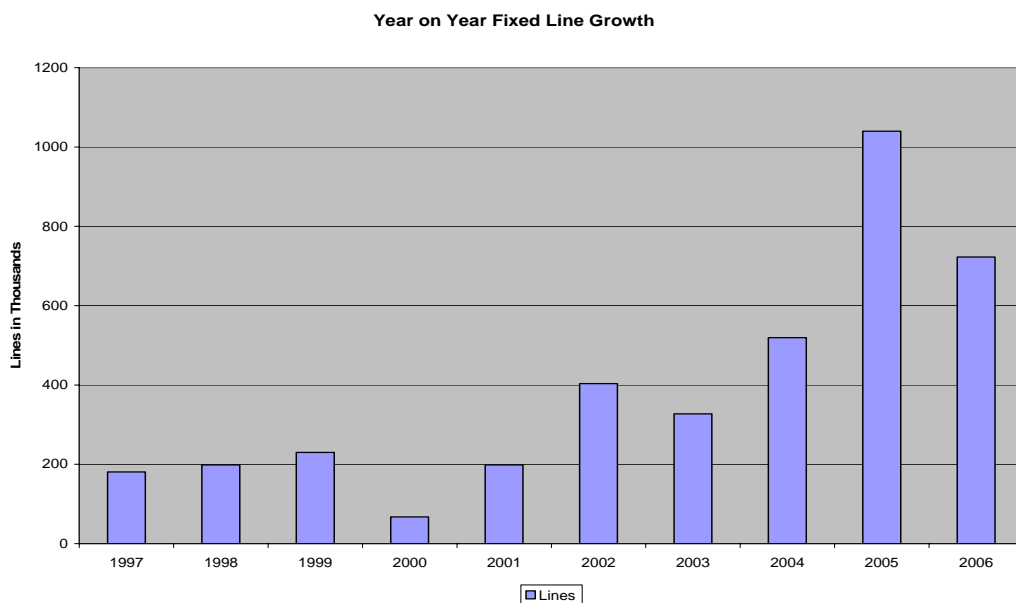
In view of the above discussion it is obvious that with present tele-density at 4.03%, telecom market in Pakistan has a huge growth potential in fixed line sector. The potential needs harnessing through creation of enabling environments. Numbering resource being the most vital part of such enabling conditions needs to have the capacity to cater the needs of the segment for the next 10 to 20 years.

Introduction of new technologies is expected to provide economical deployment solution to the new licensees. Numbering resource with distinct number ranges will help licensees

introduce innovative cost effective service instantly recognized by the customer. All the service solutions need numbering resource hence need for enhancement.

Year on Year Fixed Line Growth History

Following graph traces the history of Year-on-year growth of local loop segment. The growth has picked up after liberalization of the sector however it does not match the market potential mainly due to free availability of mobile connection which is presently cost effective as well. Free availability of local loop connection with higher internet speed and better affordability certainly has the potential to overwhelm the market.



Estimated Fixed Line Growth

- a) Under universal service obligation¹ Government of Pakistan plans to cover 90% of the population by year 2015. With present population growth rate of 1.9% gradually declining to 1.7% in 2016, estimated population will be around 185.6 million². With the present tele-density for fixed line at 4.03 against 155.4 million people and 6.1 million lines ,to maintain present tele-density the number of fixed line customers will be 7.31 million lines against an estimated population of 185.6 million people.
- b) At least one service (Landline, WLL or Mobile) is available at 337 Tehsils³ out of a total of 348 Tehsils. But it does not mean that all these Tehsils are fully

¹ Consultants’ report on Universal Service (MoIT)

² Economic affairs PTA

³ USF Policy

covered, or that service is immediately available to all potential subscribers. Covering all the Tehsil Head Quarters is only the first step in reaching the rural areas. Only 80% of Pakistan's total population has been covered by the fixed line, WLL, and cellular operators jointly while 70% of the rural population⁴ is covered by at least one telecom service provider, and in many areas there is a lack of capacity so even if a subscriber requests service, he may not immediately be satisfied. There is significant unmet listed demand in the areas stated to be covered rural while present tele-density, including fixed, WLL and mobile services, is estimated at about 1%⁵.

- c) It is estimated that access to telecommunications services from their home location is available to only about 40% of the Pakistan population to-day. Government of Pakistan has fixed a goal of providing access to telecommunication services to 95% of population by year end 2015 under Universal Service Access.
- d) Government of Pakistan has set a goal to achieve 5% rural tele-density in fixed line by year 2015 under Universal Service Obligation. Provision of infrastructure in the un-served/under served areas under USF is expected to benefit the surrounding localities in terms of subsidized access thus pushing the costs for service provision within workable limits. This in turn will help provide affordable fixed line services in the area. It will help improve overall tele-density in the country.
- e) It is estimated that the overall tele-density will increase proportionate to the increase in rural tele-density. With present figures of 1% rural and 4% overall tele-density it is reasonable to expect that with rural tele-density improving to 5%, overall tele-density will be around 20% in 2016.
- f) With an estimated population of 185.6 million in 2016 and 20% tele-density the number of fixed line customers will be well over thirty-seven million.

The kind of growth projected above and the introduction of IP based services is going to multiply the need for geographic and non geographic numbers alike. It is obvious that the existing numbering plan will run out of capacity in a couple of years. There is an immediate need to revise national numbering plan to enhance the capacity for geographic as well as non geographic numbering.

Such a capacity enhancement will help meet both the requirements for next ten to twenty years.

6. IP based Network Implications

⁴ Rural areas are defined to include villages and communities of 10,000 persons or less.

⁵ Universal Service Policy (MoIT)

Over the next decade, a host of new technologies are expected to change the way telephone numbers are presently used. Disruptive, as Internet Protocol (IP) based technologies are called by many, in the sense that the number structure as discussed in previous section is not going to hold for some of the services:

- i) transition from Public Switched Telephone Network ('PSTN') to NGN networks, already implemented by many service providers in the core and on its way to implementation for end user (Class 5), means that telephone numbers will no longer be the underlying mechanism by which fixed networks route calls, which implies that policy can focus on numbers as they are seen and used by consumers rather than as part of network infrastructure;
- ii) possible convergence of fixed and mobile communications may erode, over time, the distinction between fixed and mobile networks and between fixed and mobile telephone numbers with the emergence of new service identifiers. Telephone numbers, as such, may not be used by consumers as a means of accessing some new communications services
- iii) availability of new mechanisms for managing service identifiers may change the way different identifiers relate to each other, and their visibility to consumers
- iv) next generation networks are IP-based with the capability to offer a greater range of services than traditional fixed networks, including voice, video and data, all across a single core network.
- v) existing network operators in Pakistan are already migrating their existing PSTN networks to next generation network, to streamline their businesses and reduce operational expenses, as well as to enable the provision of new services not possible over PSTN.
- vi) in parallel with the migration from legacy PSTN to NGN networks, a new class of provider is emerging which delivers voice services over broadband using VOIP technologies, essentially exploiting the increasing uptake of broadband services.
- vii) commercial roll out of standardized WiMAX equipment is eagerly awaited by the local loop operators in Pakistan for deployment if the cost of spectrum makes a sound business case
- viii) IP addresses, rather than telephone numbers, are the underlying network addresses used by NGN and VOIP networks including WiMAX. While the consumer dials a telephone number to make a telephone call his service provider translates this telephone number into an IP address to determine the correct destination of the call which is then carried to the destination in the form of IP data (IP 'packets') which may or may not be converted into TDM for delivery depending upon the called customer.
- ix) key characteristic of both VoIP and NGN networks is that whilst consumers may still be able to use telephone numbers to make calls, these telephone numbers are no longer the mechanism by which calls are physically routed. This means that

there will no longer be an intrinsic linkage between a telephone number and a specific physical location on the network.

- x) this characteristic will, inevitably, erode the traditional relationship between telephone numbers and geography. Historically individual blocks of geographic numbers have tended to be mapped onto individual local exchanges. This has had the effect of underwriting the meaning provided by area codes, and it has also meant that the first two digits of a subscriber number commonly provide additional geographic information (all the residents of a particular village will tend to have similar numbers). This will no longer necessarily be the case.
- xi) erosion of geographic meaning is likely to be accelerated by fixed-mobile convergence. Hybrid telephone services are already being introduced which share some of the attributes of existing fixed and mobile services (e.g., concept of Wireless Office implemented by some operators across the globe). For such services the concept of geography is inevitably weaker than for a traditional fixed service. This trend is likely to continue.
- xii) use of IP addresses rather than telephone numbers for routing purposes also has some more technical implications for numbering policy, for example:
- xiii) the reason that telephone numbers have historically been allocated in large blocks (typically 10,000 numbers per block) is that traditional PSTN networks have difficulty routing numbers with any greater granularity than this. This is due to the limited capacity of legacy PSTN switches. The use of IP addresses to route calls eliminates this constraint, and will permit telephone numbers to be allocated in any block size; and
- xiv) IP addresses are difficult to remember and do not provide any meaning in themselves, they will not normally be visible to consumers. As noted above, it is likely that telephone numbers will continue to be used by consumers wishing to make telephone calls.
- xv) However, NGN and VOIP providers may use a variety of other identifiers to provide other services to consumers, and may even provide voice services using new forms of identifier. Other forms of identifier that are already familiar to consumers include e-mail addresses and World Wide Web addresses, and new identifiers are emerging (Session Initiation Protocol (SIP) identifiers, H.323 identifiers, .tel URIs).
- xvi) new ways will be required to manage the range of identifiers used by NGN and VOIP providers. The IP Multimedia Subsystem (IMS), the Domain Name System (DNS), ENUM and the Universal Communications Identifier (UCI) all include ways to achieve this. The most important of these are probably IMS (a core NGN technology used to manage a variety of data about end users) and ENUM (a directory service used to manage various identifiers associated with a particular user).

- xvii) interestingly, although the role of telephone numbers is expected to change, services such as ENUM illustrate why telephone numbers are likely to have a continuing role. ENUM allows a variety of contact information for an end user (telephone numbers, e-mail addresses, etc.) to be contacted via a single directory entry. The primary means of accessing this directory entry is a telephone number, a decision which exploits the familiarity and ubiquity of such numbers. These attributes of telephone numbers continue to have value despite technological change.

All the above services will need telephone numbers for access to the customer.

7. Conclusion

- i) Authority has concluded that the present numbering arrangement does cater the immediate numbering requirements of Karachi city, while it can meet the numbering requirements for the rest of the country for some years to come.
- ii) Authority is mindful of the fact that a number of services and technologies have recently appeared on the telecom horizon around the world. These services need to be distinct from the conventional services for implementation of a different charging regime by the operators and charging transparency for the customer to make a conscious decision to use the services.
- iii) only a separate numbering range can meet both the requirements of signifying & separating such services from conventional service. There is an immediate need to create a numbering range to be allocated for such services.
- iv) no such spare numbering range is presently available in all the ninety-nine Numbering Plan Areas. For introduction of such services across the country, it is important that a uniform range is defined and reserved for the whole country.
- v) it is important that enough spare numbering resource is available on country-wide basis for future services. With the present pace of development in the telecommunication sector innovative services are hitting the markets with greater frequency. Present numbering plan does not cater such requirements.
- vi) Authority is of the view that customer should not be put to bear the inconvenience of frequent number change. Numbering resource should be structured such that changes brought about for the introduction of new services and system expansions should not impact the existing customers in any way.
- vii) these objectives can be achieved only when the numbering resource has enough capacity to support the expansion in system for a reasonable period of time into future. Present numbering resource, we have seen, may need revision in near future, at least for Karachi city. However numbering change in Karachi will

impact the whole country and all the operators in the country in terms of data base changes to be implemented both in the mobile and fixed line sectors.

- viii) It is therefore important that piecemeal changes spread over a period of time and with regular interval is avoided to save the operators the cost of implementing these changes over and over again and from region to region. Instead a consolidated plan is implemented at one go for the next 10 to 20 years with ample spare capacity to meet the needs of new services and technologies without any change in the numbering already implemented for the existing services.
- ix) Such a plan makes it necessary that the existing numbering with 7-digit subscriber number is replaced with 8-digit subscriber number through addition of one leading digit to the existing subscriber number. The capacity of each NDC is increased ten fold. In the present numbering plan one NDC can hold eight million subscribers at the most since digit 0 & 1 cannot be used as leading digits. 0 is presently used as escape code for long distance and international dialing and will be used as such in the new plan. Further digit 1 will remain the leading digit for services and short codes etc.
- x) With 8-digits for the subscriber number each NDC can hold eighty million customers enough for a city like Karachi for the next twenty years. Only one leading digit i.e. 3 can hold eight million customers under one NDC. By reserving more than one leading digit for Karachi quite a few leading digits can be reserved for future services.
- xi) The Authority is in the process of reviewing National Numbering Plan. Detailed discussion on future services and the leading digits will be dealt with in the NNP since beyond the scope of this consultation paper.

The Authority has a considered opinion that present numbering plan does not have enough numbering capacity to meet requirements of the sector for the next few years

Authority is further convinced that there is not enough capacity available for allocation of numbering to non geographic services only overlay ranges are reserved which cannot stand the initial onslaught of numbering demand with the introduction of end to end IP solutions

Services are not harmonized internationally or within the region. Such a harmonization will benefit foreign visitor who want to use such services.

PTA has come to the conclusion that the present 7-digit subscriber number needs migration to 8-digit subscriber number to create capacity for expansion foreseen in the coming years besides creating capacity for upcoming new services.

It is proposed that

- a) Fixed line subscriber number is changed from 7 digits to 8 digits. The migration will increase the numbering capacity for each numbering plan area ten folds.

- b) It is further proposed that two levels are allocated for geographic numbering such that southern half (Sind & Baluchistan) share one level while Northern half (Punjab & NWFP) share another level sparing five national levels presently used. These levels will be reserved for new non geographic services.
- c) Level “1” presently under use by PTCL for international booking and enquiry should also be vacated by shifting to internationally harmonized service codes being proposed in the National Numbering Plan.
- d) To start with only one range is allocated to fixed line voice services while other ranges are kept in reserve for subsequent use.

From the above discussion it is obvious that;

National Numbering Plan review is warranted which includes number capacity enhancement for next 10-20 years

The approach to be adopted for migration path is discussed in the next part of this paper. Remaining numbering ranges will be allocated to various services and technologies in the National Numbering Plan presently under review at PTA.

B. Invitation for Public Comments

Comments are invited on any of the following:

- a) ***Projected future of fixed line telephony services market and its impact on numbering resource;***
- b) ***Conclusion that fixed line numbering plan merits review to make it forward looking and intervention from PTA is warranted;***
- c) ***Time is ripe for fixed line number migration from 7 digits to 8 digits to resolve the constraints on number ranges for the next ten to twenty years and to create numbering capacity for future services.***
- d) ***Country wide use of one uniform leading digit for fixed line numbering ranges for the existing services and to be followed for future services to give a face to the service for customer to recognize the service and associated charge***

III. Benchmarking

Following sections examine the fixed line numbering plan presently implemented in various countries of the world to benchmark home fixed line market for migration from 7-digit to 8-digit subscriber number in the best possible way .

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

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

1. *Bangla Desh*

Country Code : 880

Fixed Network Numbering Plan

National Destination Code: 1

Subscriber Number: 7 digits

+ 55 - NDC - Customer Number

For Example: + 880 2 989 1242

2. *Brazil*

Country Code: 55

Fixed Network Numbering Plan

National Destination Code: 2 digits

Subscriber Number: 8 digits

+ 55 - NDC - Customer Number

For Example+55 61 2312 2000

3. *China*

Country Code: 86

Fixed Network Numbering Plan

National Destination Code: 2 digits Subscriber Number: 8 digits

+ 86 - NDC - Customer Number

For Example: +86 10 6606 6668

4. India

Country Code: 91

Fixed Network Numbering Plan

National Destination Code: 2 digits Subscriber Number: 8 digits

+ 91 – NDC - Customer Number

For Example: +91 10 6606 6668

5. Indonesia

Country Code: 62

Fixed Network Numbering Plan

National Destination Code: 2 digits Subscriber Number: 8 digits

+ 62 – NDC - Customer Number

For Example: + 62 21 386 9512

6. Japan

Country Code: 81

Fixed Network Numbering Plan

National Destination Code: 1 Digits Subscriber Number: 8 digits

+ 81- NDC - Customer Number

For Example: + 81 3 5253 5863

7. Mexico

Country Code: 52

Fixed Network Numbering Plan

National Destination Code: 2 digits Subscriber Number: 8 digits

+ 52 - NDC - Customer Number

For Example: +52 55 1253 4203

8. Nigeria

Country Code: 234

Fixed Network Numbering Plan

National Destination Code: 1 digit Subscriber Number: 7 digits

+ 234 - NDC - Customer Number

For Example: +234 1 552 0000

9. Pakistan

Country Code: 92

Fixed Network Numbering Plan

National Destination Code: 2 Digits Subscriber Number: 7 digits

+ 92 - NDC - Customer Number

For Example: +92 51 523 1342

10. Russia

Country Code: 7

Fixed Network Numbering Plan

National Destination Code: 3 Digits Subscriber Number: 7 digits

+ 7 - NDC - Customer Number

For Example: + 7 495 771 8426

11. USA

Country Code: 1

Fixed Network Numbering Plan

National Destination Code: 3 digits

Subscriber Number: 7 digits

+ 1 - NDC - 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.

B. Benchmark Analysis

Summary of the benchmarked countries is laid out in the following table.

S.No	Country Name	Population	Teledensity Fixed Line (2006)	NDC	SN	NSN
1	Bangla Desh	135.11	1.2	2-digit	7-digit	9-digit
2	Brazil	176.39	26.3	2-digit	8-digit	10-digit
3	China	1221.19	27	2-digit	8-digit	10-digit
4	Indonesia*	215.09	5.3	2-digit	8-digit	10-digit
5	India	1056.89	4.7	2-digit	8-digit	10-digit
6	Japan	127.61	45.8	1-digit	8-digit	9-digit
7	Mexico	102.12	20.1	2-digit	8-digit	10-digit
8	Nigeria	123.31	1.1	1-digit	7-digit	8-digit
9	Pakistan	155.54	4.03	2-digit	7-digit	9-digit
10	Russia	146.41	30.3	3-digit	7-digit	10-digit
11	USA	290.8	56.1	3-digit	7-digit	10-digit

* Jakarta only

Out of ten countries (eleven with Pakistan) benchmarked five countries have 8-digit subscriber number and have tele-density more than 20% while two other countries with tele-density higher than 20% also have 10-digit NSN, however, in this case 3-digit NDC is deployed with 7-digit subscriber number. (Russia & USA) and Indonesia has variable NSN where subscriber number ranges from five digits to eight digits for various cities. Jakarta has 2 digit NDC and 8 digit SN.

Bangla Desh and Nigeria have a very low tele-density i.e. close to 1

Conclusion

Eight out of ten countries benchmarked have created fixed line numbering capacity to hold a subscriber base of eighty million against one NDC. Five of them with 2 digit NDC and 8 digit SN while the other two countries have created similar capacity with 3 digit NDC and 7 digit SN, however in this case one NDC can hold only eight million customer while the number of NDCs makes up for the capacity comparable to 8 digits SN while Indonesia has such an arrangement for Jakarta alone.

Remaining two countries have fixed line tele-density close to 1%. It is evident that these countries do not need to review their fixed line numbering plan yet.

PTA has concluded that Pakistan should go ahead with the expansion of fixed line numbering capacity. The two concepts (2 digits NDC with 8 digits SN & 3 digits NDC with 7 digits SN) are discussed in detail in following sections.

C. Invitation for Public Comments

Comments are invited on:

- a) **Conclusion drawn that now is the time for fixed line numbering capacity enhancement to relieve pressure on number ranges.**

IV. Issues to be addressed

Following sections examine the issues and solutions thereof:

A. Statement of the issue

From the previous discussion it is evident that fixed line numbering plan needs immediate migration from 7 to 8 digits subscriber number to take care of the impending numbering requirements by the new licensees (55 in all) in the local loop segment who are in the process of network roll out. Most of the new operators will start their operations in metropolitan areas, the real cash cows. Karachi being the financial hub of the country will put strain on the numbering resource in immediate future with twenty-one new operators in the city alone.

Following guidelines laying down parameters for the revision of national numbering plan are generally accepted the world over⁶:

- a) A numbering plan in which the usable geographic space has fallen below one number per person is in danger of exhaustion
- b) When carrying out changes to the numbering plan, it is sensible to increase geographic capacity to at least three usable numbers per person
- c) Countries in which the numbering space available for specially tariffed services is below two numbers per person should consider a major review
- d) A major change should make at least five numbers per person available for specially tariffed services
- e) When fundamentally redesigning a numbering plan, it is reasonable to allow one initial digit for short codes, two for geographic numbering and two for specially tariffed numbering, leaving 5 initial digits free for long term flexibility.

Following table compares each rule with the ground realities to examine the existing national numbering plan for review or otherwise.

Numbering Plan - Guidelines	Present Position
A numbering plan in which the usable geographic space has fallen below one number per person is in danger of exhaustion	Present population of Karachi is 10.1 million with a numbering capacity of 8 million while projected population for 2020 is 21 million . According to this rule existing numbering capacity of Karachi city is less than the existing population.
When carrying out changes to the numbering plan, it is sensible to increase geographic capacity to at least three usable numbers per person	Karachi alone with a population of more than 21 million in 2020 numbering capacity for the city should be 63 million.
Countries in which the numbering space available for specially tariffed services is below two numbers per person should consider a major review	(0)400,500, 600, 700 and have been reserved for non geographic services leading to an overall capacity of 40 million against a projected population of 243.4 million. According to this rule major numbering plan review is warranted.
A major change should make at least five numbers per person available for specially tariffed services	With a projected population of 243.4 million in 2020 new plan will have three number ranges each range capable of holding one billion numbers
When fundamentally redesigning a numbering plan, it is reasonable to allow one initial digit for short codes, two for geographic numbering and two for specially tariffed numbering, leaving 5	All the initial digits are utilized in the present NNP, 0- Escape code, 1-Services, 2- Geographic Number, 3- Mobile, 4 through 7-Geographic Number, 8- Free phone, 9- PRS, Only part ranges are available for non geographic numbering

⁶ ETO capacity Guideline (Antelope Consulting UK)

initial digits free for long term flexibility.

It is evident from the above table that following issues necessitate numbering plan review:

- i) national numbering plan does not have enough capacity to meet future needs of deregulated telecommunication market
- ii) no number ranges are presently available to provide enabling environment for launch of distinct services for customers to make informed choice
- iii) enough number ranges are not available for non geographic services
- iv) service codes are not harmonized internationally or within the region.

B. Possible Solutions

There are more than one issues involved leading to revision of National Numbering Plan. Each issue requires a separate solution. Following solutions are proposed:

- i) enhance numbering capacity with addition of digit in SN
- ii) shift PTCL international booking to services
- iii) allocate two NDCs to four provinces
- iv) vacate other NDCs presently allocated
- v) reserve these NDCs for non geographic services
- vi) harmonize service codes with the rest of the world

Following section will examine the possible approaches to implement the plan and select the best option based on best regulatory practices and minimum service disruptions and inconvenience to the customers

The option selected should serve the sector at least for the next ten to twenty years and meet the needs of the society against projected population of year 2020 as depicted in the following table.

Province-wise Population in Year 2020	
Province	Population
Baluchistan	11,928,178
Sind+Agencies	63,524,308
Punjab	134,039,618
NWFP+FATA	33,996,631
Total	243,488,735

Population of Sind and Baluchistan together is projected at 75.452 million while that of Punjab and NWFP is estimated at 168.03 million. Addition of a leading digit will enhance numbering capacity ten fold. One NDC will hold 80 million geographic numbers while one national level will hold 800 million numbers thus enhancing the capacity to cater the needs for 10 to 20 years.

1. Approaches for Expanding Number Supply

There are three approaches to increase number ranges. All the options are discussed in the following sections, separately.

a) Subdivision of NDC

First approach of subdivision of NDC leads to allocation of two separate NDCs to Karachi city i.e. Karachi is divided into two geographic areas with each of the geographic area having a separate national area code. Allocation of two NDCs has **following advantage;**

Length of National Significant Number (NSN) does not change. In the existing fixed line numbering plan national destination code consists of two digits while subscriber number consists of seven digits. Overall length of fixed line number remains nine digits (excluding escape code 0). There is no change in NSN while the numbering capacity of Karachi city is doubled. Numbering capacity is thus enhanced to take as many more customers as already in service leaving room for more.

However this approach has following **disadvantages;**

- a) Telephone users in multi exchange area of Karachi city will have to dial all the digits including NDC for access to another telephone number in the same city unlike present arrangement where only subscriber number needs to be dialed leaving the NDC out. This arrangement may lead to customer inconvenience with chances of wrong dialing.
- b) All the telephone numbers will have to be defined with the new NDC, generating as much work for various operators as for actual conversion of existing 7-digit to 8-digit.

- c) Short codes and such other numbering resource (being reviewed in National Numbering Plan) will remain under pressure and may lead to another revision in near future.
- d) The enhanced capacity is available only in Karachi city. Numbering capacity for the rest of the country remains unchanged. The solution as such can at best be described as interim and may not hold for a period of ten years.
- e) No numbering range is created for new services as discussed earlier.

b) Closed Numbering Scheme

Second approach is migration to closed numbering scheme (US model) as against the present open numbering scheme. This scheme has **following advantages;**

- a) The length of subscriber number 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 NDCs 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 can still hold eight million customers.
- e) Numbering capacity will be 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 will be 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 will increase from existing 2 to 3 digits.
- c) Telecom user will have to dial all the ten digits (3 digits for NDC & 7 for SN) in all cases whether this is a call within the same NPA or otherwise. This will be applicable for fixed line to fixed line, mobile to mobile or fixed line to mobile or vice versa.
- d) Network identity will be lost for fixed and mobile sectors as also the brands of the service providers. All subscriber numbers will be alike.
- e) Customer will have to dial ten digits even for local calls within the same network.

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.

Closed numbering scheme, therefore is not recommended.

c) Addition of a Leading Digit

Third approach is addition of a leading digit to the existing subscriber number, migrating from existing 7-digit to 8-digits subscriber number for whole of the country.

. 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; and
- d) Subscriber Numbers are not substantially altered in the process.
- e) Numbering capacity will increase ten fold.
- f) Out of a total of ten possible digits one or two digits can be allocated for fixed line voice service while remaining possibilities of leading digit can be reserved for new services. The plan thus can take care of numbering requirements for quite some years to come, saving the operators the effort and the resources involved. At the same time saving the customer the trouble and possible outages.

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 18 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.

The arrangement will result in ample spare capacity after meeting immediate numbering requirements leaving enough capacity for new services. The capacity thus made available can meet the needs of the market for the next ten to twenty years.

Geographic Code	Allocation	Capacity
1	Non Geographic Numbering	1 Billion
2	Sind & Baluchistan	800 Million
3	Mobile (with one access code)	80 Million
4	Punjab & NWFP	800 Million
5	Non Geographic Numbering	1 Billion
6	Non Geographic Numbering	1 Billion
7	Non Geographic Numbering	1 Billion
8	Free Phone Service	1 Billion
9	Premier Rate Services	1 Billion
0	International escape code	

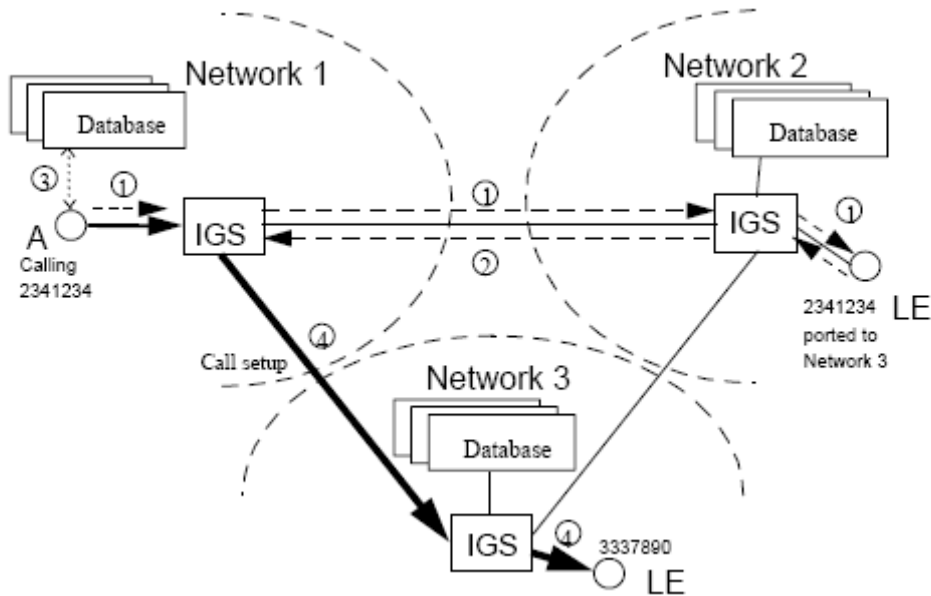
PTA has concluded that “Addition of a leading digit in the subscriber number” is the preferred approach

2. LNP Implications

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.

A few local loop network operators have recently launched their services and have a small customer base. PTCL with major share of the local loop market does not have a credible partner for number portability. Local Number Portability, under the present market conditions, appears too early to deliberate upon. However, a call scenario for a ported number is depicted through a drawing to display that number migration from 7 digits to 8 digits has no implications for local number portability.

- a) When caller A dials 2341234, network 2 will send the cause value to Network 1 to indicate that the number has been ported out. Network 1 then query the Database and obtained the routing number 333 7890 and route it to Network 3.
- b) All messages between network 1 and 2 are exchanged on SS-7 and finally the call is routed to the recipient network directly. With a centralized data base every POI will exchange messages with the database and route the call direct to the recipient network for a ported number and to the dialed number (network) if a negative query is returned by the central database.

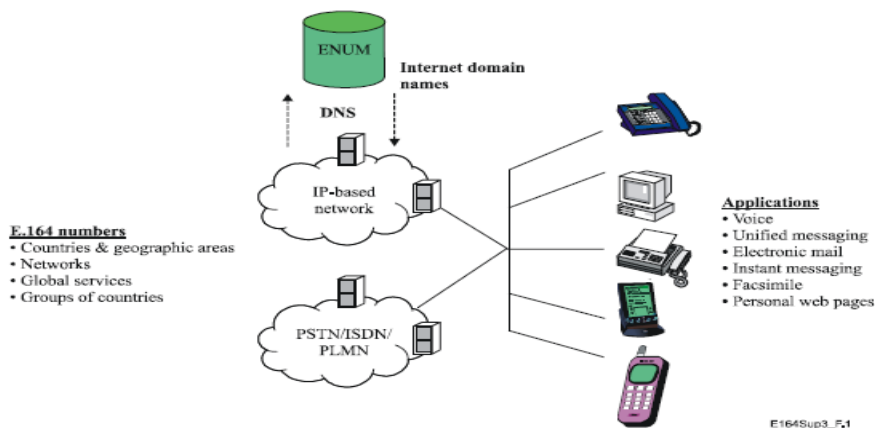


Number Portability in IP Environment

ENUM allows a variety of contact information for an end user (telephone numbers, e-mail addresses, etc.) to be contacted via a single directory entry. The primary means of accessing this directory entry is a telephone number, a decision which exploits the familiarity and ubiquity of such numbers. These attributes of telephone numbers continue to have value despite technological change.

With packet switching taking over from circuit switching call routing will be based on IP address as against telephone number blurring the geographic location of the customer as also the telephone number assigned. Number portability (MNP as well as LNP) may acquire an entirely different meaning with the evolution of technology.

Following drawing demonstrates how ENUM enabled customer can enjoy number portability through ENUM provisioning for any of its telecom facilities.



It is obvious that numbering migration has no implications for LNP even in IP based environment.

3. 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 would 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 would have to update to that new 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.

4. Invitation for Public Comments

Comments are invited on

- a) *proposed approach for numbering migration through retention of 2 digit NDC with increase of SN from existing 7 digits to 8 digits.*
- c) *the conclusion that 7-digit to 8-digit number migrations has no implications for LNP*

V. Migration Process for Number Expansion

In the interest of consumer confidence, a smooth transition to a planned number expansion and to minimize the cost impact highlighted earlier, migration plans for number expansion to adopt the following process unless there are good reasons to depart from the standard:

1. First Stage –Public Notice

This stage involves the publicity of the impending change of the end-user’s existing Subscriber Number by way of mail notification and through advertisements in national dailies of all major languages at least 3 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 by means of the addition of a leading digit or by merger of existing number ranges. Depending on the situation, this stage may not be possible for migration plans adopting the number merger approach. Parallel operation should continue for 6 months.

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 6 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. The old number range will be reserved and not be assigned even if the old number range has undergone a change in its number structure. The duration of this stage will be ascertained by many factors, including the scarcity of appropriate numbers, the need to re-assign the range in question, the extent of the number restructuring and the extent of prior use of the old number range.

A variation can be achieved by modifying the above preferred process by deleting or contracting one or more stages. Typically, the contraction will affect the first stage (parallel operation) or the third stage (sterilization). As noted, contracting the sterilization stage may not have adverse consequences, particularly if the old number range was little used or the extent of change in the new number structure is minimal. Deleting or contracting the parallel operation stage may be necessary if spare digits are not available for the purpose

B. Invitation for Public Comments

Comments are invited on

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

VI. ANNEX-I

This annexure hosts the factual allocation of 10 K numbering blocks allocated to various Fixed Line service providers. Wireless Local Loop (WLL) has been treated as part of the fixed line segment, as practiced the world over.

Blocks of 10,000 Subscriber Numbers

S.			Spare Blocks
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No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 2)										(10 K)
		1	2	3	4	5	6	7	8	9	0	
1	20											10
2	21											10
3	22	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L			PTC L	2
4	23	PTC L				PTC L						8
5	24	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L			PTC L	2
6	25	PTC L	PTC L	PTC L	PTC L		PTC L	PTC L	PTC L	PTC L		2
7	26	PTC L	PTC L	PTC L						PTC L		6
8	27		PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L		2
9	28	PTC L	PTC L			PTC L	PTC L			PTC L		5
10	29											10

Blocks of 10,000 Subscriber Numbers

S. No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 3)										Spare Blocks (10 K)
		VACANT										
		1	2	3	4	5	6	7	8	9	0	
1	30											0
2	31											0

3	32											0
4	33											0
5	34											0
6	35											0
7	36											0
8	37											0
9	38											0
10	39											0

Blocks of 10,000 Subscriber Numbers

S. No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 4)										Spare Blocks (10 K)	
		1	2	3	4	5	6	7	8	9	0		
1	40	PTC L	PTC L									8	
2	41	PTC L	PTC L	PTC L							PTC L	6	
3	42											10	
4	43	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L			PTC L	PTC L	PTC L	1
5	44	PTC L		PTC L						PTC L		PTC L	6
6	45	PTC	PTC	PTC	PTC	PTC	PTC	PTC	PTC	PTC	PTC	PTC	0

		L	L	L	L	L	L	L	L	L	L	
7	46	PTC L	PTC L	PTC L	PTC L	PTC L		PTC L			PTC L	3
8	47	PTC L		PTC L		PTC L						7
9	48	PTC L	PTC L			PTC L	PTC L				PTC L	5
10	49	PTC L	PTC L	PTC L	PTC L		PTC L	PTC L	PTC L	PTC L	PTC L	1

Blocks of 10,000 Subscriber Numbers

S. No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 5)										Spare Blocks(10 K)
		1	2	3	4	5	6	7	8	9	0	
1	50	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L		1
2	51							PTC L			PTC L	8
3	52	PTC L	PTC L								PTC L	7
4	53			PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L		3
5	54											10
6	55											10
7	56	PTC L				PTC L	PTC L	PTC L	PTC L	PTC L		4
8	57											10

9	58	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	0
10	59											10

Blocks of 10,000 Subscriber Numbers

S. No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 6)										Spare Blocks (10 K)
		1	2	3	4	5	6	7	8	9	0	
1	60											10
2	61											10
3	62											10
4	63	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L			2
5	64				PTC L							9
6	65											10
7	66	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	0
8	67					PTC L	PTC L	PTC L		PTC L	PTC L	5
9	68	PTC L							PTC L	PTC L		6
10	69	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	PTC L	0

62 DN Blocks spare

Blocks of 10,000 Subscriber Numbers

S. No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 7)										Spare Blocks (10 K)	
		1	2	3	4	5	6	7	8	9	0		
1	70											World call	
2	71	Wise				Habib Rafique						Danco	
3	72	Cybersoft										Stanley	
4	73	Great Bear	Great Bear									Great Bear	
5	74												
6	75												
7	76												
8	77												
9	78												
10	79												

Blocks of 10,000 Subscriber Numbers

S. No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 8)										Spare Blocks (10 K)	
		1	2	3	4	5	6	7	8	9	0		
1	80												10

2	81											10
3	82	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	0
4	83	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	Telecard	0
5	84										Cyber Internet	9
6	85											10
7	86											10
8	87											10
9	88											10
10	89											10

Blocks of 10,000 Subscriber Numbers

S. No	Level	ALLOCATION OF NUMBERING SPACE IN KARACHI (Level 9)										Spare Blocks (10 K)
		1	2	3	4	5	6	7	8	9	0	
1	90	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
2	91	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
3	92	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
4	93	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
5	94	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0

6	95	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
7	96	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
8	97	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
9	98	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0
10	99	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	NTC	0