



COMMERCE COMMISSION

**DRAFT REPORT ON NUMBERING MANAGEMENT
IN NEW ZEALAND**

28 AUGUST 2008

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EXECUTIVE SUMMARY

This study is conducted pursuant to Section 9A of the Telecommunications Act 2001 which empowers the Commission to conduct studies, (including international benchmarking) into any matter relating to the telecommunications industry or for the long term benefit of end-users of telecommunications services within New Zealand.

On 6 June 2008, the Commission issued Terms of Reference for a Review of international best practice in numbering administration, to compare best practice with the current New Zealand regime.

Market liberalisation, the rise of competition and advances in technology have given numbering a significant economic dimension. Numbers have been recognised as a scarce national resource, driving the need to ensure optimum utilisation and the promotion of competition. Internationally, numbering plans have been reviewed to ensure they continue to meet the requirements of changing market conditions.

The administration of New Zealand's telecommunications resources is governed by an industry agreement, the Number Administration Deed (NAD), established on 15 December 1998, and authorised by the Commission on 17 May 1999. Significant changes have occurred in the decade since the NAD was established, and a review of those arrangements is now appropriate.

This report draws on the experiences of various countries in regard to:

- Numbering Principles and Administration;
- Numbering Allocation Rules;
- Numbering Allocation Procedures;
- Numbering Usage Rules; and
- Role of Numbers in an NGN Environment

International best practice clearly reflects the key principles set out by the WTO in 1996; the WTO Reference Paper on Telecommunications¹ sets out some key principles in relation to numbering administration:

- the national numbering plan is a national resource;
- numbering should be managed in the overall national interest, and

¹Negotiating Group on Basic Telecommunications Reference Paper (World Trade Organisation (WTO) April 1996) states that "any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely transparent and non discriminatory manner".

- numbering allocation and use should be objective, timely, transparent and non discriminatory.

In light of the drivers identified for this study, the Commission views that the following elements should also be present in a best practice number administration regime:

- technological flexibility;
- efficiency in managing demand;
- effectiveness in meeting customer expectations, and
- capacity to support emergency services.

Finally, and crucially for the success of the Commission’s broader goals, the regime should support competition for the long term benefit of end users. Convergence and increasing competition produce a need to ensure that this resource is managed effectively for the maximum benefit of consumers and service providers who can continue to plan their businesses with certainty.

The Commission’s preliminary analysis shows that the current New Zealand numbering regime does not meet best practice standards in relation to the elements set out in the table below:

Key Elements for Efficient Number Management

No	Key Elements	New Zealand Practice
1.	Numbering is recognised as a critical national resource which influences the way numbering frameworks are developed.	This fundamental principle is not recognised in the NAD. Numbering Principle 6 records that “number allocation does not affect number ownership or other intellectual property rights...”. The TCF/NAD Report has identified that “resolution of ownership issues relating to the numbering plan and number allocation” needs to be addressed.
2.	Numbering plan must be robust to accommodate technology advancements	No clear rules exist in regard to the allocation of numbers for VoIP service providers. Allocations are currently made on a case to case basis without any clear guidelines.
3.	Access to emergency services should be available from a wide range of communications services	Emergency call service requirements are set out in the TSO whereby Telecom is presently the “gatekeeper” for emergency calls. No formal framework is in place providing for wider requirements in a multi operator environment (including VoIP service providers).
4.	Public consultation	Decisions on numbering plan reviews are made by parties to the NAD based on an agreed voting structure. Recommendations on issues under review are not subject to a public consultation process.
5.	Reporting – forecast and utilisation reports are important tools for tracking utilisation efficiency and future planning	Application criteria for number allocation in the Numbering Rules do not include requirements to provide forecast and utilisation data by the applicant.

6.	Withdrawal of Numbers	The NAD does not have the right to withdraw numbers. Instead, service providers are only required to relinquish redundant capacity on their own volition which creates the risk of number hoarding.
7.	Activation timeframe	The NAD rules do not contain any obligation to activate allocated numbers within a certain timeframe, failing which the numbers will be withdrawn and re-assigned to other operators. Allocations made before the establishment of the NAD were much larger than that permitted under the current Rules. As a result, very large block of numbers have been held unactivated by NAD members since the establishment of the NAD.
8.	Transparency	The New Zealand Number Register is available on the NAD website. However, records of recommendations and decisions (notice, minutes of meetings etc) and information on ongoing work streams under the NAD are not available in the public domain.
9.	Market based allocation methods used for numbers with exceptional economic value (including short codes and premium rate services)	Allocations are based on “first come first served” principle for all number ranges.
10.	Enforcement	Enforcement powers do not include withdrawal of numbering capacity for breach of Rules.

This paper sets out the Commission’s preliminary views on international best practice and how that compares with the existing NAD principles. The Commission invites submission on the draft report from interested parties. The closing date for submissions is Friday, 19 September 2008 and should be sent either by email to sharoon.abas@comcom.govt.nz or in writing to:

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SECTION 1 PURPOSE AND SCOPE OF STUDY

Introduction

This study is conducted under Section 9A of the Telecommunications Act 2001 which empowers the Commission to conduct studies, (including international benchmarking) into any matter relating to the telecommunications industry or for the long term benefit of end-users of telecommunications services within New Zealand.

On 6 June 2008, the Commission issued Terms of Reference for a Section 9A study to review international best practice in numbering administration, and to compare best practice with the current New Zealand regime. This report summarises the current international approach to numbering administration, and:

- i. identifies the main economic and regulatory characteristics of number management;
- ii. examines the experiences and policies of a representative group of countries in respect to numbering management;
- iii. outlines international best practice for the efficient management and administration of national numbering resources; and
- iv. compares international best practice with the current New Zealand regime.

Drivers for the Study

The administration of New Zealand's telecommunications resources is governed by an industry agreement, the Number Administration Deed (NAD) which was established on 15 December 1998, and authorised by the Commission on 17 May 1999. Significant changes have occurred in the decade since the NAD was established, such that a review of those arrangements is long overdue.

In addition to the huge advances in technology, we have seen the passing of the Telecommunications Amendments Acts of 2001 and 2006, and for the first time the beginning of intense of competition in all telecommunications markets.

Significant issues in the current environment include:

a. Technology changes

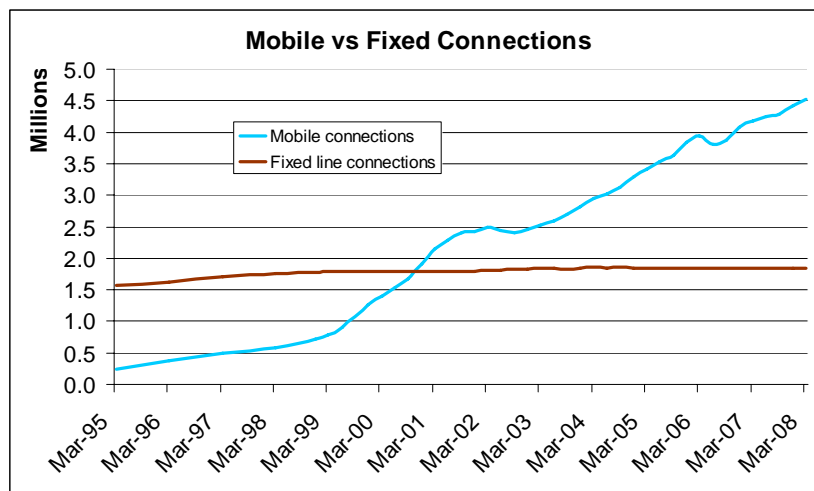
Convergence of the internet and telephony will require coordination of the telephony numbering plan and internet addresses. Voice over Internet Protocol (VoIP), which refers to the transmission of voice telephony over internet protocol (IP) networks, can be delivered either over the Internet and or over IP networks. Gateways can be used to interconnect VoIP to the PSTN or mobile networks.

Approaches to VoIP services in the numbering plan have attracted much debate internationally² over the last few years in the context of portability, number type and service obligations³.

b. Demand for Numbers

Increased competition has resulted in the entry of new players in the market and the proliferation of new services. While the fixed line market is still exhibiting very high incumbent shares, the recent introduction of UCLL in New Zealand is resulting, as expected, in increasing competition in broadband and fixed line markets. In the mobile market, mobile phone subscriptions have surpassed the 100% penetration mark. Figure 1 illustrates this growth trend.

Figure 1: Mobile and Fixed Connections Growth Trends in New Zealand



Competition in the mobile market is expected to intensify with the imminent entry of a new player, New Zealand Communications. This increasing demand for numbers raises a number of issues:

- sufficient numbering capacity is needed to meet the increasing demand. This requires forecasts of the utilisation of numbers, with the incorporation of trigger points to identify potential shortages as a useful tool to effectively manage this resource.
- numbers need to be allocated on equal terms i.e like for like basis to remove the potential barrier to entry for new entrants.

² See ERG Common Statement for VoIP Regulatory Approaches in Europe 2005; FCC Report 07-188; IDA Explanatory memorandum on policy framework for IP Telephony and Electronic Numbering; ACMA regulatory approach to VoIP services 2008

³ VoIP numbering is discussed further in Section 3 of this report

- changes to the numbering plan must be minimal. Service providers should not be constantly forced to change their technical and business processes, often a costly exercise, as a result of frequent changes.
- customer expectations must be met without causing undue inconvenience (e.g. change of dialing pattern) as a result of changes to telephone numbers.

c. Customer Expectations

Customers value numbers that help them:

- make calls to the right numbers. Numbers should be short, to make them easy to remember, find and reproduce accurately. Users also prefer a single number length and uniform number patterns.
- avoid making calls to the wrong numbers. Numbers should not be changed often or be confusingly similar to numbers that are dialed frequently.
- change service providers without having to change their existing number (number portability).
- decide to make, or to bar, calls of particular types. Numbers should have initial digits that give easily recognizable useful information about likely call costs and the location of the called party. Users rarely want to have information about the service provider and technology encoded in phone numbers.

d. Emergency Services

The availability of emergency calling (to the fire department, police, hospitals, etc.) has been defined as a core element of numbering regulation in many countries. Location information becomes more and more a requirement posed both for fixed and mobile telephony while it remains a challenge for VoIP⁴ services.

From a public policy point of view it is desirable that access to emergency services is available from as wide a range of electronic communications services as possible.

All of the factors discussed above have led to numbering plan reviews in many economies, particularly when wide-scale market liberalisation occurred in the early to mid 1990's. Following that, as technology has evolved and competition has developed,

⁴In Europe, National Regulatory Authorities could impose an obligation on certain 'non-PATS' service providers to offer emergency service access. However the practicalities of call routing and handling have not yet been resolved by the market and until they are, such an obligation may not be technically feasible and could be disproportionate.

further reviews have taken place. Table 1 indicates when reviews have been conducted by various countries.

Table 1: Numbering Plan Review Dates for Various Countries

Country	Review Dates
Hungary	1992, 2008
Singapore	2006
Hong Kong	1993, 2007
France	1996
Sweden	1994, 2002, 2008 (expected)
Australia	1997, 2007
Finland	1996
Ireland	2001, every 18 months
United Kingdom	1995, 2007

CORE PRINCIPLES FOR ASSESSING BEST PRACTICE

The issue of numbering has acquired important economic and social dimensions. Numbering is not simply a functional means of routing calls, but is a strategic tool in the development of competition and the promotion of consumer benefits.

The WTO Reference Paper on Telecommunications⁵ sets out some key principles in relation to numbering administration:

- the national numbering plan is a national resource;
- numbering should be managed in the overall national interest, and
- numbering allocation and use should be objective, timely, transparent and non discriminatory.

In light of the drivers identified by the Commission for this study, the following elements should also be present in a best practice number administration regime:

- technological flexibility;
- efficiency in managing demand;
- effectiveness in meeting customer expectations, and
- capacity to support emergency services.

Finally, and crucially for the success of the Commission's broader goals, the regime should support competition for the long term benefit of end users. Convergence and increasing competition produce a need to ensure that this resource is managed effectively for the maximum benefit of consumers and service providers who can continue to plan their businesses with certainty.

⁵Negotiating Group on Basic Telecommunications Reference Paper (World Trade Organisation (WTO) April 1996) states that "any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely transparent and non discriminatory manner".

Where the Commission observes a high degree of international convergence in regulatory practice which accords with these principles, the Commission will take the view that it represents international best practice.

SECTION 2 NUMBERING ADMINISTRATION

In recognition of the principles of objective, transparent and non discriminatory number allocation, many OECD countries were by the mid 1990s transferring number planning functions from incumbents to an independent regulator. The European Commission in its Common Position on the application of Open Network Provision to voice services stated that “Member States shall ensure that national telephone numbering plans are controlled by the national regulatory authority, in order to provide for fair competition”⁶.

Since then, the shift of responsibility from incumbent to regulator has been almost universal. The most significant exceptions identified by the Commission are Columbia and Costa Rica (monopoly markets), Burma (Government operator) and New Zealand (industry agreement)⁷.

The following functions are almost exclusively undertaken by the regulator:

- maintaining a long term vision for the numbering plan including forecasting potential shortages of numbers and activating review processes when necessary.
- setting rules for allocation. The legal status of numbers is made clear through a transparent system of rights and obligations of use to avoid creation of bottlenecks.
- adjusting rules to deal with new developments (for example, introduction of new services such as VoIP and NGN).
- public consultation. Proposed changes to the numbering plan must be publicly announced and regard must be given to views received from interested parties.
- maintaining a public register of numbers is essential to reinforce clarity and transparency in number allocation request and provide for better planning of all free blocks.

Some examples of how this is done are set out below:

United States

The Federal Communications Commission (FCC) is responsible for the formulation of numbering policies which are designed to ensure efficient and effective use of telephone numbers for the provision telecommunication services. The FCC works with the North American Numbering Council (NANC) and industry groups to achieve effective numbering resource management.

The North American Numbering Plan Administration (NANPA)⁸ function is delegated by the FCC through a competitive bidding process to a non-governmental body that is

⁶ Common position adopted by the European Communities Council (ECC) with a view of adopting EC Directive on Open Network Provision for voice telephony, July 1993

⁷ Data sourced from ITU-Telecommunications Regulatory Survey 2004.

⁸ NANP is an integrated numbering plan serving 16 North American countries that share it's resources. This approach has been in place for the last 60 years

impartial and not aligned with any particular telecommunications industry segment. This appointment is made for a five year term. NANPA is funded by the telecommunications industry under an arrangement specified in the FCC rules.

NANPA is not a policy making entity. In making assignment decisions, NANPA follows regulatory directives and industry developed guidelines. The North American Numbering Council (advisor to the FCC) via it's Numbering Oversight Working Group (NOWG) provides continuous oversight of NANPA on behalf on NANC and evaluates NANPA's performance each year.

Administration of numbering resources is done via the NANP Administration System (NAS) which is an automated system designed to:

- process number resource application
- collect resource utilisation data to measure numbering capacity and recommend relief plans where necessary
- forecast data to support forecast of the exhaust date for each code in use

Canada

Numbering resources are managed under numbering guidelines approved by the Canadian Radio-television and Telecommunications Commission (CRTC). The CRTC Interconnection Steering Committee (CISC) is an organization established by the CRTC to assist in developing information, procedures and guidelines as may be required in various aspects of the CRTC's regulatory activities which includes numbering. Participation is open to all industry members.

The Canadian Steering Committee on Numbering (CSCN) is a Working Group of the CISC and addresses numbering issues that fall under the jurisdiction of the CRTC. The CSCN establishes numbering administration guidelines which the Canadian Numbering Administrator (CNA) follows to provide numbering administration functions for the Canadian telecommunications industry.

Australia.

The Australian Communications and Media Authority (ACMA) manages the Telecommunications Numbering Plan 1997, which sets out the framework for carriage services in Australia and the use of numbers in connection with the supply of such services. ACMA is responsible for managing the existing numbering resource and planning for new numbering developments in Australia.

ACMA also has the power to delegate the allocation of certain number ranges. The allocation of freephone, local rate numbers and premium rate numbers in Australia is delegated to a non profit company known as the Industry Number Management Service (INMS).

ACMA has established a consultative process through the Numbering Advisory Committee (NAC). Representation is balanced, comprising Government, telecommunications industry, user and vendor sectors.

The terms of reference for the NAC are to provide advice and recommendations on issues related to ACMA's numbering functions, with the objective of improving the benefits to suppliers and users of carriage services and facilitating competition. Members of the NAC meet an average of more than four times a year in performing this function. Consensus views of the NAC are reflected in ACMA's papers, but not formally adopted as recommendations.

United Kingdom

The Communications Act 2003 provides that Ofcom is to ensure that the best use is made of numbers in a way that reflects a broader responsibility to benefit citizens and consumers. Ofcom has established a Numbering Forum which has the following objectives:

- increase the transparency of Ofcom's telephone numbering policy and strategy development processes;
- provide an additional channel for any interested party to express their views on Ofcom's numbering policy and strategy development;
- provide a platform to inform Ofcom of implications from numbering issues for consumers, providers and other interested parties;
- promote widespread and more effective contributions from interested parties to the policy-making process; and
- provide an additional channel for disseminating numbering-related information to interested parties on policy developments at international, EU or UK Government levels.

While the Numbering Forum is chaired by Ofcom, it is not in itself a decision-making body but it will inform Ofcom's decision-making process. Meetings of the Forum takes place at approximately six-monthly intervals and attendance is open to anyone with an interest in numbering issues.

Ireland

The Commission for Communications Regulation (ComReg) is solely responsible for designing and managing of Ireland's National Numbering Scheme. ComReg has established an industry group called the Numbering Advisory Panel (NAP) to facilitate discussions on numbering policy. The NAP is represented by network operators and a range of consumer interests groups with the aim of achieving good coverage of the major consumer issues. Membership of the NAP and its committees is identified on the ComReg website to:

- allow the public to see their contact points if they wish to raise numbering issues (e.g. transparency); and
- encourage interest in membership.

Hong Kong

The Telecommunications Authority (TA) has the overall responsibility for the numbering plan. Industry consultation is facilitated via the Telecommunications Numbering Advisory Committee (NAC). The NAC is an advisory committee consisting of members representing operators, service providers, professional engineering bodies and independent experts to advise the TA on numbering related issues.

The terms of reference of the NAC are as follows:

- to advise the TA on the development, implementation and administration of Hong Kong's telecommunications numbering plan and issues related to it.
- to advise the TA on the allocation of numbers in a fair and equitable manner to telecommunications operators and users in Hong Kong.
- composition of the NAC includes network operators, consumer interested groups, industry associations and academics.

Table 2 provides more examples of numbering administration structures in various countries.

Table 2: Numbering Administration Structures in Various Countries

Country	Regulator responsible for managing the numbering plan	Combined policy and administrative functions	Industry Advisory Groups
Australia	yes	no	yes
Finland	yes	yes	yes
Germany	yes	yes	-
Japan	yes	yes	yes
Hong Kong	yes	yes	yes
United Kingdom	yes	yes	yes
Ireland	yes	yes	yes
Finland	yes	yes	yes
Sweden	yes	yes	no
Hungary	yes	yes	no
Singapore	yes	yes	yes
United States	yes	no	yes
Canada	yes	no	yes

SUMMARY OF INTERNATIONAL BEST PRACTICE FOR NUMBERING ADMINISTRATION

Internationally, numbering has been recognised as a critical national resource and dominant feature of the telecommunications infrastructure. Policy development and planning activities for numbering schemes are designed to ensure optimum utilisation and the promotion of competition.

In most jurisdictions, the overall responsibility for managing national numbering resources is entrusted to an independent regulator. In some cases, the day to day aspects of numbering administration (for example, processing applications, forecasting utilisation, identifying shortages) are delegated to independent organisations by the regulator.

In addition, industry bodies are often formed by the regulator to promote greater transparency, and to assist in promoting efficient numbering practices. While this allows for views and recommendations to be made, advisory bodies are not empowered to make any decisions.

SECTION 3 NUMBERING ALLOCATION RULES

Typically, number ranges are divided into several generic types which indicate the service that may be offered using these numbers. Most countries differentiate between geographic and non geographic numbers. This section examines some of the current issues affecting various types of number ranges.

GEOGRAPHIC NUMBERING

Traditional numbering plans were planned around geographic codes that identified different parts of the country. This geographic system of numbering provided the basis for distance based tariffs. The geographic codes are usually standardised and all service providers share the same set of geographic codes.

VoIP Service Providers

Geographic numbering plans are being increasingly challenged by new technologies such as VoIP, which offers a substitute for PSTN services⁹. As interoperability with traditional voice services is crucial, VoIP services need adequate access to numbers for their subscribers.

An important requirement for a number range for VoIP services is that it should support the “nomadicity” feature which is a key differentiator from a traditional fixed telephony service. In other words, the service is not linked to a particular physical location and the service can potentially be provided to or from any network endpoint in the world. VoIP, however, is not inherently a mobile telephony service. It does not necessarily involve a radio access network, an authorisation to use a particular frequency band, or support cell hand-overs.

VoIP services may entail a degree of nomadicity where calls can be made and received at various locations within the country, which is arguably inconsistent with the use of geographic numbers. In some jurisdictions, nomadic use is not permitted, or permitted only within a defined numbering area. In other jurisdictions, there are no restrictions on nomadic use. Table 3 provides the status of VoIP geographic numbering in various countries.

Table 3: Status of VoIP Geographic Numbering in Various Countries

Geographic Number (non nomadic use)	Nomadicity allowed with conditions – tied to minimum numbering area	Nomadicity allowed without conditions
Austria	Belgium	Finland
Hungary	Netherlands	Switzerland
Spain	Ireland	UK
Portugal	Germany	
	Australia	

⁹ Not all VoIP services are subject to numbering

Arguments in favour of allocating geographical numbers for VoIP services have been advanced by all stakeholders:

- VoIP subscribers
 - consider geographic numbers as the most familiar types of numbers.
 - associate geographic numbers with low tariff class.
- VoIP service providers
 - consider geographic numbers as the best way to compete against PSTN operators for same reasons highlighted above.
 - will easily establish interoperability.
- Regulators
 - will stimulate competition by enabling innovative service providers to use the most popular range for VoIP subscribers.
 - strives for technology neutrality number ranges and VoIP is just a delivery technique.

While VoIP challenges the meaning of geographic number blocks, non geographic number blocks are generally considered unsuitable for VoIP services because of a concern among service providers that end users associate non geographic numbers with high tariffs.

As an alternative to geographical numbers, in some jurisdictions VoIP service providers are allocated completely new number ranges to:

- keep the existing geographical number range location based.
- give freedom to VoIP service providers to have a unique range.
- avoid the risk of exhausting geographic number ranges.

In most cases, VoIP providers are granted geographic numbers if they operate under the voice service regime (*i.e.*, voice quality of service, lawful interception obligations, access to emergency services), and specific number ranges if VoIP providers operate under the “information service” regime (based on best effort practices).

The differentiation highlights to consumers that these services are not equal, and that VoIP specific range service providers do not necessarily provide the same set of features commonly associated with public voice service. Table 4 below provides the status of VoIP numbering in various countries.

Table 4: Status of VoIP Numbering in Various Countries

Country	Geographic Numbers	Non Geographic Dedicated Ranges for VoIP
Australia	yes	yes
Austria	yes	yes
Denmark	yes	yes
Netherlands	yes	no (several ranges are open for VoIP services)
Poland	yes	yes
United Kingdom	yes	yes
Ireland	yes	yes
Japan	yes	yes
Korea	yes	yes
France	yes	yes
Germany	yes	yes
Czech	yes	yes

NON GEOGRAPHIC NUMBERING

Non geographic numbers are typically used for:

- mobile numbers
- personal numbers
- corporate numbers
- shared cost/premium rate/freephone numbers
- short codes (e.g. international dialling, directory services etc)

Mobile Numbers

Mobile numbers were originally introduced to differentiate fixed and mobile calls so that callers in a caller pays environment could identify the charges likely to be incurred. Since 1998, there have been rapid developments in the mobile market, including:

- the explosive growth¹⁰ of mobile technology driving the need for more capacity for mobile numbering. The GSM standard has led to the rising popularity of short text messages and now of multimedia messages, hence creating huge demands for short codes.
- the deployment of 3G networks (therefore introducing new market entrants)
- the emergence of Mobile Virtual Network Operators (MVNO)¹¹.
- the phenomenon of the “throw away prepaid mobile phone” and extra services like voice mail, leading to ever greater demand for numbers¹². Figure 2 and

¹⁰ GSMA statistics reveal that total connections to GSM mobile communications networks have now passed the 3 billion mark globally

¹¹There are many layers of MVNOs, some of which do not require number capacity

¹²Countries with exceptionally high percentage of prepaid users like Malaysia have had to review this numbering plans

Figure 3 below demonstrate the growth of GSM networks worldwide and prepaid growth services respectively.

Figure 2: Global Mobile Penetration Growth

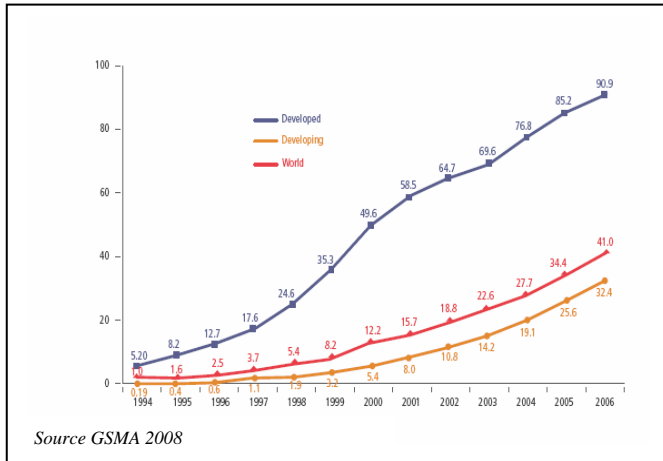
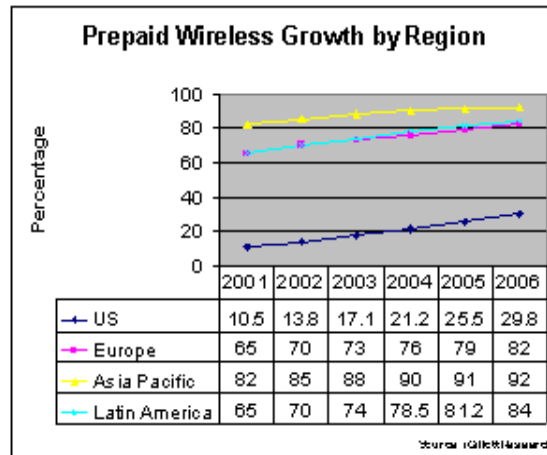


Figure 3: Prepaid Wireless Growth



Given the dynamism of the mobile market, numbering capacity limitations will affect consumers even in the short term (if not met adequately) as service providers are forced to “recycle” numbers much faster (the cooling off period before the numbers are re-used will be shortened). New subscribers will be inconvenienced by receiving calls from contacts belonging to the previous user of the number.

Thus, it is important that the continuing growth of mobile services is recognised in numbering policy decisions. This, together with a growing trend towards fixed and mobile substitution – the use of the wireless network to substitute for the copper “last mile”, with the geographic numbers ported to the device using the wireless network- has been the driver for many international numbering plan reviews.

Competition in mobile markets has resulted in innovative pricing packages, closing the gap between local and long distance calls. As a result, a growing number of countries no longer demand a relationship between numbers and geographic location. This enables a more efficient use of the scarce resource, and facilitates number portability for subscribers moving to a new location.

Another measure adopted in some jurisdictions in addressing impending shortages of mobile numbers is to add an extra digit to the mobile prefix. The ITU allows a maximum length of 12 digits. Some countries have adopted this measure to cope with demand but such changes may result in significant network and marketing costs to operators.

The size of mobile number blocks for allocation ranges from 1000 in Croatia to 10 million in Sweden. Smaller number blocks have become a common approach taken in addressing shortages as shown in Table 5. This also forces service providers to plan the use of their numbering resources more efficiently and not continue practices such as

allocating numbers to subscribers based on preferred or attractive numbers (resulting in non attractive numbers within that number range being under-subscribed and consequently, wasted). For example, the United Kingdom has reduced the mobile allocation block from 1 million to 100,000. This at the same time enables new entrants to more easily obtain numbers to compete on an equal basis.

Table 5: Allocation of Mobile Number Blocks in Various Countries

Country	Block Sizes
Denmark	10,000 to 100,000 or 100 to 1000 for smaller operators
Australia	100,000
United Kingdom	100,000
Hungary	10,000
Hong Kong	100, 000
Singapore	1,000
United States	1,000 to 10,000
Sweden	10,000,000

Short Codes

Internationally, short codes are defined as those telephone numbers which consist of no more than 7 digits. They are either used for services with high traffic volume so that public telecommunications networks will not be unduly overloaded, or where expeditious access by customers is required. Traditionally this range has been focussed on essential, operator information, carrier selection services. In Europe, these codes are also reserved for harmonisation of numbers across the EU. These include the single European emergency number 112, and the 116 range of numbers for social services.

The phenomenal growth of short messaging services (SMS) over the mobile platform has resulted in the emergence of value added service providers offering information and entertainment services such as ringtone downloads, football results etc. All these services require numbers, and have led to a preference for short codes. In some countries, service providers have agreed to use common short codes across multiple mobile networks to allow services to be provided with consistency. This has contributed towards the huge uptake of content services over mobile platforms, generating new revenue streams for service providers.

Issues which have arisen over the use of short codes include:

- permissible content;
- tariffs; and
- service provisioning practices.

In an attempt to ensure fraud prevention and consumer protection, the Electronic Communications Committee (ECC) under the European Conference of Postal and Telecommunications Authorisation (CEPT) recommended legislation or self regulation that include:

- a mechanism for tariff announcement.
- a mechanism for adequate and flexible barring of incoming and outgoing messages.
- inclusion of content information based on leading digits in these numbering ranges, which may facilitate barring of SMS.

Some regulators have developed strict rules around the use of short codes. To avoid wastage and potential abuse, they are reserved for memorable codes for special services of public interest only. Table 6 sets out the differences in approach in regard to short code regulation.

Table 6: Short Code Regulation in Various Countries

Country	Used for /Social Value	Used for Value Added Services	Industry Guidelines
United Kingdom	yes	yes	The day-to-day regulation of short codes is delegated to an independent agency by Ofcom.
United States	yes	yes	yes
Hong Kong	yes	yes	-
Greece	yes	yes	no
Denmark	yes	yes	yes
Hungary	strict use	no	no
Belgium	yes	yes	yes
Finland	yes	yes	yes
Japan	yes	yes	-
Korea	yes	yes	no

Premium Rate Services

Premium rate telephone services are services provided by companies or individuals on premium rate telephone numbers. These services are sometimes referred to as Information Services and can be recognised by their unique range of prefixes, for example, 1900, 1500. Calls to premium rate services cost more than ordinary telephone calls and generally each prefix has a specific call cost.

Issues central to premium rate services are the type of services permitted to be offered, potential abuses and transparency in charges. Ofcom conducted an indepth assessment of the non geographic category of numbers excluding mobile numbers using a consumer protection test¹³ which was adopted in Ofcom's Numbering Plan. The outcome was a strategic plan developed for Freephone and Premium Rate Service number ranges. While no real concerns were raised with Freephone numbers, Ofcom observed that there was a poor awareness of the absolute level of call charges for Premium Rate Services and the nature of micro payments (charges for procurement of the service) which is included in them. Additionally, a number of “scams” had emerged exploiting the micro payment system. All of these factors resulted in a substantial erosion of consumer trust.

¹³See Ofcom Statement on Telephone Numbering --Safeguarding the Future of Numbers, 2006

A new structure for Premium Rate Services was implemented reflecting that it is premium rate, with a division of services based on tariff bands¹⁴. The most noticeable change was the division of sexual entertainment services in a different number range (098). In doing so, regard was given to the vulnerability of children and others requiring special protection. Call barring options were also considered, and factored into the future plans on the Numbering Plan review once it is technically feasible.

Premium rate services present high growth opportunities in most markets and are increasingly being subject to various forms of regulatory controls and industry codes to safeguard consumer interests. Table 7 sets out the legislative framework for Premium Rate Services in various countries.

Table 7: Legislative Framework for Premium Rate Services in Various Countries

Country	Legislation	Industry Codes
Ireland	Regulated by an independent non-profit company formed in 1995-Regtel. Operates through a strict code of practice. Regtel also has in place procedures to deal with consumer complaints that arise from using these services.	no
Australia	Regulated by an independent regulatory body that sets fair standards for the message content and advertising of any Australian telecommunication service with the prefix 190, in the form of a Code of Practice. Service providers of 190 numbers must abide by this Code of Practice, which is developed by TISSC. Also in place, are procedures to deal with consumer complaints that arise from using these services.	yes
UK	Ofcom has responsibility for the regulation of premium rate services. PhonepayPlus acts as the agency which carries out the day-to-day regulation of the PRS market on Ofcom's behalf. The service is regulated using a code of practice. The agency investigates complaints and has the power to impose certain penalties where appropriate	no
Czech	specific	yes
Denmark	specific	yes
Finland	limited (call barring provisions)	yes
France	limited (charge bands)	yes
Germany	specific	yes
Greece	grouped – sms & audiotext	no
Hungary	general	no
Norway	specific	yes
Netherlands	smp obligation	yes
Spain	specific	yes

SUMMARY OF INTERNATIONAL BEST PRACTICE FOR NUMBERING ALLOCATION RULES

Geographic

Geographic codes are usually standardised and all service providers share the same set of geographic codes. However, fixed mobile substitution and the emergence of VoIP

¹⁴Consistent with European Commission's approach

operators and NGN is expected to erode the relationship between telephone numbers and location.

The issue commonly identified with geographic numbering is the potential shortage of numbers. The increase in demand is brought about by new market entrants and the way numbers were used by legacy networks which required them to be allocated in large blocks. Conservation measures are being undertaken to address impending shortages in geographic numbers. Best practice models are discussed in Section 5.

VoIP

VoIP is often regarded as a substitute for the PSTN voice service. In general, there is only one relevant service characteristic in which VoIP services differ from traditional fixed telephony services and that is its inherent potential to be nomadic. International best practice allows a choice of allocation of geographic numbers for VoIP services, (although the criteria for geographic numbers have been adapted in various ways to deal with the nomadic feature of the service) or allocation of a special range of numbers for VoIP services, so that VoIP service providers have the option to differentiate themselves in the market. Both categories often attract different sets of obligations discussed in paragraph 4, page 16 of this paper.

Mobile

Typically, mobile numbers are clearly distinguished from geographic numbers due to the difference in call charges between the two networks. Steady growth of the mobile industry continues to have significant implications on numbering plans.

Apart from mobile number portability which helps to relieve number shortages by letting allocated number blocks be pooled between different service providers, best practice for mobile numbers involve the allocation of smaller blocks of numbers. The rules for subsequent allocations are also being reviewed, to set a higher threshold for the utilization rate before further allocations are made.

Short Codes

Traditionally used for essential services, in recent years short codes for SMS have become popular for providing value added services. Examples include subscription services such as news and weather services. Growing demand for service interoperability between networks has resulted in the central management for short codes based on regulation, which are contained in the allocation methods.

Concerns over high and non transparent tariffs, inappropriate content and unclear business rules have also receive regulatory attention. Protection of consumers and price transparency requirements are achieved for the use of short codes through guidelines

developed by the industry. Based on international best practice, a self regulation approach is evident in this area of short code management.

Premium Rate Services

International experience suggest that frequent incidences of abuse and negative publicity in the media have heightened public awareness of the premium service industry and led to the implementation of regulatory controls to safeguard public interest. While industry codes for this purpose are reasonably common, regulatory controls over the use of premium rate services are predominantly set out in a legislative instrument. From the observations made, there is little commonality in terms of content categories and/or charge bands although the call barring facility i.e. the possibility to bar a telephone from being able to dial Premium Rate Services numbers is available in most countries.

SECTION 4 NUMBERING ALLOCATION PROCEDURES

This section examines how number assignment practices have evolved in various jurisdictions, with the purpose of identifying:

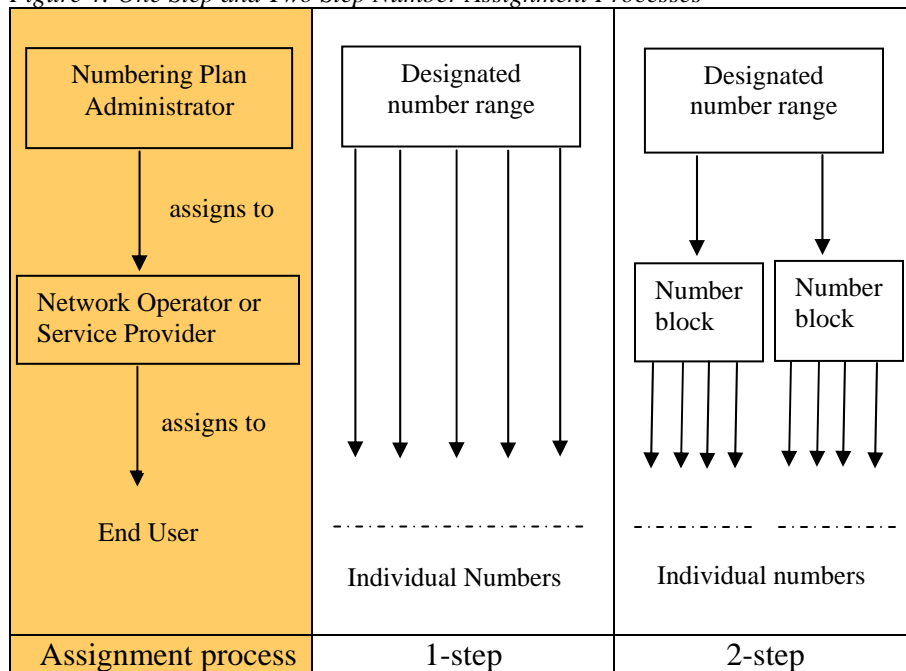
- international approaches to assignment of numbers.
- current developments and future trends in number assignment.

BLOCK OR INDIVIDUAL ASSIGNMENT

Assignment of number blocks refers to assignment of numbers in contiguous series. Individual assignment of numbers refers to assignment on a number by number basis (where more than one number is required by an applicant, it may be necessary to make a separate application for each number).

Both forms of assignments can be done in either a one step (assignment of a number directly by the national numbering plan administrator to an end user) or two step process (an initial assignment of numbers by the numbering plan administrator to a network operator or service provider, followed by the onward allocation of a number to an end user). The distinction is illustrated in Figure 4 below:

Figure 4: One Step and Two Step Number Assignment Processes



In all countries, geographic numbers are assigned in blocks. The most common block size is 10,000 numbers¹⁵. Also, in all countries, geographic numbers are assigned in 2 step process.

Similarly, mobile numbers are assigned in blocks, with the block size ranging from 1000 in Sweden to 10 million numbers in Portugal, based on a 2 step assignment format.


Individual number assignment and 1- step assignment process are most appropriate for number ranges where:

- certain individual numbers are of greater value to end users than others, or the number range as a whole is regarded as valuable (for example, because all the numbers are short).
- the numbers are subject to portability.

The countries in which individual number assignment is practiced, and the types of service numbers which are subject to this practice are listed in Table 8 below:

Table 8: Types of Number Ranges Subject to Individual Assignment in Various Countries

	Freephone	Premium Rate	Personal	VoIP	Calling Card	Innovative	Short Codes
Austria							
Czech Rep							
Finland							
Germany							
Greece							
Ireland							
Netherlands							
Norway							
Switzerland							

 Individual Assignment

While individual assignment and 1–step assignment have the potential to provide significant benefits to end users, it:

- is less cost effective than assignment of numbers in blocks.
- is impractical for certain type of numbers (geographic, mobile).
- is difficult to maintain a relationship between end users and the number administrator.
- results in increased administrative burden – updating of records, invoicing fees etc.

¹⁵ Conservation efforts have resulted in the allocation of geographic and mobile number blocks significantly reduced Example: blocks of 100 for geographic numbers in Sweden

ALLOCATION METHODS

In most countries, all number types are assigned via an administrative assignment procedure, where typically the first applicant to apply for the particular number is assigned that number range. Increasingly legislative frameworks allow for electronic assignment based on the first come first serve principle.

Market based allocation methods

Competitive methods of allocation are becoming increasingly popular for numbers regarded as having high economic value, for example short numbers, “golden numbers” and numbers that are easily remembered “Golden numbers” are numbers which provide additional value because the sequence of digits is something meaningful.


The European Commission recognises that numbers of high economic value may be assigned through competitive or comparative selection procedures, i.e. lotteries and auction¹⁶, although indicating that these methods are to be employed only after consultation with interested parties. The purpose of the consultation is to determine:

- what type of numbers are, or are not, regarded as numbers of exceptional economic value.
- whether it is appropriate to apply a particular method – auctions, lotteries or “beauty contest” to assign these numbers.

There are various views regarding which numbers could be characterised as numbers of high value. These views are summarised in Table 9 below.

Table 9: Numbers Characterised as High Value in Various Countries

	Carrier Selection Codes	Non Geographic Numbers	Short Codes	Golden Numbers	Easily remembered numbers	Special sequence of digits
Austria						
Belgium						
Denmark						
Finland						
France						
Germany						
Greece						
Hungary						
Ireland						
Netherlands						
Norway						
Sweden						
Switzerland						
United Kingdom						

 High Value Numbers

¹⁶ Article 5 of Directive 2002/20/EC of the European Parliament and the Council, 2002

Assignment of numbers via lottery

Lottery provides an equal chance to all candidates to have access to this resource and facilitates secondary trading of numbers. Where used, lotteries are generally limited to the assignment of numbers immediately after opening of a new range, but is also used in cases where more than one application for the same number is submitted at the same time. Lotteries have been used, or are allowed in several countries, as seen in Table 10 below.

Table 10: Types of Number Ranges Subject to Assignment via Lottery in Various Countries

	Country	Geographic	Mobile	Carrier Selection	Short Codes (includes directory service)
Relating to newly opened number ranges	Finland				
	Germany				
	Ireland				
	Portugal				
	Switzerland				
	United Kingdom				
Relating to numbers subject to multiple, simultaneous applications	Austria				
	Germany				
	Netherlands				

 Assignment via Lottery

Assignment of number via auction

Auctions are not a common method although it could be considered the most appropriate mechanism for the allocation of premium numbers and most efficient in terms of maximizing revenues for the state.

Netherlands introduced auctions in 2004 which applied to corporate numbers and short codes, because such numbers are considered to be of exceptional economic value. Australia introduced this system in 2004 for freephone and local rate numbers known as “SmartNumbers”¹⁷ which includes concessional arrangement for charities that want to purchase numbers via auction¹⁸.


The benefits of competitive allocation methods clearly relate to the efficiency in the allocation of numbers with exceptional economic value, as it promotes economic efficiency. Cost is an overriding factor which national administrators often need to consider prior to implementation of the same. It is worthwhile noting however, that Australia has sold over 18,000 numbers and raised a total of A\$23million using this process. Table 11 provides a summary of alternative allocation procedures in various economies.

¹⁷ See Telecommunications (Freephone and Local Rate Numbers) Allocation Determination 2005

¹⁸ Telecommunications (Freephone and Local Rate Numbers - Charities) Allocation Determination 2005

Table 11: Summary of Alternative Allocation Procedures in Various Countries

	Individual Assignments	One Step Assignments	Market Based Allocations (Lottery and/or Auction)
Australia			
Austria			
Czech Republic			
Finland			
Germany			
Ireland			
Netherlands			
Norway			
Switzerland			
Portugal			
United Kingdom			
Hong Kong			
Singapore			

 Alternative Allocation

SUMMARY OF INTERNATIONAL BEST PRACTICE FOR NUMBERING ALLOCATION PROCEDURES

Block and Individual Assignments

In all countries, national regulators are solely responsible for the assignment of almost all types of numbers (in Australia and US, the assignment process is delegated to an independent body).

While block assignments and the two step assignment process are most common for geographic and mobile numbers, individual assignment and one-step assignments are practiced for number ranges which are generally regarded as valuable. Best practice indicates that this approach is widely employed for the allocation of freephone, premium rate and short codes.

Allocation Methods

In most countries, all number types are assigned via an administrative assignment procedure, where typically the first applicant to apply for the particular number is assigned that number range. Increasingly legislative frameworks allow for electronic assignment based on the “first come first served” principle.

Market based allocation methods are widely used in most jurisdictions today for numbers considered to be of high value; short codes, golden numbers and easily remembered numbers. Auctions, are less common than lotteries although they may promote better allocation efficiency.

International trends show that the assignment of numbers via administrative procedures is most appropriate for numbers that are assigned in blocks and competitive methods of assignment are best suited for numbers that are assigned individually and in one step.

SECTION 5 NUMBERING USAGE RULES

Given that numbers are regarded as a scarce national resource, national administrators often impose restrictions and conditions on the use of numbers.

Common restrictions or conditions for usage include:

- ***Secondary assignments***
Sometimes prohibited but where permitted, the responsibility for compliance with rules of use remains with the original assignment holder. Notification of assignment must be provided to the national administrator.
- ***Transfer***
Generally, transfers are not allowed unless specifically authorised in writing by the number administrator or under number portability regimes.
- ***Requirement to activate number***
Numbers must be activated within a defined period (12 months) to prevent hoarding or under- utilisation of numbers.
- ***Reporting***
This is an important requirement to promote transparency. It represents an important tool in number planning. National administrators rely on this process to facilitate number conservation efforts through forecast and usage status reports¹⁹.

In addition to these restrictions and conditions, national numbering administrators or regulators typically have a number of powers to ensure an effective and efficient management plan for numbering, including:

- ***Right to withdraw numbers or reject further allocation***
The right to withdraw numbers or refuse further allocations for non compliance with rights of use.
- ***Trading***
An ability to choose allocation methods. See discussion on allocation methods above. Primary consideration being the cost-benefit analysis of implementing various trading options.
- ***Charging***
Setting charges for number allocations. As noted, premium charges for numbering with intrinsic value is increasingly becoming popular. Charging is also a designed

¹⁹ NANPA has developed a sophisticated system involving regular reporting by service providers to gauge the utilisation rate of numbers in areas that are potentially at risk of exhaustion. The ACMA has adopted similar approach under the Protection and Watch process.

to cover operational cost of managing numbers and may be used to fund other regulators activities and perhaps fund additional numbering related functions.

As an illustration, Articles 12 and 13 of the EU’s Authorisation Directive specifies the requirements which National Regulatory Authorities must meet in levying charges and fees related to granting of rights of use of numbers.

Two types of charges and fees are envisaged:

- charges, both one off and recurrent, which correspond to the actual administrative cost of managing the system for granting rights of use of numbers.
- fees for rights of use, in all cases recurrent, which correspond to the need to promote efficient use of numbers, and may also correspond to the value of a particular number or number range.

In Australia, ACMA administers the annual numbering charge process in accordance with the Telecommunications Act 1997, the Telecommunications (Numbering Charges) Act 1997 and a series of four determinations made by the ACMA under those acts. ACMA collects a set amount of revenue each year from carriage service providers (CSPs) that hold telephone numbers. ACMA collects this revenue through the annual numbering charges process, in each year since 1998, the revenue target has been AUS\$60 million.

Common restrictions or conditions for usage imposed by various countries are shown in Table 12 below.

Table 12: Common Restrictions or Conditions For Number Usage Imposed by Various Countries

	Secondary assignment	Transfer	Activation	Reporting	Withdrawal	Charging
Australia						
Germany		*				
Ireland						
Sweden		*				
Denmark	**					
Norway						
Greece						
Hungary		*				
Finland						

 Usage Conditions
  ** Secondary Assignment is Prohibited
 * Allowed with Authorisation Only

Conservation and Relief Efforts

There is an increasing trend for rights of use to be made explicit when service providers and end users are provided numbers. Ambiguity leads to inefficiencies in number planning, and becomes costly to rectify. Rules of use help maintain a long term vision for the numbering plan, and are also designed to facilitate conservation efforts.

Apart from number portability which can be regarded as a mechanism to improve the utilisation efficiency of numbers, other conservation measures often involve:

- number pooling initiatives
Numbers are assigned in relatively small blocks from a shared inventory within the same geographic area. Mobile numbers are also increasingly being allocated in smaller blocks and hence belong to a single pool compared to multiple pools of geographic numbers.
- charging
This measure provides operators with the necessary financial incentive to utilise numbers efficiently. It may also encourage operators to return unassigned numbers to avoid paying unnecessary fees.
- returning unused numbers for reallocation
Sequential assignments by operators are mandated to make the reclamation process easier i.e. in specified (for example, 1,000, 5,000 and 10,000) contiguous blocks. This allows for the numbers to be re-allocated to other operators.

Number efficiency policies such as those described above are implemented to delay the necessity to introduce additional numbers for as long as possible. Supplementation (adding digits) is a costly exercise for the numbering administrator and service providers as it involves:

- reprogramming telecommunications networks and customer equipment to make calls to the new numbers (most countries have extended the length of their respective national subscriber numbers at least once).
- conducting communications campaigns to raise consumer awareness of the new numbers.


Some economies have implemented closed numbering plans which have a single dialling procedure for an entire country and there is usually a single uniform number length.

Recent conservation and relief initiatives undertaken by various countries are outlined in Table 13 below.

Table 13: Conservation and Relief Initiatives in Various Countries

Country	Allocation of smaller blocks of numbers	Charging	Closed numbering plan	Withdrawal procedure	Supplementing extra digits
Australia					
Belgium					
Italy					
Hong Kong,					
Singapore					
Spain					
Switzerland					
United Kingdom					

United States					

 Conservation/Relief Initiative

Access to Emergency Services

One of the most important features of traditional phone services is that they enable users to call emergency services. The UK’s 999 emergency call service from fixed phones, the first of its kind in the world, was launched in 1937 and extended to all major towns and cities by 1948. The 999 service was introduced for mobile phone users in 1986. In 1991, the European Union established a single emergency call number, 112, which can be used anywhere in the European Union to call emergency services (so in the UK the emergency services can be reached on 999 and 112)²⁰.

Historically, regulatory arrangements for emergency calling were developed when a single incumbent provider delivered fixed-line services over a traditional Public Switched Telephone Network (PSTN) environment, thus providing virtually universal access to the emergency services. These arrangements were later extended to cover mobile services and multiple providers of both fixed-line and mobile services and some VoIP services.

Location Based Services

In its simplest form, emergency calls originating from fixed or mobile lines are usually directed either through an operator’s network or directly to a public safety answering point, where it is answered in person. Each call is then routed to the emergency authority (police, ambulance, fire brigade) although there are many variations to this basic model.

In early 2000, the EU imposed a mandatory requirement on public telephone networks operators to forward caller locations to emergency authorities²¹.

The location of calls from fixed lines are generally identifiable based on the callers area code or known address and further enhanced by the Caller Line Identity (CLI) facility. More recently, the provision of billing /installation address is provided via a direct link to the emergency authorities which is able to “pull” the required data from service providers.

The increased use of mobile phones means that more than half of emergency calls now originate from this source, the location of which is often not available. However, emergency calls are increasingly able to use the “cell ID” location method and location based technologies are expected to provide higher accuracy to enable quicker response to emergency calls.

²⁰ Council Decision of 29 July 1991 (91/396/EEC) and Directive 2002/22/EC (Universal Services Directive) of 7 March 2002. EU member states are required to ensure all end-users of publicly available telephony services and public pay phones are able to call the emergency services free of charge using 112, in addition to any national emergency call numbers.

²¹ Article 26 of Universal Services Directive (2002/22/EC)

The core issue surrounding this capability is how the cost is to be recovered by service providers. A number of different approaches have been taken in terms of cost recovery (for example, reduced license fees) while some regulators consider this requirement is a public service obligation, to be fully borne by the service provider.

Access to Emergency Services by VoIP Service Providers

The increasing use of VoIP for calls has created a further set of challenges. VoIP technology has introduced one-way services that allow users to make calls to traditional fixed or mobile phones but not to receive calls (called type 2 VoIP services) as well as two-way services that allow users to make calls to and receive calls from traditional fixed or mobile phones (called type 4 services). This has raised issues about whether consumers can call 999 from VoIP services. The various approaches taken by European regulators on VoIP and emergency services access are summarised in Table 14 below.

Table 14: Approaches to VoIP and Emergency Services Access in Various Countries

Country	Emergency Services access from type 2 VoIP services	Emergency services access from type 4 VoIP services
Denmark	yes	yes
Netherlands	no	yes
Switzerland	yes	yes
Norway	no	yes
Finland	yes	yes
Sweden	no	yes
United Kingdom	yes	yes
Germany	-	yes
Ireland	no	yes
Poland	no	no
Hungary	no	yes

The USA and Australia require type 4 VoIP services to offer emergency services access. Australia has recently decided to consult with industry on the implications of also requiring emergency services access from type 2 VoIP services²². Hong Kong requires type 2 and type 4 VoIP services to offer emergency services access. Canada requires type 2, type 3 and type 4 VoIP services to offer emergency services access²³.

Although there appears to be some degree of consistency in requiring VoIP service providers to provide access to emergency services, large differences still remain in regard to the rules applied for various other elements as shown in Table 15:

i. caller line identification

²² See http://www.acma.gov.au/WEB/STANDARD/pc=PC_310364 and [http://www.frl.gov.au/ComLaw/Legislation/LegislativeInstrument1.nsf/0/2981B0B34FC20E33CA257386000846F1/\\$file/TelecomEmergencyCallServiceAmDet2007No1.pdf](http://www.frl.gov.au/ComLaw/Legislation/LegislativeInstrument1.nsf/0/2981B0B34FC20E33CA257386000846F1/$file/TelecomEmergencyCallServiceAmDet2007No1.pdf), page 3. The July 2007 Consultation said that Australia required type 2 and type 4 VoIP services to provide emergency services access

²³ See <http://www.crtc.gc.ca/archive/ENG/decisions/2005/dt2005-21.htm>

- ii. caller location information
- iii. obligation to inform customers about the risks of VoIP services

Table 15: Other Emergency Calling Obligations for VoIP Services in Various Countries

Country	Caller line identification	Caller location information	Are VoIP providers required to inform customers about the risks to VoIP
Poland	no	no	yes
Germany	Exempted until 1/1/09	Exempted until 1/1/09	no
UK	Restricted to type 4 but will be expanded to all PECS in 9/08	Restricted to type 4 will be expanded to all PECS in 9/08	yes
Spain	Restricted to type 4	Restricted to type 4	yes
Denmark	To the extent technically feasible	To the extent technically feasible	yes
Italy	To the extent technically feasible	To the extent technically feasible	yes
Austria	yes	On request	no
France	no	To the extent technically feasible	yes
U.S	To the extent technically feasible	To the extent technically feasible	yes

Portability

One of the most important rights associated with the use of numbers is the ability to port a number. This right is available in all liberalized markets for geographic numbers, service numbers and mobile numbers. Cost-benefit studies have shown that provider portability has been delivered net benefits in high teledensity countries. Number portability for geographic, mobile and specially tariffed numbers is now universally required in all OECD countries.

Location portability is the ability of users of telecommunications services to retain existing numbers when moving from one physical location to another. In this case, a given telephone number can be associated with any network termination device, independent of location. The situation seems to vary significantly as shown in Table 16.

Table 16: Rules on Location Portability in Various Countries

Country	Voluntary	Restricted within local areas	Non geographic areas	Not possible
Ireland				
Norway				
Czech				
France				
Sweden				
Netherlands				

Location Portability Conditions

Service portability is the ability of users of telecommunications services to retain numbers when switching from one service to another service provided by the same telecommunications carrier. It is worth noting that this is made easier by having a closed numbering plan. Ultimately there might be a single pool of numbers which can be used for any purpose within a country. Denmark is furthest along this route, by providing location and service number portability between geographic and mobile numbers and Estonia, portability between geographic and nomadic numbers seems to be possible.

SUMMARY OF INTERNATIONAL BEST PRACTICE FOR NUMBER USAGE RULES

Comprehensive rules have been developed for the use of numbering resources based on the widely accepted principle that the numbering plan is a national resource. These rights of use do not amount to “ownership” as the administrator retains control over the management of the numbering plan. Numbering rules typically consist of the assignment criteria, surveillance of usage, withdrawal circumstances, charges applicable and publication obligations.

Increasing demand for numbers has led to modifications to number usage rules to ensure that existing numbers are used as efficiently as possible, to delay the introduction of any measures that may unduly impact users, businesses and the industry such as the introduction of additional numbers.

The allocation of smaller number blocks for geographic and non geographic numbers (mobile) represent international best practice. This measure requires close monitoring of the way numbers are issued to users within a specified time period (usually 12 months). Operators are required to report on their utilization statistics in areas identified by the administrator to be potentially in danger of exhaustion. This practice also enables the administrator to withdraw unutilised numbers and reassign them to another operator, hence maintaining efficient use of the resource at all times.

In addition, charging on a per number allocated basis is widely used to recover the administrative cost for managing the numbering plan, while providing a disincentive for number hoarding.

Access to Emergency Services

Emergency call service arrangements have progressed significantly from the way it was provided over traditional networks. Internationally, legal requirements have been placed on operators, both fixed and mobile, to deliver caller location information to the relevant agencies handling such calls. Various solutions have been deployed by service providers to meet this requirement depending on technology feasibility and costs.

It has been recognized that from a public policy point of view, it is desirable that access to emergency services is available from as wide a range of electronic communications

services as possible. The increasing use of VoIP for calls has created a set of challenges in this regard due to its inherent nomadic capability. Although there seems to be some degree of consistency in requiring VoIP service providers to provide access to emergency services (largely required for type 2 VoIP services), large differences still remain in the regard to the rules applied for various elements:

- i. caller line identification
- ii. caller location information
- iii. obligation to inform customers about the risks of VoIP services

Portability

Number portability is implemented universally in all OECD countries for geographic, mobile and specially tariffed numbers. On the other hand, no consistent approach has been observed for location portability and service portability.

SECTION 6 ROLE OF NUMBERS IN AN NGN ENVIRONMENT

Development in technology has driven, and will continue to drive significant changes in the way policies and rules that govern the communications industry are designed. Migration from PSTN to NGN, which in its simplest description is an all IP or packet based network allows different kinds of application to be transformed into packets and delivered simultaneously over one core network. Some market analysts predict that the entire PSTN will evolve into an NGN over the next few years²⁴.

VoIP, is already an alternative available to PSTN networks. In addition, fixed to mobile substitution, (hybrid telephone services which share the attributes of both fixed and mobile services) will increase. Vodafone's "Home Zone" product is an example of this phenomenon²⁵.

The key consequence of these developments is that the traditional linkage between telephone numbers and geographic location will start to become irrelevant. This signals a significant departure from the way numbering plans were initially designed with area codes marking geographic location.

In addition, innovative retail pricing formulas such as flat rates and expansion of tollfree areas all suggest it is timely to reconsider the way numbering plans are designed .

In the course of migrating to NGN, the period in which PSTN and IP networks will operate in parallel is expected to range from 2-4 years to 5-10 years²⁶. Hence, a mutual recognition system between circuit switched and packet switched networks becomes increasingly necessary. The Internet Engineering Task Force (IETF) has already introduced ENUM (Electronic NUMbering) as an integrated numbering scheme which allows one number to be mapped to many applications services and interface with traditional telephony. ENUM demonstrates why telephone numbers remain a key identification mechanism for users as it allows one number to be mapped to many applications services and interface with traditional telephony.

See Figure 5²⁷ below for illustration:

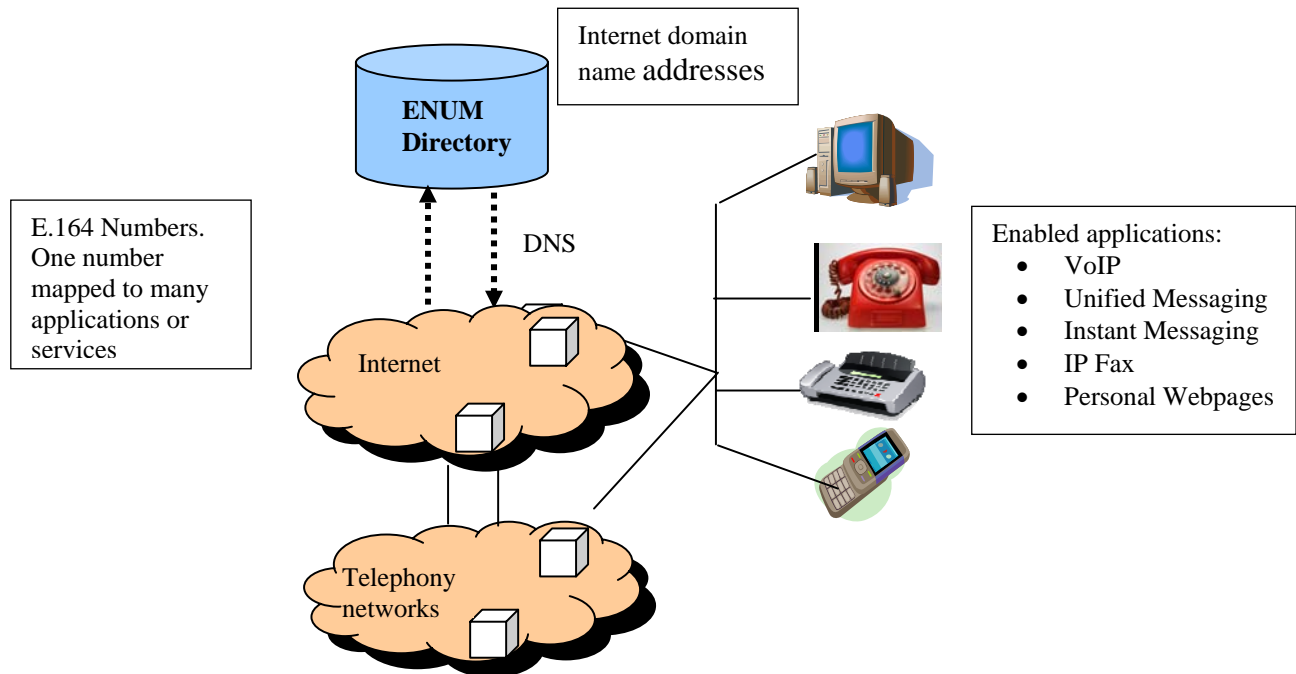
²⁴See *OECD report on NGN development in OECD countries 2005*, which predicted full migration to NGN over the next 10 years

²⁵ See <http://www.vodafone.co.nz/local-zone/index.jsp#>

²⁶ European Regulators Group (ERG) presentation at NGN Conference Copenhagen, 2007

²⁷ Telcordia, *Numbering and Addressing in the Era of Convergence*

Figure 5: ENUM Diagram



These developments have led regulators to consider making modifications to numbering policies and regulations to:

- accommodate convergence and the migration towards IP-based NGN services;
- address issues such as which number range should be assigned for VoIP; and
- consider whether traditional telephone service operator obligations should be imposed on VoIP providers.

Given that the ENUM protocol, databases and services are a key element in routing communications in IP interconnection, regulators have been urged by the ITU to encourage the national and regional implementation of ENUM²⁸.

The TCF issued a report in 2006 on ENUM²⁹ which concluded that any ENUM trial in New Zealand (encompassing both USER and Carrier ENUM) should be deferred until number portability was fully implemented, and after taking stock of the lessons learnt overseas. The TCF identified Austria, Finland and Germany as the only three countries that had rolled out ENUM commercially in 2006, while many others were in various stages of trials to assess technical requirements and implications of ENUM.

Significant progress towards the adoption of ENUM has occurred since then. ENUM is increasingly being implemented commercially in competitive markets. Although a handful of countries have chosen to put ENUM implementation on hold for lack of

²⁸ ITU Global Symposium for Regulators 2007- Best practice guidelines for next generation networks migration

²⁹ Report for ENUM in New Zealand, May 2006

interest by operators, in countries where ENUM has been commercially rolled-out, there is now a move towards interoperability among service providers (Ireland and Sweden).

The current status of ENUM implementation in various countries is reflected in Table 17 below³⁰.

Table 17: Status of ENUM Implementation in Various Countries

Production	Trial	Hiatus - Trials completed but no interest from operators towards commercial launch
Austria	China	Australia
Czech Republic	France	Sweden
Finland	Japan	France
Germany	China	
Ireland		
Poland		
Romania		
Netherlands		
Austria		
Czech Republic		
Finland		
Germany		
United Kingdom – system launch in August 2008.		
United States - scheduled late this year		

Numbering and Electronic Addressing

The international regulatory framework for administration of IP-addresses is headed by ICANN and completely separate from those in the E.164 numbering plan. At the national level similar models of self regulation have often been established in order to administer the national allocation of IP-addresses and domain names.

There is continuing debate over the utilization of IP addresses. The ITU recommended for member states to participate and follow the policy, operational and technical developments of the management of internet domain names and addresses³¹.

Discussions at the 2003 World Summit on the Information Society (WSIS) on the international management of the Internet and the role of all stakeholders triggered increased attention on Internet governance and led to the creation of a Working Group on Internet Governance (WGIG) by the United Nations Secretary-General. The main activity of the Working Group on Internet Governance is to investigate and make proposals for action, as appropriate, on the governance of Internet by 2005. The issues related to Internet governance are not limited to technical or policy areas, but also have potentially wide-ranging social, economic, and national security implications.

³⁰ Source: RIPE (a collaborative forum open to all parties interested in wide area IP networks) ENUM Working Group

³¹ ITU Resolution 102, Marrakesh 2002

The Working Group on Internet Governance (WGIG) identified what it considers to be key public policy areas for further investigation and discussion³², represented in Table 18:

- i. issues relating to infrastructure and the management of critical Internet resources;
- ii. issues relating to the use of the Internet;
- iii. issues which are relevant to the Internet, but with impact much wider than the Internet; and
- iv. issues relating to developmental aspects of Internet governance.

Table 18: Key Public Policy Areas in Internet Governance

Internet Infrastructure and Management of Critical Resources		
Physical and secured infrastructure	Telecommunications infrastructure, broadband access, convergence with NGN	
	VoIP	Peering and Interconnection
	Spectrum Policy	Technical Standards
Logical Infrastructure	Administration of internet names	Administration of IP addresses
	Administration of root server system	Administration of root zone files
	Technical system	Multilingualisation of internet naming systems
Issues relating to the use of the Internet		
Spam	Cybersecurity, cyber crime	Security of network and information systems
Critical infrastructure protection	Applicable jurisdiction, cross border coordination	National policies and regulations
Issues with wider impact than the internet		
Competition policy	Unlawful content and practices	Consumer , user protection , privacy
Electronic authentication	Dispute resolution	Access protection
Intellectual property rights	Freedom of information and media	E-commerce and taxation of e-commerce
E-government and privacy		
Issues with Developmental Aspects		
Affordable and universal access	Education, human capacity building	Internet leased line costs
National infrastructure development	Cultural and linguistic diversity	Social dimensions and inclusion
Open source and free software	Content accessibility	

Source: WGIG 2003

In 2005, the Government Advisory Committee (GAC) under ICANN in its revised set of “Principles and Guidelines for the Delegation and Administration of Country Code Top-Level Domains” strongly encouraged governments to ensure that country code Top Level Domains (ccTLD) are being administered in the public interest through public policy and national laws.

Best practice indicates a majority of ccTLDs registries are non-profit organizations formed by ISPs, in which government’s have a role. The relationship between

³² WGIG Working Group Report on Internet Governance 2005

governments and ccTLD managers are formalised in various ways. Examples include letter of acknowledgement and contract. Increasingly, countries are passing legislation to establish a legal basis for their participation in the ccTLDs associated with their country. Table 19 shows the status of this relationship in various countries.

Table 19: Administration of ccTLDs in Various Countries

Country	Status	Government Relationship	Government Involvement
Australia	Non profit corporation	Formal	Endorsement
Austria	Non profit corporation	Informal	Observer
Canada	Non profit corporation	Formal	Agreement
Denmark	Non profit corporation	Formal	Legislation
Finland	Part of Government	Formal	Legislation
Germany	Non profit corporation	Informal	Observer
Ireland	Non profit corporation	-	Legislation
Japan	Private sector	Formal	Endorsement
Korea	Part of Government	Formal	Approval
Spain	Part of Government	Formal	Legislation
Switzerland	Academia	Formal	Legislation
United Kingdom	Non profit corporation	Informal	Advisory
United States	Private Sector	Formal	Contract

SECTION 7 THE NEW ZEALAND EXPERIENCE

Numbering Administration in New Zealand

In New Zealand, Telecom New Zealand (Telecom) was responsible for the administration of numbers until 1999. Concerns relating to Telecom's claim over the ownership of numbers³³ by some telecommunications service providers led to an industry initiative facilitated by the Ministry of Commerce to develop:

- an appropriate set of principles for number administration and allocation;
- the establishment and industry funding of an independent number administrator;
- a dispute resolution process; and
- a legal framework within which such an approach would operate.

As a result, Newcall Communications Ltd, Teamtalk Ltd, Telecom New Zealand Ltd, Telstra New Zealand Ltd and Vodafone New Zealand Ltd entered into the Number Administration Deed (NAD) on 15 December 1998. The NAD is essentially a multilateral agreement, which establishes a governance body to oversee number administration.

The Ministry of Commerce wrote to the Commission on 18 December 1998, setting out the overall economic policy of the Government in relation to telecommunications numbering pursuant to Section 26 of the Commerce Act 1986. The objectives for numbering identified are:

- the efficient administration of telecommunications numbering resources
- the efficient provision of number portability

The Commission granted authorisation to the NAD on 17 May 1999 as it was satisfied that the agreement met the following policy objectives for telecommunications numbering³⁴:

- to ensure the efficient administration of telecommunications numbering resources; and
- to ensure efficient provision of telecommunications number portability.

The NAD and the number allocation rules developed by parties to the NAD represent the governance framework for number administration in New Zealand. A summary of the

³³ By virtue of it being part of the assets sold by the Government in 1987

³⁴ Transmitted to the Commission by the Ministry of Commerce pursuant to Section 26 of the Commerce Act 1986.

Number Allocation Rules under New Zealand’s Numbering Plan are provided in Table 20 below.

Table 20: Summary of Number Allocation Rules in New Zealand

General Criteria	<ul style="list-style-type: none"> • Only parties to the NAD can qualify for code blocks • Allocations made prior to the formation of NAD are not bound by these Rules if, the allocation holder is not a party to the NAD presently. • Former NAD parties (ceased membership) holding any allocations continue to be bound by these Rules • Non NAD parties are not obligated to relinquish their allocation 	
Application Criteria	Sufficient information must be provided to the Numbering Administrator to ensure that the code block applied for will be used for the specified service category	
Code Allocation	Method	First come first serve principle for all service categories
	Code Block Reservation	<ul style="list-style-type: none"> • Allowed based on the reservation period defined for each service category, after which the code block is either assigned or relinquished. • If there is a request for a Reserved Code Block, applicant holding the reservation must either relinquish the Code Block or activate the Code Block within 6 months.
	Block Sizes	Varies according to service categories. For example: <ul style="list-style-type: none"> • Geographic: 10,000 • Non geographic (mobile): 10 million
	Subsequent Allocations	Based on utilization rate - varies for each number range
Activation	No obligation to activate allocated numbers	
Transfers	<ul style="list-style-type: none"> • Allowed without need for authorization • No requirement to relinquish numbers if parties to the NAD amalgamate under one entity 	
Fee	<ul style="list-style-type: none"> • NZD10,000 per annum i.e. administration cost for managing the NAD • NZD500 per code block 	
Relinquishment	<ul style="list-style-type: none"> • Applies only when Code Block is no longer required by a NAD party • Applies to former and present NAD parties 	
Publication	<ul style="list-style-type: none"> • Public Number Register of Current Code Block Allocations and • Code Block Utilisation Statistics (optional) 	
Enforcement	Independent Chair may: <ul style="list-style-type: none"> • require to remedy the breach • require to pay a fine or compensation • suspend right to participate in numbering mechanism 	
Dispute Resolution	<ul style="list-style-type: none"> • referred to NAD Management Committee at first instance • arbitration 	
Notification	<ul style="list-style-type: none"> • MED - Updated Numbering Plan • Commission - first time allocation of geographic, non geographic and free phone service Code Blocks and if a party relinquishes all of its Code Blocks for that service category 	

Recently, members of the Telecommunications Carrier Forum (TCF) and Numbering Administration Deed (NAD) formed a joint working group to initiate a review of the governance structure for numbering in New Zealand. The purpose of the review is to identify:

- who should be responsible for managing the numbering plan
- how it should be managed

Preliminary views of the working party are contained in the “Report on the Administration of the Numbering Regime in New Zealand” which is currently undergoing a public consultation process³⁵. Key recommendations in the report include:

- preserving the self regulatory approach to numbering. However, the working party will consider “outsourcing” the regulatory oversight function to the Commission or choose to have them placed under the TCF (depends on the strength and robustness of the TCF self regulatory framework).
- a permanent Numbering Working Party will be formed which will be responsible for developing the Numbering Code and Allocation Rules. This working party will have absolute decision making powers over substantive decisions on numbering (for example, Numbering Code and Allocation Rules).

In coming to this view, the working party acknowledges that the self regulation approach is unusual by international best practice, but believes that it remains viable.

Emergency Services

In New Zealand, emergency call service requirements are set out in the Local Service Telecommunications Service Obligations (TSO) established in 2001 between Telecom and the Crown³⁶. Telecom is presently the “gatekeeper” for emergency calls in New Zealand and performs the following functions:

- conveyance and interrogation of emergency calls dialled by Telecom residential subscribers with fixed telephony access (TSO).
- conveyance and interrogation of emergency calls dialled by Telecom mobile subscribers and Telecom fixed and mobile subscribers (non TSO).
- conveyance (through transit) and interrogation of emergency calls dialled by non Telecom subscribers telephone connections on alternative fixed and mobile public telephone networks (non TSO).

The TCF was invited by the Ministry of Economic Development (MED) in November 2006³⁷ to consider developing an industry code of practice for calls to emergency services. The aim of the code is to provide the general public with the reassurance of a responsible industry approach to emergency services. In response to this, the TCF proposed to³⁸:

- produce a report containing any information that the Working Party considers would assist the Board’s decision on whether to develop a draft code;

³⁵ The draft Report was released for consultation between 14 July to 15 August 2008. Final report is due to be released on 30 September 2008.

³⁶ Prior to 2001, this responsibility was included in the Kiwi Share requirements when the telecommunications business was transferred to Telecom from the New Zealand Post Office

³⁷ See TCF Project Scope to develop a Code for Calls to Emergency Services, 21 August 2007

³⁸ See <http://www.tcf.org.nz/library/3f3807c7-b393-4b20-ae71-3e6a1926587d.cmr>

- subject to the outcome of (1), develop a non-regulated Emergency Services Code; and
- provide an ongoing forum for discussion on issues related to emergency services.

The MED further issued a discussion document on 23 August 2007 to seek input on the TSO requirements for emergency calls. The document highlighted the need to consider the multi-provider market today, strongly suggesting the need for wider industry requirements which addresses:

- emergency calls routing to emergency centres (Telecom maintains the gatekeeper role now).
- emergency call information.
- availability of emergency call service across various technologies such as VoIP.
- availability of lifeline access.

According to the discussion document, these issues were to be addressed by the Emergency Telecommunications Services Steering Group (ETSSG). This Group was set up by Cabinet³⁹ with the purpose of researching and planning for a robust public safety framework for emergency telecommunications services. The work of the Steering Group includes policy, regulatory, organisational, governance and operational aspects of emergency telecommunications services. In doing so, it will also consider models based on international best practice.

The Commission has been advised that the ETS working group has provided input to the TCF committee charged with putting together their proposed (voluntary) code of practice for Emergency Services (the TCF Emergency Services Calling Code) mentioned above.

The question of whether the provisions for emergency calling should be prescribed through regulations under the Telecommunication Act 2001 or enforceable industry codes was also raised in the discussion document.

Portability

In New Zealand, local telephone number portability and cellular telephone number portability are regulated services⁴⁰. National toll-free telephone number portability ceased to be a regulated service in December 2006. The decision to deregulate the national toll-free number portability service was based on market indications that the service was not a source of concern to actual or prospective access seekers or access providers. This service is currently provided by Telecom/Vodafone/TelstraClear. Concerns have been raised recently as to whether this arrangement is working efficiently, and whether it promotes competition for the long term benefit of end users. Market information was sought on the operation of this service by way of a letter from the Commission dated 28 June 2008.

³⁹ CBC Min (06) 16/20, 25 September 2006

⁴⁰ Schedule 1 Subpart 2 of the Telecommunications Act 2001- Designated Multi-Network Services

ENUM

The TCF report on ENUM⁴¹ concluded that any ENUM trial in New Zealand (encompassing both USER and Carrier ENUM) should be deferred until number portability was fully implemented, and after taking stock of the lessons learnt overseas.

⁴¹ Report for ENUM in New Zealand, May 2006

SECTION 8 COMPARISON OF BEST PRACTICE WITH THE CURRENT NEW ZEALAND REGIME

The Commission recognises the need for this finite resource to be managed efficiently. On the basis of its analysis of international trends, the Commission has identified a number of key aspects of number administration where New Zealand departs from international best practice:

1. Numbering is a key national resource

International recognition of this principle has in most cases, placed the responsibility of managing numbers to an independent regulator. In this regard, service providers and end users are granted usage rights based on a prescribed set of rules, not amounting to ownership.

This fundamental element is not reflected in any of the Principles⁴² set out in the NAD. According to Numbering Principle 6 of the NAD, “number allocation does not affect number ownership or other intellectual property rights...”. This issue was not addressed when the numbering mechanism was established under the NAD and remains an outstanding issue⁴³.

2. Numbering plan must remain relevant in light of changing market conditions

Technology advancement has over the years changed the way numbering plans are designed. The emergence of VoIP services, which is a key driver for competition, has had significant implications on numbering plans worldwide.

In New Zealand, no policy and/or rules exist for the allocation of numbers for VoIP service providers. Allocations are currently made on a case to case basis without any stated guidelines, potentially leaving end users confused over the nature of the service and what it is capable of offering.

3. Access to emergency services

Access to emergency services is extremely important for citizens and should be available from a wide range of communications services along with broader requirements.

In New Zealand, basic access to emergency services is provided by Telecom under its TSO obligations, is presently the “gatekeeper” for all emergency calls including

⁴² General Principles and Numbering Principles set out in the NAD

⁴³ The issue of ownership has been identified in the TCF/NAD report as an outstanding issue.

those originating from non Telecom networks. No formal framework is in place for wider requirements in a multi operator environment. At the same time, the question of where this obligation should lie (i.e. in a legislative instrument or an industry code) remains to be addressed.

4. Public consultation

In line with the general approach to regulation and/or self regulation, any proposed changes to the numbering plan must be publicly announced, and regard must be given to views received from interested parties.

Decisions on numbering plan reviews are made by parties to the NAD based on an agreed voting structure and are not subject to a public consultation process.

5. Reporting requirements

Given that numbers are a scarce resource and with increasing competition, service providers are typically required to provide forecast data (usually over a 3 year period) when applying for initial and subsequent allocations of numbers. Utilisation reports (annually) are also required for tracking usage efficiency and planning purposes.

Under the Numbering Rules, service providers are merely required to provide sufficient information to assure the Number Administrator that the allocated code will be used for the service category stated. This requirement seems insufficient to gauge the risk of number exhaustion, and assist with conservation and relief plans.

6. Withdrawal of unused numbers

Withdrawal of unused numbers represents an important function for efficient management of numbers, as it prolongs the lifespan of the existing numbering plan. In addition, sequential assignments are now typically mandated to make the reclamation process easier and to allow for reallocation to other operators.

The NAD does not have the right to withdraw numbers. Instead, service providers are only required to relinquish redundant capacity only on their own application which creates the risk of number hoarding.

Before the NAD came into being, very large allocations of non geographic numbers were made. Each of Telecom, Vodafone and TelstraClear continue to hold many millions of numbers which have not been used.

Further, the recovery mechanism under the NAD for parties who were allocated numbers prior to the formation of the NAD and no longer exist, and who ceased to be a party to the NAD and are no longer in operation, is unclear.

7. Timeframe for activation of numbers

In ensuring efficiency, this requirement is crucial to prevent hoarding and under utilisation of numbers.

The Numbering Rules do not require service providers to activate allocated numbers within a certain timeframe, failing which the numbers will be withdrawn and re-assigned to other operators. Allocations made before the establishment of the NAD were much larger than that permitted under the current Rules and these allocations are significantly greater than could be justified on any reasonable grounds.

8. Transparency

Following market liberalisation, numbering management schemes have operated based on the principles of objective, transparent and non discriminatory. Various processes have been developed to reinforce these principles.

The New Zealand number register is published on the NAD website to enable interested parties to view all current allocations. This register is updated “live” by the number administrator each time a change occurs.

However, the numbering administration mechanism under the NAD still largely operates within its circle of members. For example, issues being considered, information on past and ongoing work streams, recommendations and decisions on numbering issues are not subject to a public consultation process, and are not in the public domain.

9. Market based allocation methods

Market based allocation methods such as auctions and lotteries are used for numbers with high value. Besides encouraging efficient use, it is considered an effective mechanism to fund the number administration function and other number related initiatives, such as number portability.

In New Zealand, all allocations are still based on “first come first served” principle for all number ranges. A fee of NZD500 is charged for each code block regardless of the service categories.

10. Enforcement

Under the Numbering Rules, the Independent Chair may require a party in breach to remedy the breach, pay a fine or compensation or suspend right to participate in numbering mechanism. It is unclear what suspension means, and how effective it is. The enforcement powers do not include withdrawal of numbering capacity for

breach of the Numbering Rules, which is an important feature for effective and efficient management of the numbering scheme.