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Department of Engineering and Licensing

Consultation Document: Ref. 2003/2

The National Numbering Plan

31 July 2003

1. Explanatory memorandum

The ICT Authority has the statutory duty, under section 18 (1) (*q*) of the Information and Communication Technologies Act 2001, to "*determine the numbering system to be used for every ICT services including telecommunication service, and manage, review, and, where appropriate, re-organise the numbering system*". In this respect reviewing of the numbering plan for Mauritius, which has until very recently been administered by the incumbent operator, Mauritius Telecom (MT), is considered to be a normal consequence of the liberalisation process in the telecommunication sector. Being fully aware of the fact that in a liberalised environment the numbering plan should be administered by the regulator in order to allow a fair and equitable competition among the different operators, the Authority has taken over the management of the numbering system from MT as from January 2003.

The numbering plan for Mauritius must reflect the competitive telecommunication market that the regulator mandates for the country. Hence a competition-driven numbering Policy must be developed and the country's present numbering plan has to be modified accordingly so as to accommodate new functions such as number portability and carrier selection. On the other hand, it is recognised worldwide that it is a dreadful challenge to review a national numbering plan, and this exercise is proposed to be carried out very carefully so as to avoid unnecessarily high deployment costs and possible network failures.

This consultation document consists of three papers: The first paper introduces the current numbering plan for Mauritius and sets out the framework for the new plan. The second paper describes the allocation procedure that the Authority intends to adopt with regard to number allocation. The third paper addresses the issue of carrier selection in a multi-operator environment.

This document is being made available for public consultation. Views, contributions, and comments thereto, especially with respect to the questions that are brought up for consultation should be sent to the **Chairman, ICT Authority, Jade House, Remy Ollier street, Port Louis**, or by email to icta@intnet.mu, at latest by Friday 15 August 2003 at 16:00 hrs. An open house session relative to this issue will subsequently be held at a date that will be communicated later.

Glossary of Terms

Access Network means the network to which the caller is connected directly

Basket means a service, or group of services, for which an end-user can pre-select one carrier network for the provision of that service or group of services [3].

Carrier Selection means the mechanism that allows customers to choose between carrier network providers to carry their long distance calls essentially but not exclusively

Carrier Network means a network to which the caller is not directly connected to, consisting of transmission lines and exchanges providing transmission between access networks

Call-by-call selection means selection used when a user has the possibility to dial in each call a carrier that he wants to use usually by making use of a prefix

ICTA means the Information and Communication Technologies Authority, also referred to as the Authority or the ICT Authority

Multi-basket means a pre-selection requirement whereby an end-user can pre-select a separate carrier provider for the provision of each pre-selectable basket.

Numbering Plan means a plan that specifies the format and structure of the numbers used within that plan. It typically consists of decimal digits segmented into groups in order to identify specific elements used for identification, routing and charging capabilities. (*ITU-T Recommendation E.164*

Number Portability means the ability of a customer to change the carrier or service provider supplying a particular telecommunications service, without having to change their number

Personal Number Services means services that allow an end-user to have a discrete number that is not permanently associated with a physical network termination point but, rather, with a particular end-user.

Premium Rate Services means services for which the caller pays a premium over and above the cost of conveying the call.

Pre-selection means selection used when a user has the possibility to preselect his carrier beforehand. In this case, it is not necessary to dial the carrier code.

PSTN means the Public Switched Telephone Network

PLMN means the Public Land Mobile Network

Single basket means a pre-selection requirement whereby end-users can pre-select one carrier network provider for the provision of a number of services.

Shared Cost Services means services for which callers only pay a proportion of the charge for conveyance.

Paper 1: The National Numbering Plan for Mauritius

1. Introduction

This paper presents a first proposal to the new numbering plan and is organised as follows: The rationale for a change in the current numbering plan is presented in section 2. Section 3 describes the current numbering plan. The method used in designing the new plan to meet the basic requirements for such a design is summarised in section 4. Section 5 gives the forecast of future demand for numbers. Section 6 gives the very first proposal to the new 8 digit numbering plan.

2. The need for a new Numbering Plan

A numbering plan change is required because the business environment has evolved from a monopoly to a competitive based one. In such a competitive environment, each operator must have the same rights over numbers, which arguably though, is a scarce resource of the country. This means that numbers have to be allocated fairly amongst all competitors to ensure a level-playing field. Hence, it is extremely important to see to it that there is adequate numbering capacity to cater for the future services, and new functions such as:

1. Carrier selection
2. Number portability,

have to be introduced.

Also new entrants will require similar access to the number ranges for existing services as is enjoyed by the incumbent. Such services include:

1. Free-phone services
2. Shared cost services
3. Premium rate services
4. Personal number services

3. The Current Numbering Plan

The current numbering plan has been designed and managed by the incumbent operator, and is as shown in Table 1. The numbering system uses a fixed 7 digits format: NXX – XXXX where N represents digits between 2 and 9 and X represents digits between 0 and 9. NXX is the central office code while XXXX is the line number. With such a numbering format it is good to point

out that mathematically there are 8 million available numbers and this should in principle be sufficient for Mauritius for at least the next 20 years.

Number	Service
00	International Access
01xx	Home Country Direct (Outbound)
1xx	Emergency Numbers and other Short Codes
2xx xxxx	MT Geographic Numbering - Region North Cellplus Mobile subscribers (25x xxxx) Pager services (219 xxxx, 228 xxxx)
3xx xxxx	Value Added Services, including Premium rate & shared cost services Internet (312 1212 & 3151515, 312 0101, 312 0909) Audiotext (301-1/6xxx, 302-1/6xxx, 303-1/6xxx) Call Services Ltd (301-9xxx, 302-9xxx, 303-9xxx) Virtual Telephony / Virtual Fax (39x-xxxx) Videotex & Data (317-1/9xxx)
4xx xxxx	MT Geographic Numbering - Region Central Emtel Mobile subscribers (421 xxxx, 422 xxxx, 423 xxxx, 49 xxxx)
5xx xxxx	Wireless Local Loop subscribers
6xx xxxx	MT Geographic Numbering - Region South
7xx xxxx	Cellplus Mobile subscribers (75x xxxx, 76x xxxx and 77x xxxx) Emtel Mobile subscribers (72x xxxx, 73x xxxx)
800 xxxx	Toll Free numbers (freephone service)
801 xxxx	Inbound IFS
810 xxxx	Home Country Direct (Inbound via Passe Partout)
83x xxxx	Geographic Numbering (Rodrigues)
9x	Short Codes
99x	Emergency Numbers (995 and 999 with new 11x codes)

Table 1: Current Numbering Plan

Analysis

a. The numbering scheme is closed, implying a single dialling procedure for the whole country. Hence no area code is required.

b. The current numbering plan is divided into two main numbering categories:

(a) Geographical numbers

(b) Non-geographically numbers which can further be divided into:

- Mobile services numbers
- Special Services numbers
- Short codes

c. The island is divided into three main regions:

1. North
2. Central
3. South

The 2xx xxxx numbers have been allocated to the north, while the 4xx xxxx numbers have been allocated to the centre and the 6xx xxxx numbers have been allocated to the south. Under such a numbering scheme it can be seen that there is mathematically one million numbers available per region which is definitely more than adequate. The Wireless Local Loop subscribers are allocated numbers in the 5xx range.

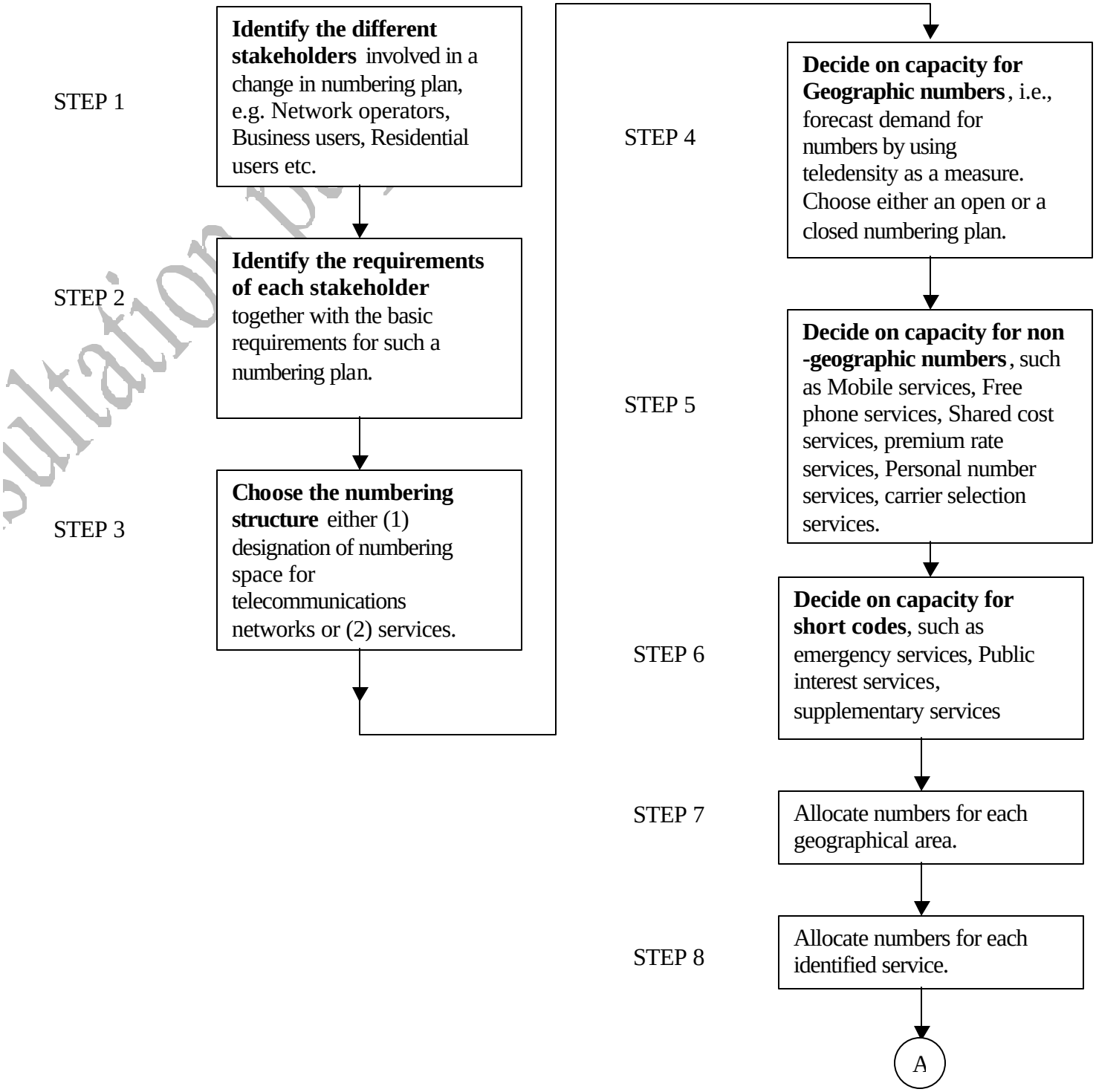
d. It can be seen in the numbering plan that some numbers allocated for mobile services are interspersed with the geographical significant numbers. This situation has to change if the Calling Party Pays (CPP) policy is to be applied to the mobile tariff system. With this system in place end-users must be able to differentiate between fixed line numbers and mobile numbers so that the numbers they dial indicate exactly the tariff that will be charged.

e. The 5xx range is used almost completely by the incumbent. In case that a new operator proposes to offer WLL, it will be impossible to allocate numbers in that range.

f. The numbering capacity used for mobile services is consumed very rapidly mainly because the operators do not have the proper mechanism to reuse numbers, especially for pre-paid services.

4. Methodology for Numbering Plan Design

A well defined method is required when designing a new numbering plan and all the steps must be made clear at the very start of the project. This section proposes a sequence of processes that are to be carried out during and after the elaboration of the new numbering plan in order to be in line with the requirements of a good design. This is depicted in Figure 1.



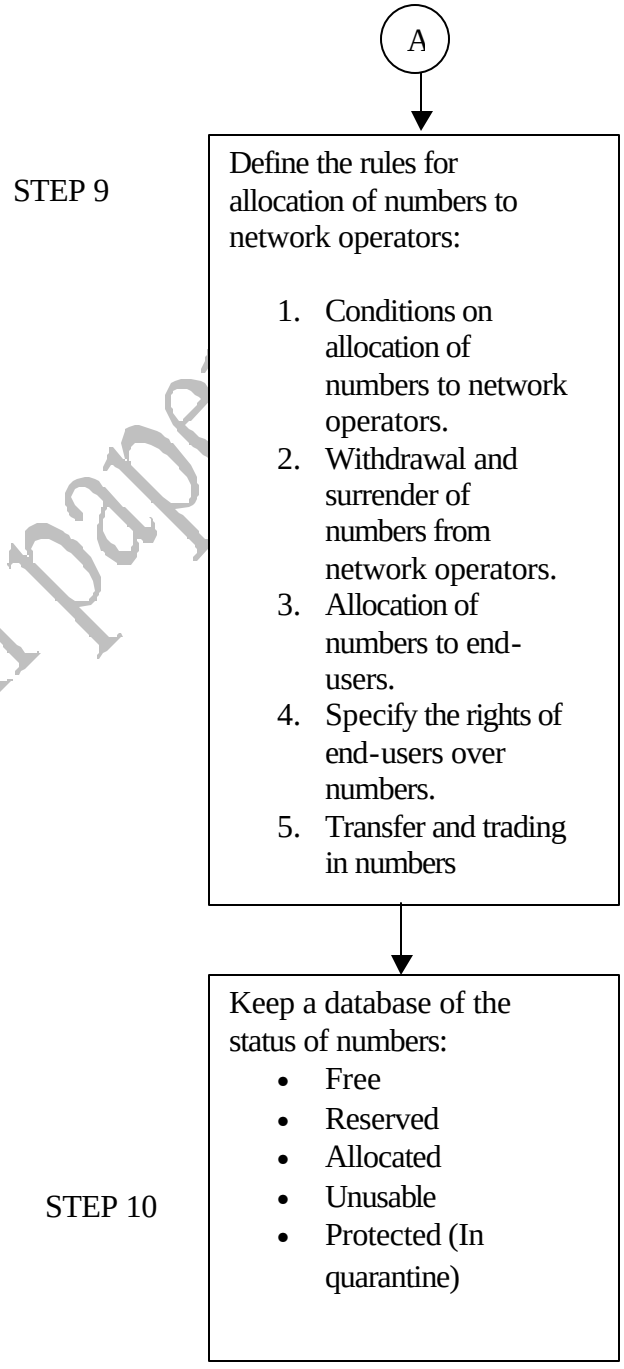


Figure 1: Steps for numbering plan design[1]

The Requirements for a New Numbering Plan

A numbering plan has some basic requirements to satisfy such as:

[1] Adapted from *Learning About Numbering – Course Notes*, ITU, http://www.aca.gov.au/number/index.htm

i. Adequate numbering capacity. It is extremely important to ensure that there is adequate numbering capacity for both geographic significant and geographic insignificant numbers. Hence a good forecasting of demand in numbers is required.

ii. Competitive neutrality. The allocation system of the new numbering plan should be competitively neutral. This means that numbers should be allocated fairly amongst all competitors.

iii. User-friendliness. The numbering plan has to be easy to understand and needs to follow a logical structure so that it is easy to convey the type of service and the tariff to be charged for that service. For instance all numbers with prefix 800 should indicate that the call is free of charge.

5. Forecasting Numbering Capacity

The forecast for the numbering capacity is carried out for 20 years which is the traditional period for a viable numbering plan. The data used for the population, number of fixed telephone lines and cellular telephone subscribers are according to the Ministry of Information Technology & Telecommunications for the period 1996 to 2002. The forecasting carried out concerns only the population and fixed telephone lines. As far as cellular subscribers are concerned the forecasting is more difficult since after a drastic rise in the number of subscribers for the last six years, from 1996 to 2001, the rising rate seems to have decreased in 2002. Hence the forecasting is done with respect to population growth instead. The forecasts are shown in Figure 2.

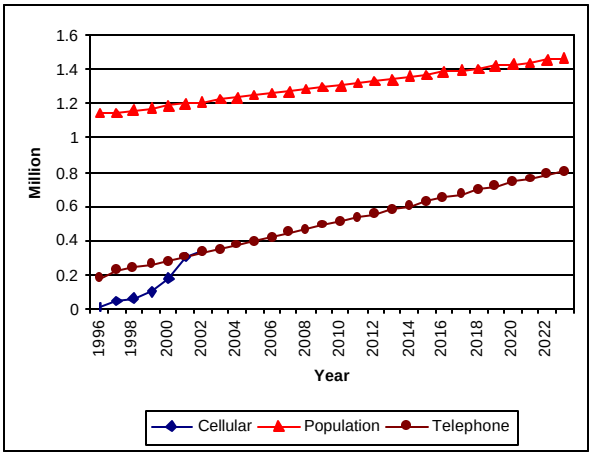


Figure 2: Forecasting growth in Population and number of telephone lines

As far as geographic numbers are concerned, there is a capacity of 4 million numbers as shown in Table 2.

2xx xxxx	1 Million	Geographic number - North
4xx xxxx	1 Million	Geographic number - Centre
5xx xxxx	1 Million	Geographic number - WLL
6xx xxxx	1 Million	Geographic number - South
	4 Million	

Table 2: Capacity in terms of geographic significant numbers

Not all the 4 million numbers are assigned to subscribers however. Numbers starting with 200, 300, 400, …, 222, 333, 444, …, 233, 244, …. are normally not assigned. This only reduces the capacity for geographic significant numbers slightly.

According to the European Commission[2], the numbering plan for countries in which the usable geographic numbering space has fallen below **one number per person,** is in danger of exhaustion. As demonstrated by the forecast, this is not the case of Mauritius presently and it is not expected to be, in 20 years time either. As such, it is recommended that sensibly at least **three usable numbers per person** should be allowed. Hence, considering that the population is of the order of 1.2 million presently, the reasonable capacity for geographic numbers is 3.6 million.

The same report[2] argues that countries in which the numbering available for non-geographic services is below **two numbers per person,** should consider a major review. It is recommended that at **least five numbers per person** should be made available for non-geographic services. As far as the mobile numbering capacity is concerned, we have less than two numbers per person reserved; hence that might need to be reviewed. The reasonable capacity for mobile numbers for Mauritius should thus be of the order of at least 6 million.

In these circumstances the Authority is of the considered view that the country needs to evolve towards an eight-digit numbering plan.

[2] *Final Report on Review of National Numbering Schemes on their Openness to Competition*, European Commission

6. Proposal for an Eight Digit Numbering Plan

The following changes to the current numbering plan are proposed:

a. A leading 2 will be added to the existing geographic numbers. This will increase the capacity to 10 million numbers.

b. A leading 7 will be added to the existing mobile numbers. This will increase the capacity to 10 million numbers hence satisfying the requirement of 6 million numbers stated in the previous section.

c. The Numbering Plan will be fully service based with a 2 representing all geographic numbers, 3 representing all special numbers, 7 representing all mobile services numbers, 800 representing all free phone numbers.

d. As far as the 3 and 800 ranges are concerned, the Subscriber Number (SN) will be increased by one digit by adding a digit in front of the subscriber number.

e. New functions and services will be added in order to implement a real competition driven Numbering Plan, these include:

i. Carrier selection

Carrier selection enables an end-user with a standard telephone service to choose a particular carrier for his international calls or fixed to mobile calls. This choice can be done in two ways:

a. By using an over-ride code on a call-by-call basis. In this case each service provider is assigned with a Prefix, say 04 XX, consisting of a Carrier Access Code (CAC) and a Carrier Identification Code (CIC). The 04 is the CAC and it indicates that the number is for the carrier selection service and XX is the CIC and identifies the service provider. To make an international call through a particular carrier the end-user dials: 04 XX + 00 + Country Code + Telephone Number.

b. Pre-selecting the carrier provider so that no over-ride code is used. The call is then automatically carried by the pre-selected service provider.

ii. Personal number

Personal numbering allows calls to be delivered to a fixed network termination point such as the home or office or even to the mobile phone. The choice of the delivery point can change several times a day on user demand or pre-programmed. Hence the holder of a personal number does not miss any calls and gives a feeling of mobility.

iii. Number portability

Three different types of portability can be defined:

1. geographic portability
2. Operator portability
3. Service portability

The types of portability that will be implemented in the new numbering plan are yet to be finalised. Number portability will concern both fixed and mobile networks.

The proposed eight digit numbering plan is given in Table 3 and the description of number change in Table 4.

7. Conclusion

In this paper, a first proposition to the competition driven numbering plan has been presented. The plan presented consists of eight digits long numbers. The main reasons why such a change has been carried out is because:

1. No capacity is currently available for a number of proposed new services, such as new WILL-based services
2. The capacity reserved for mobile numbers is believed to be inadequate in the current plan.
3. The only free leading digit in the current plan is 9

The essential features in this proposal are:

i. The approach towards the new numbering plan has to be evolutionary rather than revolutionary.
ii. The proposed plan is service based.
iii. New services such as Carrier Selection/Pre-selection and number portability are being taken into account in the modified numbering plan.

For Country Code **230**

(1) Leading digits of N(S)N – National (Significant) Number	(2) N(S)N Number Length		(3) Usage of E.164 Number	(4) Additional Information	
	Maximum Length	Minimum Length			
1	**5**	**3**	Short Codes	Used primarily for emergency and public interest services	
2	**8**	**8**	Geographical number	Numbers starting with 2 83X and 2 83X are reserved for Rodrigues and 2 81X for Agalega	
3	**8**	**8**	Special Numbers	30X	Premium Rate numbers
				312	Internet Services
				317	Videotext and data services
				33X	Shared Cost services
				36X	Personal Numbers
4	**8**	**8**	Free numbering block		
5	**8**	**8**	Wireless Local Loop Services		
6	**8**	**8**	Free numbering block		
7	**8**	**8**	Non-geographical numbers	Used for mobile services including paging. Numbers starting with 7 8XX are reserved for Rodrigues	
800	**8**	**8**	Freephone Numbers		
9	**8**	**8**	Reserved for non-geographical number		
999	**3**	**3**	Short Codes		
995	**3**	**3**	Short Codes		

Table 4: Proposed Eight Digit Numbering Plan

(1)	(2)		(3)	(4)		(5)	(6)
	N(S)N			Parallel Running			
Communicated Time & Date of Change	**Old Number**	**Proposed New Number**	**Usage of E.164 number**	**Begin**	**Ends**	**Operator**	**Proposed Wording of Announcement**
-	2xx xxxx	2 2xx xxxx	Geographic number Region North	-	-	Mauritius Telecom	-
-	4xx xxxx	2 4xx xxxx	Geographic number Region Centre	-	-	Mauritius Telecom	-
-	6xx xxxx	2 6xx xxxx	Geographic number Region Centre	-	-	Mauritius Telecom	-
-	831 xxxx	2 831 xxxx	Geographic number Rodrigues	-	-	Mauritius Telecom	-
-	832 xxxx	2 832 xxxx	Geographic number Rodrigues	-	-	Mauritius Telecom	-
-	814 xxxx	2 814 xxxx	Geographic number Agalega	-	-	Mauritius Telecom	-
-	5xx xxxx	5 5xx xxxx	WLL	-	-	Mauritius Telecom	-
-	75x xxxx	7 75x xxxx	Non-geographic numbers	-	-	Cellplus	-
-	76x xxxx	7 76x xxxx	Non-geographic numbers	-	-	Cellplus	-
-	77x xxxx	7 77x xxxx	Non-geographic numbers	-	-	Cellplus	-
-	78x xxxx	7 78x xxxx	Non-geographic numbers	-	-	Cellplus	-
-	79x xxxx	7 79x xxxx	Non-geographic numbers	-	-	Cellplus	-
-	421 xxxx	7 421 xxxx	Non-geographic numbers	-	-	Emtel	-
-	422 xxxx	7 422 xxxx	Non-geographic numbers	-	-	Emtel	-
-	423 xxxx	7 423 xxxx	Non-geographic numbers	-	-	Emtel	-
-	49x xxxx	7 49x xxxx	Non-geographic numbers	-	-	Emtel	-
-	72x xxxx	7 72x xxxx	Non-geographic numbers	-	-	Emtel	-
-	73x xxxx	7 73x xxxx	Non-geographic numbers	-	-	Emtel	-
-	875 xxxx	7 875 xxxx	Non-geographic numbers	-	-	Cellplus Rodrigues	-
-	22x xxxx	7 22x xxxx	Non-geographic numbers	-	-	Teleservices	-
-	219 xxxx	7 219 xxxx	Non-geographic numbers	-	-	Paging Services	-
-	218 9xxx	7 218 9xxx	Non-geographic numbers	-	-	Paging Services	-
-	3xx xxxx	3 xx 1xxxx	Special numbers	-	-	N/A	-
-	800 xxxx	8 00 1xxxx	Free phone numbers	-	-	N/A	-

Table 5: Proposed Description of Number Change for National Numbering

Paper 2: The Proposed Allocation procedure for numbering

1. Introduction

A transparent and non-discriminatory allocation system for telephone numbers is required in a liberalised telecommunication environment. The challenge for the Authority is to determine the best methods and conditions including legal framework in the allocation of numbers to operators. Valuable numbers have to be identified and the best ways to allocate these numbers have to be found. This paper presents the different alternatives for the allocation of numbers. Then, the current allocation method is described. A proposal is made for a new allocation method and the terms and conditions of the proposed allocation method are given. The method proposes that allocation of telephone numbers be made to the operators in blocks of 10,000 for geographic numbers and in block of 100,000 for mobile numbers. Finally a charging algorithm for geographical and mobile numbers, based on a cost recovery model is given. For geographical numbers, both an application fee and an annual fee are defined whereas for mobile numbers, only an application fee is proposed.

2. Importance of a Numbering Allocation Mechanism

A well defined numbering allocation mechanism serves three purposes[3]:

1.1 It ensures that the integrity of the numbering plan is protected by establishing a framework for allocation of numbers that is consistent with the structure of the numbering plan.

1.2 It provides certainty for network operators and end users on how number allocation is undertaken and the procedures and rules involved

1.3 It provides the necessary platform for other numbering administration policies to be implemented relating, for example, to portability, rights of use of numbers and trading in numbers.

[3] *Learning About Numbering – Course Notes*, ITU, http://www.aca.gov.au/number/index.htm

3. Numbering Allocation Methods

Allocation methods may take different forms:

- Administrative allocation
- Allocation by lotteries
- Allocation by tenders
- Allocation via auctions

The first allocation method involves only an administrative fee and is on a first-come, first-served basis. The three other allocation schemes are of a competitive type.

3.1 The administrative method offers a simple, inexpensive and fast allocation scheme but ignores the potential value of numbers. Valuable numbers are threatened by rapid exhaustion since the application charge is intended to cover the administrative cost only.

3.2 Lotteries involve the use of a chance generator to determine either the number or number block to assign to an applicant or the applicant to whom a number or number block is to be assigned. This allocation mechanism makes sense only if the number of applications exceeds the number of telephone numbers to allocate.

3.3 The use of tenders is justified in the sense that with this method it is easier to determine the party that will make the most effective use of the numbers to be allocated. However, it is agree that this method is a subjective and time-consuming way to allocate phone numbers.

3.4 The allocation of numbers via auctions is determined on the basis of willingness to pay[4].The party who offers the most money wins the bid. The use of auctions in phone number allocation in several countries including UK, Australia and Hong Kong is currently being considered.

[4] *Learning About Numbering – Course Notes,* ITU, http://www.aca.gov.au/number/index.htm

4 Former Allocation Method

The allocation method practiced by MT, the previous administrator of telephone numbers is as follows: the operator requesting the block of numbers addressed a correspondence to MT mentioning the numbering capacity required. MT then allocated the requested number blocks without charging any fee to the operator.

5 Phone Number Allocation Model: Proposal for Mauritius

In this section an allocation proposal for block of telephone numbers for Mauritius is given. The allocation procedure described can be applied to both geographic and mobile block of numbers. This allocation model has the following objectives to satisfy:

1. allocate numbers in an administrative fashion but take the value of numbers into consideration
2. allow full and easy access of numbers by customers
3. be easy to implement and manage
4. be fair and equitable to all operators
5. promote efficient use of numbers through charging
6. have a relatively rapid administrative procedure
7. Protect the interest of consumers

The proposed allocation model is shown in Figure 1. The Authority shall address several issues in the allocation process of numbers, these are:

A. Define the criteria for eligibility of applicants for number allocation
B. Define the information to be supplied by an applicant for number allocation
C. Define the unit sizes for number allocation
D. Define the terms and conditions that operators have to abide to once they have been allocated blocks of numbers
E. Define how to deal with competing requests
F. Define the timescale for handling applications
G. Define conditions under which applications for numbering capacity can be rejected
H. Define number capacity withdrawal terms and conditions

I. Consider revision of the Information and Communication Technologies Act 2001 to include the terms and conditions for number allocation, especially with respect to charging issues.

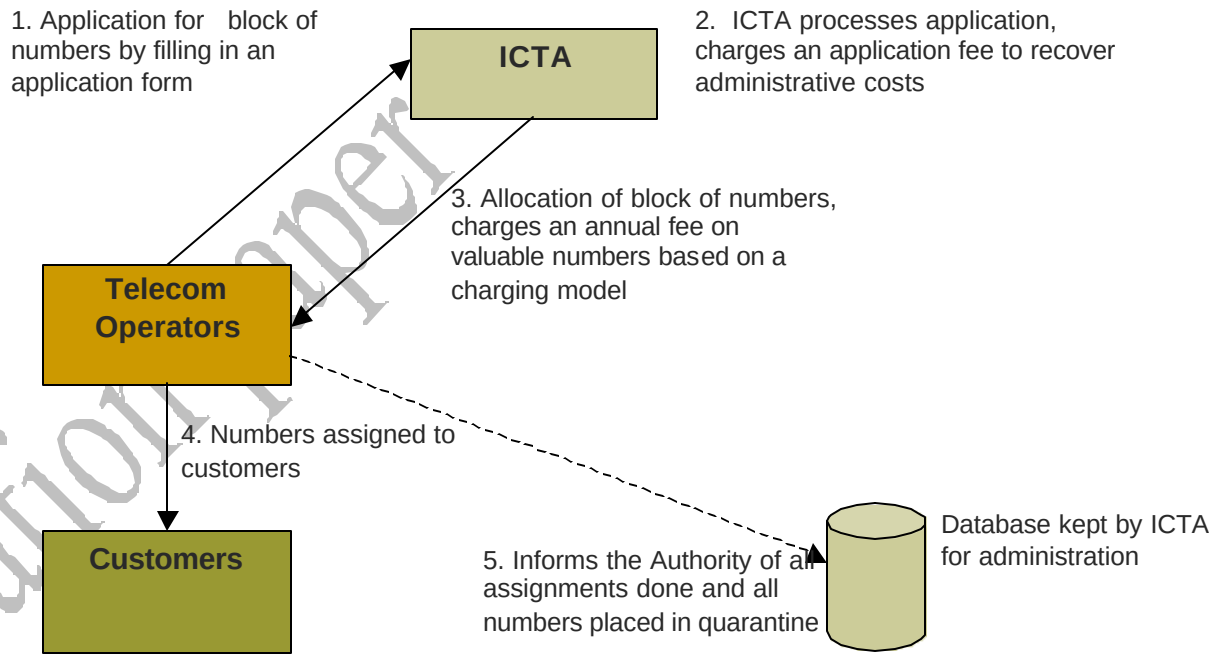


Figure 1: Proposed Allocation Model

This paper briefly addresses each of the issues raised above on the basis of best practice examples from other regulatory bodies particularly OFTEL[5] and ACA[6]. The way that these issues have been addressed here are amenable to changes.

A. Definition of the criteria for eligibility of applicants for number allocation

- Applicant operators must have been granted a licence under Part IV Section 24 of the *Information and Communication Technologies Act 2001* (the Act) to establish and operate a telecommunication system that requires numbering arrangements.
- Other persons who require number capacity but do not satisfy the above criteria should apply directly to eligible operators to be granted numbering capacity

[5] Revising the National Numbering Conventions, OFTEL February 2001
[6] Telecommunications Numbering Plan 97, ACA

B. Definition of the information to be supplied by an applicant for number allocation

The Authority will require the following information about the applicant for all applications:

- Name and contact details of Operator/Service Provider
- Details of the licence granted by the ICTA under which the numbering capacity sought will be used
- The purpose for which the numbering allocation is required
- The quantity of numbers required
- The preferred number range
- The date at which the number range applied for will be in-service
- If application is temporary, the date the numbers requested will cease service
- Details of the applicant's utilisation of existing number allocations in the previous 12 months such as:
    - Percentage of numbers allocated to end-users in service
    - Reserved capacity at request of specific customers
    - Numbers reserved for geographic growth
    - Free capacity
    - Quarantined numbers
    - Ported numbers (when applicable for Mauritius)
    - A forecast of expected utilization over a period of at least three years
    - Confirmation that portability is available on request (when applicable for Mauritius)
    - Any other information that the applicant considers important and in favour of his application

C. Definition of the unit sizes for number allocation

- It is suggested that geographical numbers be allocated in units of 10,000. The reason for this is technical. Because we use a 7 digit scheme, and the first three digits are the Central Office (CO) code belonging to one operator, it makes sense that all subscriber numbers associated with that CO code belong to the same operator.
- It is suggested that mobile numbers be allocated in blocks of 100,000 digits. This is so because as suggested in the modified numbering plan, all operators will share the same

7xxx xxxx range for mobile services, hence the second digit will be included in the range assigned to an operator, e.g 772x xxxx.

- It is suggested that special numbers such as free-phone and premium rate numbers be allocated individually.
- It is suggested that short codes be allocated individually.

D. Definition of the terms and conditions that operators have to abide to once they have been allocated blocks of numbers

- The allocation shall be used for the purpose specified in the application. This includes that any classification of the numbering space, e.g. Platinum, Gold, Silver classes, have to be respected.
- The holder of an allocation shall be responsible for it
- The holder of an allocation is responsible for the sub-allocation of numbers to his customers.
- The holder of an allocation should place it in operation within six months after allocation has been granted.
- An operator shall not use numbers other than those allocated by the ICTA.
- The holder of an allocation is responsible for notifying the public and the other operators locally and overseas of the activation of new number allocations.
- The holder of an allocation will have to agree on the terms and conditions governing any annual charges that are imposed by the Authority
- The holder of an allocation has the responsibility to inform the Authority of any numbering space that are no longer in use and should surrender this space to the Authority.
- The holder of an allocation shall submit an "Annual Numbering Return" providing the following information:
    - Current use of allocation
    - Percentage of numbers allocated to end-users in service
    - Reserved capacity at request of specific customers
    - Numbers reserved for geographic growth
    - Free capacity

- Quarantined numbers
- Ported numbers (when applicable for Mauritius)
- A forecast of expected utilization over a period of at least three years
- Details of numbers that cannot be allocated to end users and the reasons why such allocations cannot be made.
- Any other information as requested by the Authority

E. Definition of how to deal with competing requests

In the event of limited availability of number ranges and if there are two or more applications for the same number range, the Authority will consider all the applications but allocate the number range to the first operator that will provide enough evidence that he has serious number capacity problems.

F. Definition of the timescale for handling applications

The Authority will use all reasonable endeavours to complete the application procedures within one month from the reception of the application form duly filled. This period can be exceeded if

- Additional information is required from the applicant
- Consultation is required to complete the application procedures

G. Definition of conditions under which applications for numbering capacity can be rejected

- The Authority reserves the right to reject any applications if such action is needed.
- The Authority should inform the applicant in writing, giving the reasons for its decision within 15 days after the decision to reject application is taken.
- The applicant has the right to contest the decision of the Authority in writing and give further information and reasons why his application has to be re-considered.

H. Definition number capacity withdrawal terms and conditions

The Authority reserves the right to withdraw a numbering capacity allocation for the following reasons:

- If the number range allocation has not been placed in service within 6 months as mentioned in section (4).
- If no efficient use of numbering space is suspected to be made by an operator
- If the numbering space is no longer in use
- If the holder of the numbering space misuses the allocated numbering resource
- If a substantial portion of the numbering range have been ported (when this is applicable) to another operator.
- If the holder of the numbering space does not comply with the agreed charging principles imposed by the Authority.

6 Charging for Numbers

Regulators around the world have been considering the issue of charging for numbers since the last few years. The rationale behind imposing a charge on numbers is twofold according to a report[7] on the economics of numbering published by The Organisation for Economic Co-operation and Development (OECD):

1. The transfer of numbering responsibilities from a Public Telecom Operator (PTO) to an independent authority involves considerable administrative costs that have to be covered by those who make use of the numbering space and make profit out of it. The administrative costs that have to be considered according to the OECD report are associated with the human resources hired for dealing with numbering issues, any external consultation that may be required for the regulator to frame policy, and the representation of the country in regional and international standardisation fora.

2. Certain numbers contain an intrinsic value which has to be explored accordingly

6.1 Value Intrinsic in Numbers

According to the OECD report[5], users of telephone numbers can be divided into four broad categories: residential users, community users (including government agencies and social welfare groups), corporate users, and operators/service providers. The value of numbers is

[7] The Economic and Regulatory Aspects of Telecommunication Numbering, OECD 1995

different for each of these user types. Whereas residential and community users view numbers as a way to communicate with their family and friends, corporate users view numbers as a way to increase their customer base and revenue, for instance by putting their telephone numbers in advertisements. Operators on their part view numbers as the "interface" which permits subscribers to access their network.

Corporate users are usually more interested in numbers which presents a high ability to be memorized for example, 2203 3000. Free-phone numbers and premium rate numbers also have to be considered as more valuable than standard geographic numbers because businesses derive revenue out of them. Note that this class of numbers are not specifically considered in this paper.

Another category of numbers that can be considered to have value for corporate uses is those with alphanumeric significance. Almost all new telephone sets nowadays have an alphanumeric keypad similar to what is shown in Figure 2.

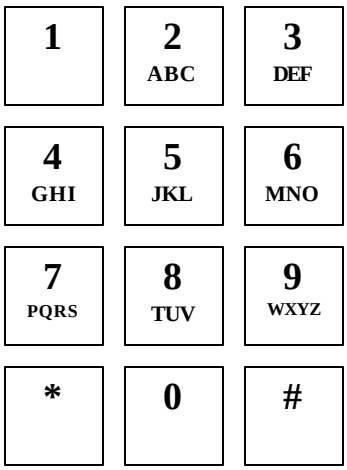


Figure 2: Alphanumeric keypad

With such a keypad telephone numbers such as 2212 8294 can be represented by 2212 TAXI and placed in advertisements as such.

Those numbers which are highly memorable should be treated as a scarce resource. Only a small percentage of such numbers are present in a block of 10,000 numbers. According to the demand curve shown in Figure 3, a scarce resource has a greater monetary value compared to one that is

readily available. Note that the value of these types of numbers also depends on the demand for them. If there is no demand for such numbers then their monetary value falls considerably.

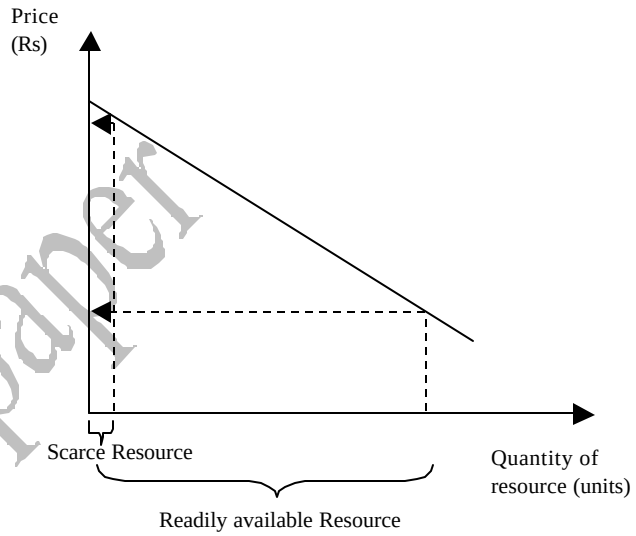


Figure 3: The Demand Curve

7 Proposed Charging Model for Telephone Numbers

A short term and a long term charging model will be proposed in this section. The short term charging model is needed at first so as to recover the cost associated with the regulatory and management functions pertaining to numbering administration. The long term model on the other hand can be applied when the commercial value of numbers has been fully recognised and there is considerable demand for valuable numbers.

7.1 Short Term Charging Model

It is recommended that the short term charging model should be of the administrative type described in section (3). It was pointed out that this method of allocation disregards the intrinsic value of numbers and can result in the rapid depletion of the numbering resource. It is important to note that this short term model will disappear when the market for telephone numbers becomes mature enough. An attempt is made here to design a charging model which, even though is of the administrative type, is able to reflect or at least maintain the value of the numbers. The charging model will be applied to:

1. Geographic number blocks

2. Mobile phone number blocks

The proposed charging model is made up of two parts:

A. An application fee to be charged to both numbering categories and

B. An annual fee to be charged to **valuable geographic numbers only**.

The proposed application forms for geographic and mobile numbers are given in the Annex section.

A. Application Fee

The application fee is expected to cover the administrative burden placed of the Authority after an application for numbers have been made. The formula to be used in the calculation of the application fee must take into account:

1. The number of employees required to process the application, *N*
2. The monthly salary of each of the employee
3. The number of hours required by each employee to process the application

Considering step 2 of Figure 1, the ICTA block in the figure can be exploded into the following internal process shown in Figure 4.

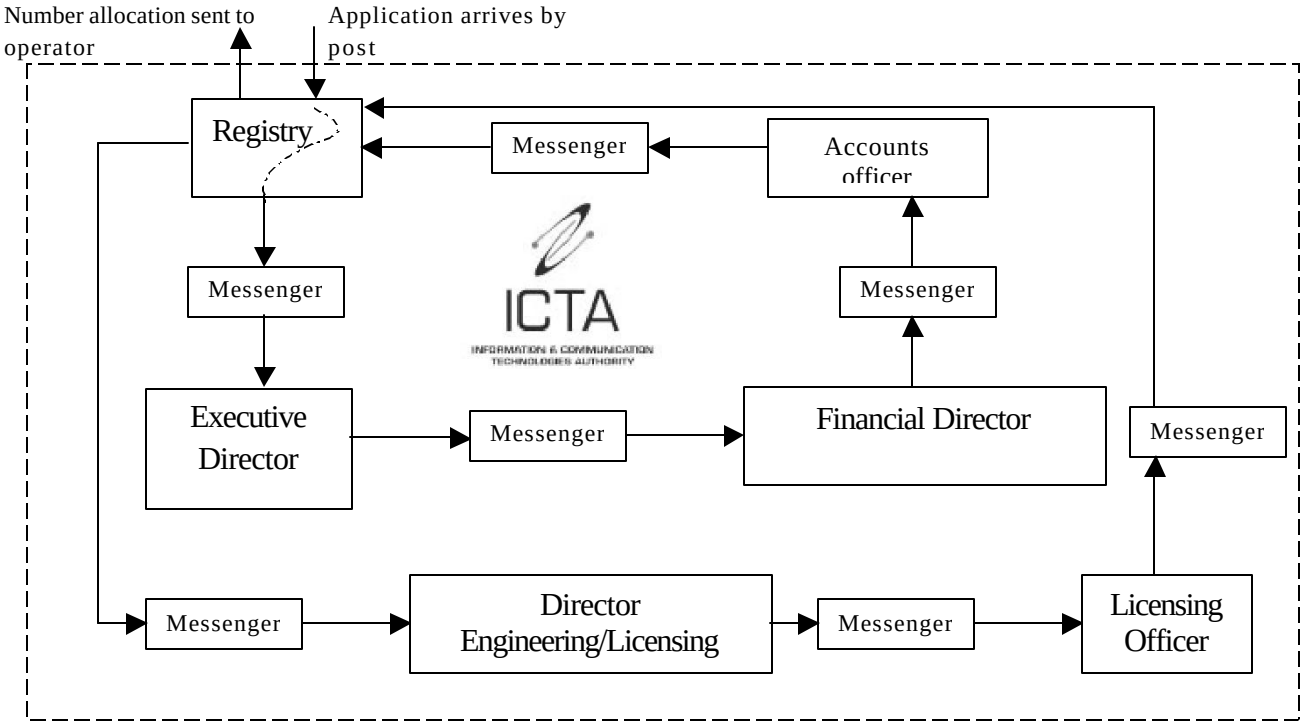


Figure 4: Application processing at the ICTA

Hence the administrative cost which is also the application fee can be expressed as follows:

$$A = \sum_{i=1}^{N} \frac{\text{Monthly salary of employee } i}{\text{no. of working hours monthly for employee } i} \times \text{no. of hours taken by employee } i \text{ to process applicatio n}$$

B. The Annual Fee for Special Geographic Numbers

The annual fee is proposed as a method of:

1. Charging for the intrinsic value of the telephone numbers
2. Discouraging anti-competitive applications for numbering blocks
3. Recovering the running cost incurred by the Authority to administer the numbering resource
4. Encouraging the operators to charge for a valuable resource so as to prevent the rapid depletion and misuse of it

This annual fee will be applied **ONLY** to valuable geographic numbers which are as they give competitive advantage to corporate users. According to a study undertaken by OFTEL, a block of 10,000 numbers can be divided into four specific classes formed with respect to the ability of memorizing the numbers. The classification proposed is as shown in Table 1.

Class	Description	% in block of 10,000 numbers
Platinum numbers	Highly memorable, numbers with Alphanumeric significance	1%
Gold Numbers	Distinctly memorable	4%
Silver Numbers	Slightly memorable or specifically requested	20%
Standard Numbers	Not specifically memorable	75%

Table 1: Number Classification

By making use of the estimated percentage of each class of numbers in a block of 10,000 numbers, an attempt is made to derive a charging equation for the annual fee to be imposed on operators and service providers for valuable numbers only. As far as standard numbers are

concerned it is proposed that **NO** annual fee be imposed. From Table 1 it is evident that numbers which are highly memorable are very scarce whereas those which are not specifically memorable are readily available. Based on this reasoning, a factor defined as the scarcity factor, *s* can be derived from the percentages given in table 1. The higher the scarcity factor, the higher is the scarcity of the number class. The class of standard numbers is assigned a scarcity factor of 1 and the scarcity of the other numbers is expressed as the number of times they are more scarce compared to a standard number. Hence, the scarcity factors shown in Table 2 are obtained.

Class	Scarcity factor
Platinum numbers	3.96
Gold Numbers	3.84
Silver Numbers	3.2
Standard Numbers	1

Table 2: Scarcity factor

If the hypothetical price of the Standard Numbers in a block of 10,000 numbers is *P*, then the prices of the other classes is expressed as *P* to the power of scarcity. This is because it is required that the price for valuable numbers rise rapidly so as to discourage operators to apply for a block of numbers only for the valuable numbers. In other words, this guarantees the efficient allocation of the scarce numbering resource.

Class Number, *c*	Class	Scarcity factor
3	Platinum numbers	$P^{3.96}$
2	Gold Numbers	$P^{3.84}$
1	Silver Numbers	$P^{3.2}$
0	Standard Numbers	P

Table 3: Price based on scarcity factor

The total price of a block of numbers cannot depend only on the scarcity factor. The demand for the number class must also be considered. Hence a demand factor, *d* which is an indication of how popular the numbering class is defined. It is proposed that a survey is carried out so as to obtain a first measure the demand for each class of numbers. This first measure can be corrected

as the real number of applications for each class of numbers is obtained from the database of allocated numbers.

The final factors to be considered are the number of man hours and the number of man required to process the annual fee. Hence the costing model for the annual fee for telephone numbers of a class *c*, where *c* represents the class number, is given as:

$$C_c = d \times P^s$$

Where C_c is the price of class c numbers in a block of 10,000 numbers, d is the demand factor, P is the price of standard class numbers in the 10,000 block and s is the scarcity factor. The total annual fee, C_t is thus given as the sum of the price of each class of numbers multiplied by N, the number of man, and H, is the number of man hours.

$$C_t = N \times H \times \sum_{c=1}^{3} C_c$$

An example is given below.

Example

For *P = Rs 10.00*
N = 3 men
H = 0.5 hrs (assumed equal for each man)

Number class	**Demand factor (d)**	**Charging (Rs), P^s**	**Effective charging (Rs), $d \times P^s$**
Platinum	5.000%	9,120.11	456.01
Gold	15.000%	6,918.31	1,037.75
Silver	80.000%	1,584.89	1,267.91
Standard	N/A	10.00(not added)	10.00(not added)
	100.000%	17,623.31	2,761.67

Hence total annual fee for a block of 10,000 numbers is Rs *4,157.50*.

7.2 Long Term Charging Models

Several charging models based on market-based allocation can be used when a well defined market for telephone numbers is in place. This market will be in place only when the competitive

advantage numbers with a memorable structure give to their owners is fully recognised. The charging models that will have to be implemented then will be of the lottery, auction or tender type as was described in section 3.0.

8 Conclusion

As far as charging principles are concern, some more work is still to be done, these future tasks are outlined here:

1. A charging algorithm for annual charges for mobile phones numbers has to be derived.
2. The charging algorithms for free-phone, premium rate and short codes also have to be derived. It is thought that these numbers will have to be allocated in smaller blocks if not individually to operators. The reason is that they should be considered as more valuable than a platinum number being very scarce and having a greater monetary value.

ANNEX

APPLICATION FOR TELEPHONE NUMBER BLOCK

PROPOSED APPLICATION FORM 1: TO BE FILLED BY ALL APPLICANTS

Name of Operator/Service Provider

……..…...

……

Registered Business Name (if different)

.....……..…….....

……

Postal Address

……..……..

……

……

Registered Office Address (if different)

……..……..

……

……

Contact person

Name …….

Telephone ……. Facsimile ……...

Email address ……

Tick the number category required

[ ] Geographic Telephone Number (Complete form 2)

[ ] Mobile Telephone Number (Complete form 3)

Declaration

I certify that the information provided in this application is true and correct and that I have read the conditions of application and that accept them.

…… ……

Signature of authorised person Position

…… ……

Name Date

CONDITIONS OF APPLICATION

ELIGIBILITY

- Applicant operators must have been granted a licence under Part IV Section 24 of the *Information and Communication Technologies Act 2001* (the Act) to establish and operate a telecommunication system that requires numbering arrangements.
- Other persons who require number capacity but do not satisfy criteria 1.1 should apply directly to eligible operators to be granted numbering capacity

FURTHER INFORMATION

- If the ICTA cannot make the allocation based on the information provided, you will be requested to provide further information in writing to the Authority.

APPLICATION FEE

- An application fee is payable before the application can be processed. The fee is payable by cheque and forwarded with the application.

ANNUAL FEE

- An annual fee will be charged for the valuable numbers that are contained in the block of numbers you are applying for.

COMPETING REQUESTS

- In the event of limited availability of number ranges and if there are two or more applications for the same number range, the Authority will consider all the applications but allocate the number range to the first operator that will provide enough evidence that he has serious number capacity problems.

TIME TO PROCESS APPLICATION

The Authority will use all reasonable endeavours to complete the application procedures within one month from the reception of the application form duly filled. This period can be exceeded if

- Additional information is required from the applicant
- Consultation is required to complete the application procedures
- The application is considered as complex by the Authority

REJECTION OF APPLICATION

- The Authority reserves the right to reject any applications if such action is needed.
- The Authority will inform the applicant in writing, giving the reasons for its decision within 15 days after the decision to reject application is taken.
- The applicant has the right to contest the decision of the Authority in writing and give further information and reasons why his application has to be re-considered.

APPLICATION FOR TELEPHONE NUMBER BLOCK

PROPOSED APPLICATION FORM 3: GEOGRAPHIC NUMBER ALLOCATIONS

Provide the following details for each number range.

	2.1 Quantity Required	2.2 Preferred Number range	2.3 Exchange region	2.4 Start date	2.5 End date
1.					
2.					
3.					
4.					
5.					

2.6 Give the details of the licence granted by the ICTA under which the requested numbering capacity will be used.

……

……

……

2.7 Describe the nature and function of the service.

……

……

……

2.8 Give a statement on the blocks that have already been allocated to you if any in the previous 12 months.

No. of blocks of 10,000 numbers …….

Percentage utilization of each block ……..

Free capacity in each block ……

Numbers in quarantine ……...

Numbers ported (if applicable)……

Give a forecast of expected utilization for the next 3 years ……

…….

2.9 Do you allow number portability (if applicable) when requested by your customers?

[ ] Yes [ ] No

2.10 Any other information you would like to add

……

……

……

INSTRUCTIONS TO APPLICANTS

2.11 Quantity of numbers required

For mobile numbers, the ICTA allocates blocks of 100,000 numbers only.

2.12 Preferred number range

You have the possibility to apply for a range of your choice or the ICTA can choose a range for you.

2.13 Exchange region

This is the region, north, centre or south, where the number block will be used.

2.14 Start date

State the month that you expect to put the numbers you are applying for in service

2.15 End date

If requesting a temporary allocation, please provide the date when you expect numbers requested will cease service.

APPLICATION FOR TELEPHONE NUMBER BLOCK

PROPOSED APPLICATION FORM 3: MOBILE NUMBER ALLOCATIONS

Provide the following details for each number range.

	3.1 Quantity Required	3.2 Preferred range (if applicable)	3.3 Start date	3.4 End date
1.				
2.				
3.				

3.5 Give the details of the licence granted by the ICTA under which the requested numbering capacity will be used.

……
……
……

3.6 Describe the nature and function of the service.

……
……
……

3.7 Give a statement on the blocks that have already been allocated to you if any in the previous 12 months.

No. of blocks of 100,000 numbers …….

Percentage utilization of each block ……..

Free capacity in each block ……

Numbers in quarantine ……...

Numbers ported (if applicable)……

Give a forecast of expected utilization for the next 3 years ……

…….

3.8 Do you allow number portability (if applicable) when requested by your customers?

[ ] Yes [ ] No

3.9 Any other information you would like to add

……

……

……

INSTRUCTIONS TO APPLICANTS

3.10 Quantity of numbers required

For mobile numbers, the ICTA allocates blocks of 100,000 numbers only.

3.11 Preferred number range

You have the possibility to apply for a range of your choice or the ICTA can choose a range for you.

3.12 3Start date

State the month that you expect to put the numbers you are applying for in service

3.13 End date

If requesting a temporary allocation, please provide the date when you expect numbers requested will cease service.

Paper 3: Carrier selection in a multi-operator environment

1. Introduction

Liberalisation, amongst others, allows subscribers with a standard phone to have the freedom to use the carrier of their choice for their International Long Distance (ILD) calls, calls to a mobile phone and any other services that might be available. This is known as carrier selection. There are two main types of carrier selection, namely "**call-by-call carrier selection**" and "**carrier pre-selection**" (CPS) [1]. Call-by-call carrier selection allows consumers to choose their carrier using a specific assigned code each time a call is made [1]. In the event that no choice is made, then the call is carried by the incumbent's network. In the case of CPS, the consumers choose a carrier permanently beforehand and all calls which are dialled without a carrier prefix are routed to the pre-selected carrier [2]. The main benefit of carrier selection is that it brings an increasing choice and quality of service and makes the industry more efficient [2]. This paper will in the first place present the different alternatives that exist in terms of carrier selection. Each will be analysed in terms of their contribution to competition. Finally the best alternative will be recommended for Mauritius based on the best practice examples from a plethora of countries.

2. Carrier Selection – Principles

Carrier selection is the mechanism that permits customers to choose between long distance carriers [2]. In the case of Mauritius, the term long-distance de facto implies only ILD since there is no national long-distance calls. This principle is illustrated in Figure 1.

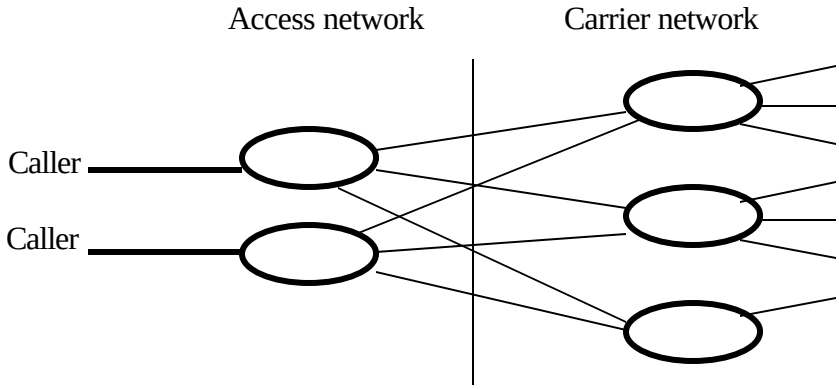


Figure 1: Principles of Carrier Selection[8]

[8] Source [2]

The callers are directly connected to the access networks. These networks are usually the local telephone networks. Note that there can be more than one access network as shown in Figure 1 above, examples of access networks are the PSTN and PLMN. The access networks are themselves connected to the carrier networks which are the long-distance networks or ILD carriers. The latter are responsible for the onward carriage of the calls made by the callers. It is important to note here that access networks providing the carrier selection facility needs to have de facto an interconnection agreement with all the carrier networks.

2.1 Alternatives for Carrier Selection

Given the high level network architecture depicted in Figure 1, carrier selection can be implemented.

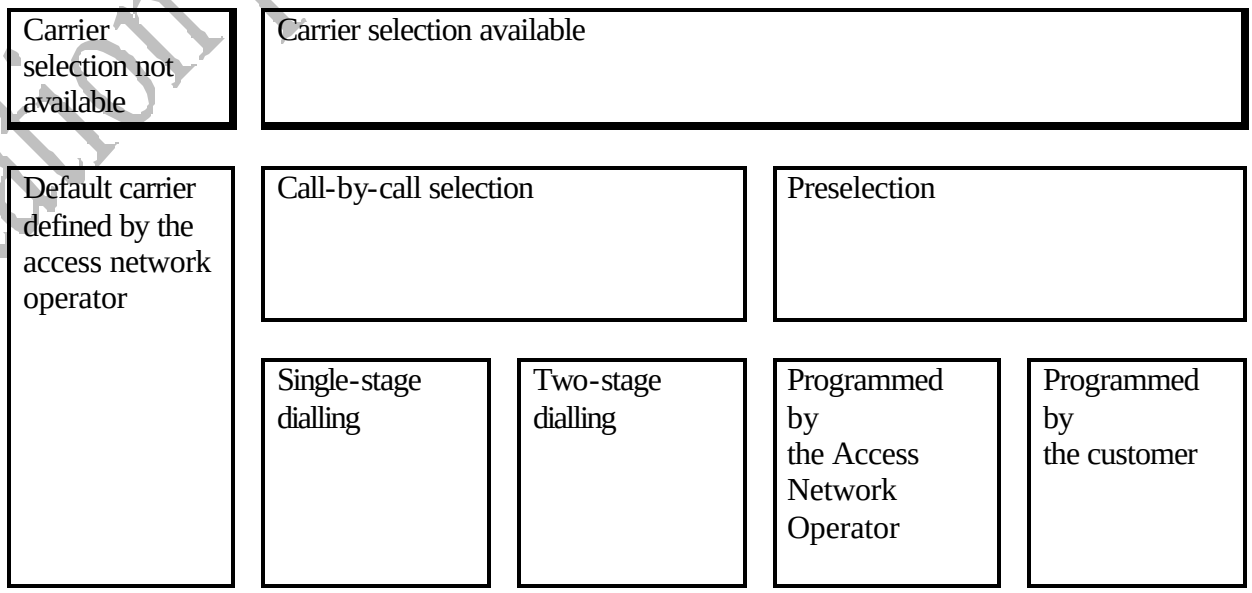


Figure 2: Alternatives for carrier selection[9]

In effect there are several ways to go about implementing carrier selection. According to [2] and summarised in Figure 2, the following alternatives exist:

1. **Default carrier**. The term default carrier is used when users have no choice of carrier at all and all long-distance calls are routed to the long-distance carrier defined by the access network operator.

[9] Source [2]

2. **Call-by-call selection**. The term call-by-call selection is used when a user has possibility to dial in each call a carrier that he wants to use.
3. **Preselection.** The term preselection is used when a subscriber can preselect his carrier beforehand. In this case, it is not necessary to dial the carrier code. Preselection can be made on a permanent basis either off-line by the access network operator (applicable today) or on-line by the user using a suitable service code procedure for changing the preselected carrier (not applicable today).
4. **Combinations** of alternatives 1, 2 and 3.

2.2 The Requirements for Mauritius in Terms of Carrier Selection

Each of the alternatives described above have their advantages and disadvantages, however the main requirements are that the introduction of carrier selection:

(1) brings competition in the ILD sector so that prices are lowered
(2) creates and maintains a level playing field for all operators
(3) is relatively cheap to implement
(4) is technically feasible given the current infrastructure
(5) is simple and user-friendly for customers to use
(6) does not lead to the depletion of the numbering resource

In case that all the above requirements cannot be satisfied equally, a compromise will have to be agreed upon.

2.3 The Options for Mauritius

The options open for Mauritius as far as carrier selection for ILD carriers is concerned, can be summarised as follows:

Option 1: Call-by-call carrier selection

Option 2: Carrier Pre-selection (CPS)

Option 3: Carrier Pre-selection (CPS) with call-by-call selection

Option 1: Call-by-call Carrier Selection: This option requires the customer to make use of a prefix code each time an international call is being made so as to select the required carrier. As

an example, assuming that there are three possible ILD carrier choices, A, B, C, excluding the incumbent, the following four digit codes can be assigned to each of them respectively: 0111, 0112, and 0113. To make a call, the customer choosing network B has to dial: (0112) (00) CC NDC SN where CC is the Country Code, NDC is the National Destination Code (when applicable) and SN is the Subscriber Number. In the event that the customer does not dial the prefix, the call is routed over the incumbent's network.

This option though easy and cheap to implement is unfair to the new entrants because it can be cumbersome and tiring for the customers to dial the prefix, or they may even forget about it. In the event that this happens, the incumbent is being favoured. Hence it is recommended that option 1 is not implemented as it is unfair to the new entrants.

It must be noted that the call-by-call carrier selection described so far is of the single stage dialling type. There exists also a two-stage dialling type whereby the customer dials the access code (usually a toll-free number) of the carrier network first so as to access its dial tone. Then the customer has to give a code for authentication and billing purposes. It is only then that the required number can be dialled.

The single stage dialling is definitely more convenient when compared to the two stage dialling. In single stage dialling authentication is carried out by Calling Line Identification (CLI), hence the customer will be able to use the carrier selection service at home only. To be able to use the carrier selection service outside the customer's home, the only way is using the two stage dialling.

Option 2: Carrier Pre-selection (CPS): In this option no prefix is necessary and the customer has to administratively pre-select the carrier who will carry all his calls. This option is termed as presubscription in the ITU-T recommendation E.164/Suppl.1 [3]. The main advantage of this method is that no prefix code has to be dialled, however additional administrative costs are involved each time a customer wants to change his preselected carrier, also no immediate flexibility is provided with this option. That is to say no immediate choice can be made by the customer in the event that another carrier is offering more competitive prices. The customer has

to go through some administrative procedures before actually being in a position to choose another carrier. This option is not recommended either.

Option 3: Carrier Pre-selection (CPS) with call-by-call selection: This third option is nothing but a combination of the previous two. With this option, the customer will have to choose his preferred carrier as in option 2, however on top of that, he is given the flexibility to override his selection and choose another carrier by dialling a prefix. This option is fair to new entrants because the dialling procedure is the same whatever the carrier network used [2]. However, it has to be noted that this method also has some disadvantages as mentioned in [2] and are listed below:

Disadvantages:

- It is technology-dependent and its implementation - in principle - is economically feasible in digital networks only.
- Implementation of this option is slow as it takes time for the switches to be adapted, and for customers to register their choice.
- There are extra costs in setting up the system.
- There are additional administrative costs each time customers change their pre-selected carrier. (These costs could be reduced later, however, by introducing procedures allowing a change of the preselected carrier on-line by the subscriber).

The incumbent's PSTN in Mauritius is fully digitalized and there should be no technical difficulty in implementing this option. **However it is imperative to consult the incumbent, namely Mauritius Telecom (MT) and the public mobile operators so as to confirm whether their system will be able to support this option.** Furthermore, this option will benefit competition and hence it is recommended that this option be implemented in Mauritius.

2.4 Technical Constraints Pertaining to Carrier Selection

The introduction of carrier selection can be subject to certain technical constraints. The constraints listed below have been identified to be relevant in Europe and are presented in [2]. It is extremely important to discuss with the incumbent about those constraints so as to be sure that the introduction of carrier selection is not hindered.

The constraints have been divided into three main parts:

(1) Network Constraints

(2) Constraints in Customer Premises Equipment (CPE)

(3) Constraints of numbering resources

(1) Network constraints

- network constraints in the number of digits that can be carried in a single sequence, and hence in the length of access codes that can be used for carrier selection
- the ability of switches to provide Calling Line Identity (CLI) numbers and hence the adequacy of billing information from the access network to the carrier network
- the number of preselected carriers the switches can accommodate
- the number analysed in the international telephone network is restricted to seven digits. Information in subsequent digits cannot be used for service or network identification in the originating exchange. In these cases a solution using the signalling network is required
- in the signalling system the protocol field carrying the called party address is limited to 15 digits
- individual preselection is not available for electromechanical exchanges. These switches cannot provide CLI either. Subscriber preselection is expensive to implement in analogue SPC exchanges
- Dual Tone Multi Frequency (DTMF) dialling is usually only available in modern exchanges
- potential constraints in the support systems

(2) Constraints in Customer Premises Equipment (CPE)

- to store and transmit a string of digits, and hence the length of access codes that can be used in a single stage carrier selection
- Dual Tone Multi Frequency (DTMF) dialling is usually only available in part of the terminal equipment

(3) Constraints of numbering resources

- when using access codes, these codes reserve capacity from SN resources of the numbering plan

2.5 The Single Basket and Multi-Basket Issue

Carrier selection has been described so far only for ILD service. However it is important to take into account that several services other than ILD can be offered by the carrier providers. One example is the operator assisted services. In such situations the term basket is used to mean a service or group of services for which an end-user can pre-select one carrier for the provision of that service or group of service [3].

The issue is whether to allow a customer to preselect one provider for the provision of a number of services, single-basket or preselect a separate provider for the provision of each pre-selectable basket, multi-basket. Muti-basket preselection would benefit the consumers however it is essential to take into account its technical feasibility and the cost involved.

2.6 Carrier Prefixes

As was mentioned earlier, a carrier prefix is required for call-by-call selection. The carrier prefix is made up of two parts: (1) the Carrier Access Code (CAC) which is common to all carriers and (2) the Carrier Identification Code (CIC) which is unique to each carrier. Figure 3 shows an illustration of the carrier prefix format.

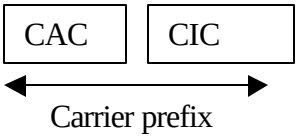


Figure 3: The carrier prefix format

For example in the code 04XX, 04 is the CAC and XX is the CIC. The carrier prefix code shall be allocated by the Authority to eligible carrier network providers for use exclusively by this provider. The allocation procedure is as depicted in Figure 4. Prefix codes which are no more in use have to be surrendered to the Authority by the carrier network provider. Codes that are used for purposes other than carrier selection shall be withdrawn from the service provider by the Authority.

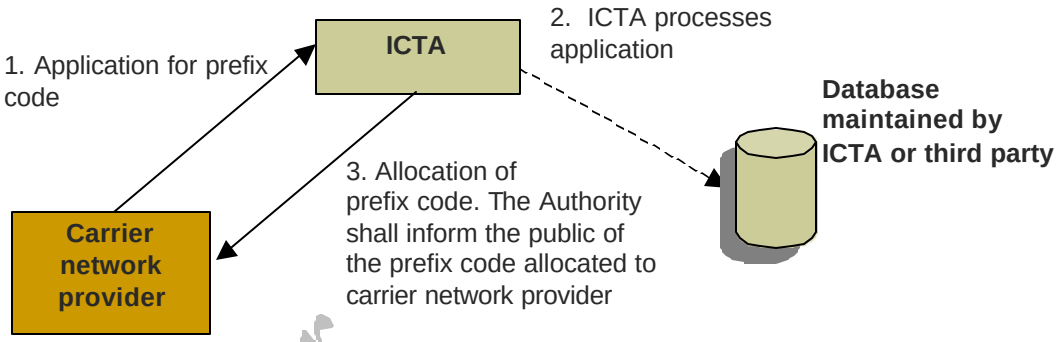


Figure 4: Prefix code allocation procedure

2.7 Carrier Selection in Public Payphones

Carrier selection in public phones is a serious issue that needs to be discussed. The only possibility for carrier selection in payphones is call-by-call selection. However there exists a billing problem with carrier selection payphones since the payphone service provider has no guarantee of covering the cost of providing the line if free calls are allowed and calling cards are used. It is imperative therefore that this issue is catered for by proper interconnection agreement between the carrier network providers and the payphone service provider.

3. Carrier Selection – Implementation Recommendations

In this chapter, the recommendations for the implementation of carrier selection are made. The recommendations concern the following issues:

(1) mechanism for carrier selection

(2) role of access network providers

(3) role of carrier network providers

(4) implementation procedure

(5) Carrier prefixes

3.1. Mechanism for Carrier Selection

The recommendation is to implement option 3 straight away, i.e. Carrier Pre-selection (CPS) with call-by-call selection if the current infrastructure permits to do so. In the event that technical problems arise, it is recommended that the implementation takes place in two phases and that option 1 is implemented in the first phase and option 3 implemented in the second phase. The

problem that will arise if the second alternative has to be implemented is that the level of competition will not be acceptable enough in the first phase as explained earlier, however it permits competitors to enter the market [2].

It would be advantageous that the multi-basket pre-selection option be implemented straight away as well; however this will depend greatly on the possibilities of the current networks. If ever due to technical problems multi-basket pre-selection cannot be implemented, then single basket option will have to be introduced first.

It is therefore strongly recommended that the fixed and mobile operators be consulted so as to know the status of their network before any concrete decision is taken.

3.2. Role of the Access Network Provider

It is recommended that **all** access network providers, including fixed and mobile, should be required to provide carrier selection facilities to their subscribers for ILD calls. They should be required to provide pre-selection with call-by-call selection if technically feasible, otherwise, they should be required to provide call-by-call selection.

3.3. Role of the Carrier Network Provider

It is recommended that **all** carrier network providers have access to carrier prefixes so as to offer call-by-call carrier with single stage dialling selection and that **all** carrier network providers have to offer pre-selection in the event that the access network providers have the appropriate infrastructure to do so. It must be noted that carrier network providers might also decide to offer only call-by-call selection with two-stage dialling and propose pre-paid cards to its customers. In the case that a provider proposes only this type of service, it may not be necessary to offer pre-selection.

3.4. Implementation Procedure for Pre-selection

There are mainly two ways that have been used to go about implementing pre-selection, these are either balloting or marketing campaigns. The issue is how to allow people decide on their preferred carriers. It is recommended that marketing campaigns be used by the carrier providers

so as to help the potential customers in their choice. It is to be expected that not all customers will preselect a carrier and there must exist a procedure of how to cater for these customers. Some alternatives are proposed in [2], ask them to choose a carrier, otherwise:

(1) calls are allocated between carriers in proportion to those who have chosen (as in the US),

(2) calls will be routed to the incumbent operator as before (as in New Zealand) or

(3) calls are allocated statistically (as in Finland).

It is recommended that issue is cleared through this consultation exercise with the stakeholders.

3.5. Carrier Prefixes

It is recommended that as explained in Section 2, the carrier prefix be made up of a two digit CAC and a two digit CIC. Hence the carrier prefix will be made up of 4 digits. It is proposed that the CAC be 04. The reason for starting with a "0" is that all other first digits are already in use in the numbering plan. The recommended length of the prefix code should cater for 100 possible carriers.

4. Conclusion

This paper is a first attempt to tackle the challenging issue of introducing carrier selection in Mauritius. As has been seen several issues have to be considered and these have to be sorted out in collaboration with the relevant stakeholders. The recommendations given are to be taken into account during consultation working sessions and amended if required.

5. References

[1] Working party on telecommunication and Information Services Policies, *Development in carrier Selection and Pre-Selection,* Organisation for Economic Co-operation and Development (OECD), 2001

[2] Jukka Kanervisto, *Final Report on Carrier Selection*, European Commission, 1997

[3] Australian Communications Authority, *Multi-basket Pre-selection, Discussion paper,* 1998

The following issues and/or questions are brought for public consultation:

1. As for Internet services, is it required to define a special number range?
2. The numbering capacity requirement for the Virtual Telephony/ Virtual Fax service is unavailable for the moment. Should these services be considered as being important to be represented in the master number plan?
3. Is there a need to plan for personalised numbers?
4. Is there a need to move towards 8 digits national numbering as the proposal?
5. What technical difficulties may arise in the implementation of the proposed plan?
6. Is there a need to reserve a large numbering capacity for paging services?
7. Is the charging principle for number block allocation reasonable?
8. Should the future plan be geographic, service, or operator based, or a combination of two or the three.
9. What are the options that prospective operators intend to offer as payphone service?
10. Should the plan cater for a special block for Internet Telephony subscribers?
11. Is call by call carrier selection a good means of selection? Substantiated suggestions are welcomed.
12. How to handle calls from subscribers who do not preselect a carrier?
13. Is multi-basket pre-selection and suitable for Mauritius?
14. Is there a demand for multi-basket pre-selection at this time?
15. What constraints are posed in the implementation of carrier selection?
16. What additional issues regarding numbering should be brought forward for discussion?