West African Common Market Project:

Harmonization of Policies Governing the ICT Market in the UEMOA-ECOWAS Space

Number Management

European Union

International Telecommunication Union

Number Management

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1.1 Introduction

The purpose of the ITU/EC project, to support the establishment of the integrated ICT market in West Africa (ECOWAS-UEMOA), is to create a uniform market framework within the community. The objective is to create a legal framework for the harmonious development of the sector and attract potential investors to ECOWAS/UEMOA countries. The project has five components, namely: interconnection, licensing, management of scarce resources (numbering plan and frequency spectrum management), universal access and model policy and legislation. The project is financed by the European Union.

Within the framework of the ITU/EC project to support the establishment of the integrated ICT market in West Africa (ECOWAS-UEMOA), best practices and guidelines on various regulatory aspects of ICTs were identified and developed. In the first phase, validation workshops were organized in 2004 on the following regulatory aspects: interconnection, licensing, numbering, spectrum management and universal access/service. Following these workshops, the comments of the participants were incorporated and the documents were revised in order for ECOWAS-UEMOA to have at their disposal a regulatory framework best tailored to their member countries in the era of the Information Society.

The first version of the report on numbering plan management was developed by Mr. Adama Nantoumé and presented at the Validation Workshop on numbering management in Ouagadougou, Burkina Faso, 14-16 December 2004. The report was revised and updated by Mr. Michael Dixon. The present document will be presented to ECOWAS/UEMOA member countries for final approval.

1.2 A numbering primer

National numbering plans (also known as numbering schemes) manage the National Significant Number (NSN), which includes the National Destination Code (NDC) and the Subscriber Number (SN). A dialing plan is the name for the numbers dialed by a caller. Number plans can be open, meaning a caller dials only the subscriber number to reach another users within the same NDC area. A closed numbering plan refers to a national requirement to use all digits of a national number (often including a trunk prefix) to place a call, whether local or long distance. (Additional information about numbering terminology is found in Box 1.) With an open number plan, users can dial fewer digits, leading to fewer misdials, and geographic area identities, including their associated tariff indications, are maintained. Closed schemes, offer uniform dialing for all calls and greater number capacity.

Increasingly, the national numbering plan is treated as a national resource to be managed in the nation's interest, including national ownership of numbers. Allocation of numbers to operators, service providers and end users is generally done on a right of use basis, meaning no ownership is conveyed in the allocation or assignment of numbers. The role for regulators includes managing numbers in a competitive fashion, treating incumbents and new market entrants alike, e.g., assigning identical geographic codes to all competitors. Regulators also engage in long-term planning to ensure adequate numbering resources are available to promote widespread information and communication technology (ICT) development.

There is increasing demand for numbers due to the growth of ICT users. At the same time, technological developments are providing solutions to enable regulators to more effectively manage their national numbering scheme.

In order to ensure international connectivity and routing, ITU Member States have agreed to a series of recommendations, including E.164. ITU recommendation E.164 provides that numbers should

be no longer than necessary, and that a maximum of 15 digits, including the country code, should be dialed internationally. Trunk prefixes, where they are used, should be the digit 0, and the trunk prefix should not be used as the first digit of an NSN. In addition, recommendation E.164 provides that major numbering plans are to be published internationally two years in advance. Additional work on numbering issues is conducted within ITU by ITU-T Study Group 2. Information about the work of Study Group 2 can be found on its website,
http://www.itu.int/ITU-T/studygroups/com02/index.asp

New issues that will affect numbering include the rise of Voice over IP (VoIP) calls and the need to map telephone numbers onto the Internet to create a global addressing scheme that applies across all networks, including traditional PSTN, mobile and IP-based networks. ENUM and other proprietary software solutions are now being tested to meet these concerns. Regulators planning for the future will closely watch these developments to ensure the effectiveness of their national numbering needs.[1]

1.3 Why number management is important

Numbering provides the external and visible framework of the telecommunications network for all users, operators and regulators. It also provides the framework by which regulation can be directed and its successes or failures measured and, of course, a basis on which investment and technical innovation may be founded and encouraged – and compared.

An effectively managed numbering plan provides users equal and easy access to various electronic communications networks and services. Most people wish to dial as few digits as possible and generally care little for the underlying technology or perhaps even think of the overall security; these things are taken for granted and only rarely considered - and then generally too late. This applies whether for business purposes, for social reasons or simply for pleasure.

An effectively managed numbering plan will ensure that numbers are assigned objectively, transparently and on a non-discriminatory basis to operators, service providers and end users.

A Numbering Scheme may be described as the framework for a given range(s) of numbers, whether used for telephone, fax, fixed wireless, mobile cellular, directory assistance, emergency calls or for revenue earning and service calls. In this way the caller may have a reasonable expectation of the number of digits to be dialed, whether or not to use a code and even an indication of the cost. In using this framework the caller may expect the number to be a unique identifier for the person, station, location or service required just as operators may then know how to charge the call.

Prior to the introduction of competition in the telecommunications sector, number management was widely within the control of incumbent fixed line operators. Ideas about number management have changed considerably during the last ten years and continue to do so as the telecommunications sector has been transformed into a competitive environment offering an increasing array of information and communications technologies (ICTs). Increasingly, number management is now the mandate of national communications regulatory authorities, while some countries are also giving greater control over numbers to end-users, e.g., through central number databases. Certainly much more is now known about the needs of callers, operators and service providers; more is also known about the importance of protecting numbers and much has been learned about their financial and service value as well as their use - as a benefit for all people. In addition, the demand for numbers has increased both with the rise of ICT users and the range of ICT services, each of which requires a number. This report will try to address this recognition of the overall benefit and discuss

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[1] The presentation in Appendix 6 provides additional information about some of these new developments.

how to manage a country's numbers to optimal effect as well as the subsequent effect of such management on the country, its economy, its citizens and its neighbours. It will also identify best practices in number management that can be used to manage this vital resource efficiently and effectively. Guidelines developed on these best practices are included in Appendix 1.

1.4 Some uses of this guide

This report is intended to offer an overview for the non-specialist as well as a discussion aid for the more experienced and although the report has tried to avoid jargon, a glossary is given in Appendix 2.

It is also hoped that, by giving illustrations of past and current numbering plans (both regionally and internationally), these examples and comments may be of some use to those managing their countries' current numbers as well as planning their countries' future schemes: hindsight is perfect but foresight is better.

1.5 Requirements and Challenges in Numbering

The topics discussed will include an outline of requirements for a Numbering Scheme and how they may be met. Before discussing these requirements the report will offer a brief history of numbering and the differing increases in customer and subscriber demand as well as some options for the future. The challenges faced by regulators include a number of key components: the creation and subsequent management of a numbering scheme or plan, the implementation of an application process for the issue and reclamation of numbers, the direct issue of numbers to end users and the determination of numbering fees as well as the more specialist topics of roaming, tariffs, competition and harmonisation.

Box 1: Number Terminology

Dialing an international number normally starts with the *international prefix* (usually, but not always, 00) followed by the country code. All the rest of the digits constitute what is known as the *National Significant Number* (NSN). This is the same as the full number that you would dial to reach the same person from within his home country, but without the *trunk prefix* if there is one (usually 0). The NSN in turn may be split into two parts: first the *National Destination Code* (NDC), often called the *trunk code* or *area code*, and lastly the *Subscriber Number* (SN).

The terms *(national) numbering scheme* and *(national) numbering plan* are here used more or less interchangeably to mean the uses assigned to NDCs and the rules for SNs within NDCs. Sometimes *scheme* may mean the larger national design while *plan* denotes a particular operator's part in that scheme. The *numbering plan* refers to NSNs, while the *dialing plan* refers to the digits dialed by a caller. A full national number from the numbering plan identifies a particular call destination (e.g., a subscriber) uniquely, and the effect of dialing it should be the same from all access networks. Short codes are part of the dialing plan because the effect of dialing them may differ depending on the access network to which the caller is connected.

Numbering and dialing plans are different where *local dialing* is permitted - this means that just the SN is dialed for connection to another user in the same NDC area. A single SN, say 234567, may be assigned to a different customer in each different NDC area. This kind of plan is known as an *open numbering plan.* The alternative, a *closed numbering plan,* exists where there is only a single dialing procedure for all national calls.

Source: ***Global telecommunications numbering issues review***, Claire Milne, Antelope Consulting, 2002
http://www.itu.int/ITU-D/treg/Documentation/Milne_Numbering.pdf

2.1 A short history of numbers - 0 to 1 and 2 to 9

Historically, telephone numbers started at one and continued upwards without any complicated requirement for a formal scheme. Indeed even with manual systems using a numeric layout the operators would usually connect by name and provide the sort of location and messaging service now only available on advanced digital systems and even then with much training. Each (manual) exchange retained a name even when automation took over, although then the numbers tended to start 2xx or 2xxx and continued until further expansion was necessary, often by inserting a 9 or another hitherto unused digit. Thus subscribers started with clarity and simplicity.

This had the benefit of obviating the use of new codes while retaining some control over the numbers. It also established the early, if almost invisible, benefit of local recognition. Callers already recognised local numbers in their village and generally rarely dialed any further, only later considering their extended area. This same pattern occurred all over the world, with some patterns spreading according to language and local style. A glance at the WATRA lists will show a preponderance of numbers beginning with the digit 2, as indeed do all the country codes. The higher digits tended to be used, although not exclusively, for single digit codes rather than for more customers (or subscribers in these early, now historic, days) and this also led to further refinements.

Where dialing has continued in an open system (where one dials local numbers only with no code or with some form of code, frequently beginning with 0 as the “escape code” to reach another area’s local numbers), as many as 50% of all calls might have been made within the local area. In 1995 in the United Kingdom, for example, 70% of calls were made within the local charging area and 70% of those on one’s own local exchange. While this is changing with the radical reductions in national tariffs and patterns of use it did set the pattern for development.

In some countries, the first digit (or second digit where the numbering scheme is still open, requiring a 9 or a 0 to access long distance routes) has given an indication of the type of call or the operator involved. Callers used this as an indication of what they might pay and for businesses of

what they might seek to prevent their staff and workers from calling. See Call Barring in Appendix 2. The report will explore this topic on indication below in the sections dealing with tariffs and competing carriers.

2.2 Current constraints and pressures on numbers and Numbering Plans

Private customers do not want to change their numbers because it causes them confusion. Business customers do not want to change their numbers because they may incur expense and the great risk of losing customers. Indeed many callers, upon hearing the change of number announcement, assume that the business has ceased trading and try another number. Operators do not want to change numbers because the engineering work can be expensive, the management and staff time invested can be prohibitive and they risk considerable difficulty if they do not foresee and prevent problems. Operators fear losing customers to another company if their competitors work more effectively. Regulators do not want to change their country's numbers frequently because of the costs to the government and because this may give rise to accusations of incompetence.

As the world develops more and more people want a full range of communications services (including voice, fax, and Internet) and this imposes pressure on operators to develop their networks and upon regulators to ensure that a supply of numbers is available and will continue to remain available. Developing countries, of course, have seen an unprecedented rise in the numbers of voice subscribers. Nigeria, for example, has grown from a total of 2 million fixed and mobile subscribers in 2002 to 12 million fixed and mobile subscribers by mid-2005. (Source: Nigerian Communications Commission website http://www.ncc.gov.ng).

It is possible to insert a spare digit into numbers, but this may upset dialing plans and hasten exhaustion elsewhere. In some countries this also ran the risk that very long numbers might not be diallable from abroad if they breached the ITU recommendation E.164 limit of fifteen significant digits, including country codes[2].

And as the number of terminations (landline, wireless and cellular as well as, now, IP-based services) grows, in some cases exponentially, competing operators want equal access to the network. This can be met in a variety of ways and the report discusses them below, drawing on examples from ECOWAS and other countries, where different conclusions may have been reached and different levels of network efficiency and customer satisfaction achieved. Table 1 below summarises some of the country practices and uses. These are detailed in Appendix 3 and illustrate the current benefits of co-operation.

The simplest way to achieve expansion is to issue new operators with a new code or a new numbering range. Despite the ease and simplicity both of these have disadvantages because callers may be confused at having the choice of two codes for a single town or city and operators may be disadvantaged by customers not wanting to take or dial the new code or number. In the United States system, the state of New York has seven separate area codes, many of them overlaid with each other. A related example is that of the Netherlands where the incumbent had suggested that new, competing, operators could have the unused digit of 7 (unused in many towns), but this was considered to be anti-competitive if callers were to be reluctant to call the new numbers, confusing them with higher tariff calls, such as mobile or Premium Rate. The regulator required the incumbent to relinquish parts of the numbering scheme to its competitors.

While such an issue of a new code may be simple and "clean" it can be regarded as anti-competitive and may lead to subsequent complications in charging and transparency. In the U.S. even the issue

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[2] Countries in West Africa, with three-digit country codes, are therefore limited to a maximum of 12 numbers for their national number and any associated code.

of a new Area Code causes considerable unrest, despite official research, sanction and approval. Lengthening the dialing to require all ten digits on local numbers (to avoid conflicts between, for example, 212 234 5678 and 718 234 5678) still proves very controversial. (This example is to serve here as an illustration and not as an exhaustive discourse.)

Where mobile growth is causing great and previously unexpected expansion (certainly in the older wire-based countries) issuing differing parts of a numbering range to different operators causes less of a problem if the initial "badge" or warning is provided when customers dial a mobile number to indicate that the number dialed is to a mobile subscriber and therefore may be a more expensive call. Users have come to understand and value this notice or warning. For example Niger uses the digits 8 and 9 at the beginning of its fixed length six-digit numbers to indicate that the call is to a mobile station or terminal. No other code is needed. The remaining digits 2 to 7 are used for geographic calls to differing areas. In Sénégal the layout is different, despite it using a closed dialing scheme where all the digits are dialed and no extra code used or discarded with the seven digit numbers (see Appendices 3 and 4). The initial digit 8 would indicate a call to Dakar, the digit 9 for a call elsewhere and the digits 5 and 6 indicating mobile or audiotext calls. There is clarity for the local caller, if some opportunity for confusion or unsureness for the visitor who has not checked beforehand. This number length uniformity is different to the UK's range of local numbers (between five and eight digits) and access codes (between three and six digits, including the initial 0 as an escape digit).

Challenges to uniformity include existing and well-known codes and numbers such as emergency assistance, international access and the overall cost of change if repeated on a frequent basis.

Table 1 – Major Features of Numbering Plans in ECOWAS/UEMOA Countries.

Country	Country Code	Internet country code	Activation date or plan readjustment	Open/ closed plan	Number of digits	Assignment of 1st digit		Position ID operator / ID geographic areas or service	NDC use Yes / No	Number of numbering areas
						Fixed network	Mobile network			
Benin	229	.bj	1963	Closed	6	2 - 3 - 4 - 5 - 6 - 8	0- 2 - 3 - 4 - 5 - 6 - 8 - 9		No	6
Burkina Faso	226	.bf	30-4-2004	Closed	8	2 - 5 - 4	7	After	No	3
Cape Verde	238	.cv	3-7-2004	Closed	7	2	9	Before	No	7
Côte d'Ivoire	225	.ci	15-1-2000	Closed	8	2-3	0	After	No	
Gambia	220	.gm	28-2-2004	Closed	7	4-5	7 - 9	Before	No	2
Ghana	233	.gh	16-12-2003	Open	3 to 6	2 to 9	*****		Yes	52
Guinea	224	.gn	21-11-2002	Closed	6	2 to 9	1 to 6		Yes / to GSM	8
Guinea Bissau	245	.gw	16-7-2003	Closed	6	2 - 3 - 4 - 5 - 6 - 8 - 9	6		No	8
Liberia	231	.lr	********							
Mali	223	.ml	29-6-2002	Closed	7	2 - 4	6	Before	No	8
Niger	227	.ne		Closed	6	2 to 7	8 - 9		No	12
Nigeria	234	.ng		Open	5 to 8	2 to 9	2 to 9		Yes	6
Senegal	221	.sn	10-10-1997	Closed	7	8 - 9	4 - 5 - 6 -7		No	2
Sierra Leone	232	.sl	7-1-02	Open	3 and 6	2 - 3 - 4 - 5	2 - 3 - 7		Yes	7
Togo	228	.tg	1-10-01	Closed	7	2-3-4-5-6-7	9 - 0		No	6

3.1 Scheme Assessment - What makes a good scheme?

In considering what basic or underlying principles might be devised to develop and guide a Numbering Scheme or a Numbering Plan (the terms are interchangeable) each country will want to build upon its inherent strengths and continue to develop its telecommunications network to the optimum point. Numbers, for example, are important both for users in a busy city with modern digital communications and high-speed Internet access and a remote village which may have only a single communications point. Users in cities may have need for multiple numbers, one for each of the various services they use. Numbers are equally important for public communications points in remote villages. Such rural public communications points may be provided through newer technologies such as fixed wireless services. In a market where end user tariffs are regulated, the regulator could plan for such public fixed wireless services to be charged at a cheaper rate, rather than the rate that might usually apply to individual fixed wireless lines, implementing this decision by assigning special numbers for public fixed wireless lines. Such a decision will, in turn, have an effect on the quantity of numbers required as well as on level of traffic or use made of the circuit and system, as well as the level of investment and the payback period.

The differences between the numbering needs of a city with many users and rural areas continue. Today, however, technology has advanced so that disparate numbering schemes, based on the development of networks over time, can be simplified. For example the UK had six hundred and thirty-eight area codes – and that was even before the advent of mobile/cellular, Premium Rate and Freephone. Similarly France was divided into two areas: Paris and everywhere else. Development of regional numbering has superseded these numbering practices as demand for telephone services has grown. In the case of the UK, with its penchant for compromise and phased numbering changes, it was necessary to utilise spare digits and not change numbers unless absolutely necessary (sometimes almost at the last minute), whereas France took a more radical approach and settled on an overnight change, putting existing codes and number ranges to different use. The UK operated a period of "parallel running" when both old and new numbers and codes worked together. The UK has also retained local dialing, that is the ability to dial local numbers in an open scheme without the use of any access code. France, on the other hand, has opted for full national dialing.

Any scheme should try to enable clarity of operation and the ability to cater for managed expansion and control, without specifying the physical and software technology to be used. The lesson from France and the UK is that both countries now have regional numbering, albeit each reached via different routes and with a different outcome. The report will attempt to show some of the strengths from both approaches.[3]

In the past many PTOs complained that the last mile or kilometre of the circuit was the most expensive part to provide and the least used, whereas it is now becoming a busy route to all manner of services. These started with telephone and then fax developed the services with dial-up and DSL Internet access following more recently[4]. So although the last mile of the circuit is increasingly well used it has given rise to a demand for more numbers as users seek access to additional services, each with a unique number with a unique indication of locality, cost or service. This is increasingly apparent with services offering several numbers to a small business or even a big household, all on a single circuit. Technology (and cost) can allow or restrict the number of simultaneous uses and so make that final circuit work harder for the money invested in plant and network.

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[3] In both of these cases the countries have chosen to include outlying islands.

[4] None of these has entirely superseded Telex, although new Telex connections are increasingly rare, because of the option of being able to prove transmission and receipt in other ways, together with faster and more robust forms of delivery.

3.2 Key Principles for Numbering Schemes

Despite disparate numbering practices around the globe, eight key points can be applied to any Numbering Scheme to enable countries to develop their telecommunications network to the optimum point. (See Box 2: Key Principles for an Effective Numbering Scheme, below). These are described more fully in the pages that follow.

Box 2: Key Principles for an Effective Numbering Scheme

Any Numbering Scheme can aim to:

1) be long-term and balanced
2) have support from the industry (operators, users and the regulator)
3) have a coherent, clear and published strategy
4) be capable of adequate management
5) enable future development
6) remember and consider neighbours (continental and world neighbours)
7) not be anti-competitive to Telecommunications Operators
8) not be anti-competitive to users

3.2.1 Any Numbering Scheme should be long-term and balanced

Any numbering scheme should be long-term and balanced to reduce strain and promote ease of use by operators, service providers and users. A long-term approach is also vital as the growing array of ICT services places greater demand on national numbering capacity. Avoiding frequent number scheme changes will reduce disputes brought by operators and service providers concerned about the effect of these changes on their businesses. A long-term and balanced numbering scheme can seek to address issues such as customer confusion and fairness to operators and will protect number managers from allegations of unfairness or mismanagement.

Some countries still have ranges where the subscriber's (customer's) number, excluding any code, might be five, six, seven or eight digits, and where the code might still vary in length. This can lead to confusion and misdials when users are uncertain what the total number of digits should be. It can also cause imbalance where longer term customers have short numbers and newer ones have longer numbers and may even need to use a code, again giving rise to confusion and even prompting accusations of unfairness, bias, or, at least, mismanagement

3.2.2 Any Numbering Scheme should have support from the industry (operators, users and the regulator)

When planning a numbering scheme it is important to have support for the scheme or it may become difficult both to manage it and to meet legal obligations. In the days before more formal regulation, frequently now with a national regulatory authority, the number planning was carried out by the single, incumbent operator. Incumbents managed the scheme or plan to optimum effect, but without any need for competitive awareness. As an interim the same staff then carried out planning on behalf of the regulator, while remaining paid by their employer – the operator. This could give rise to accusations of bias where the incumbent operator had shorter numbers and newer operators and customers might have to have longer numbers, often beginning with previously unused digits or even with a separate code.

It is possible to prevent such issues by the use of cross-industry groups where members may be operators, ISPs, business and residential users and other relevant participants – as well as the regulator. Many countries have found these groups very effective in trying to ensure that all avenues are explored and concerns aired and addressed. Australia and the UK offer examples where the regulator worked closely with such groups in developing models for full public consolidation and this pattern is developed throughout the world.

In this way the considerable experience of interested parties may be harnessed for the good of the country and effective checks and balances may be applied. Such an arrangement, however, cannot compensate for an overall vision of what the regulator is trying to achieve for its country's callers.

In drawing on and gaining from the experience of such individuals and groups it is helpful to be able to prepare discussions and consultations in advance of promulgation, including public consultations. In 1992 the Australian regulator did this and achieved considerable benefit in being able to develop its vision for the future – to the benefit of the country. (See also discussion of public consultations in following Key Principle on strategy).

The earlier work of the European Radiocommunications Office (ERO) (as the European Telecommunications Office (ETO) and part of the European Conference of Postal and Telecommunications Administrations (CEPT)) examined the options and benefits of regional numbering and cooperation and this expert analysis led to both savings and progress in number use and development. The work of ETO and CEPT led to a regional agreement to leave one number spare to accommodate subscriber growth and to use harmonized emergency codes.[5] Other regions are also involved in harmonized numbering approaches, including the North American Numbering Plan and the South Asian Telecoms Regulators' Council (SATRC).

3.2.3 Any Numbering Scheme should have a coherent, clear and published strategy

Numbering Schemes should be developed based on a coherent, clear and published strategy. The strategy may be used to encourage development and expansion, within certain guidelines that meet the other seven principles for Numbering Schemes. The strategy may include provision for trading, portability, ownership and rental (to the extent these are to be authorized or promoted), as well as the rules by which operators may apply for and use numbers. In this way control may be exercised so that, for example, operators may not provide premium rate and revenue sharing numbers on those parts of a numbering range issued and used for normal geographic numbers.

Similarly the rules may define those parts of a numbering range that may be used for service and emergency codes. In this way the operator may know how to develop their network and what they may and may not do. The strategy should also allow for the future and so declare which digits are to be held in reserve for expansion, as well as defining the type of expansion and the migration route or path. This can therefore allow for new services and opportunities without defining or restricting the technology to be used.

The regulator may choose to determine a maximum tariff for each type of call or for each part of the numbering range. While there is the risk that operators may treat this as the *de facto* rate, rather than a price ceiling, this can be addressed by effective competition. The watchword is strategy, rather than tactics; for example the regulator may choose to require emergency calls to be carried without charge to the caller, but it may not be equitable for the operator to subsidise this and so consideration of the costing and operation may be appropriate.

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[5] Additional information about this work is summarized in the report, Global telecommunications numbering issues review, Claire Milne, Antelope Consulting, 2002available at http://www.itu.int/ITU-D/treg/Documentation/Milne_Numbering.pdf

Number managers can publish their draft strategy on their websites as part of the public consultation process, giving it wide circulation at minimal cost. Where possible the publication of comments, subject to any appropriate confidentiality, can provoke and develop discussion, enabling input to be harnessed and used to find effective solutions.

3.2.4 Any Numbering Scheme should be capable of adequate management

Numbering Schemes require adequate management to inform users and operators of changes, thereby avoiding confusion to users and to operators, with dire consequences to both. In the past it was often considered necessary merely to send a postcard to subscribers to tell them that their numbers were to change in a few weeks' time (for those operators that bothered). Simply adding a digit to the front of the existing subscriber number (prepending a digit) generated more or extra usable numbers and often extended the life of equipment and plant with relatively minor disruption. Nowadays the regulator has moved from what started as mere administration and into management – with all the risks that that entails.

Management is also necessary to ensure that no number ranges—such as for geographic areas, mobile or Freephones—face sudden exhaustion, leading to stifled growth and development. Management could include balancing allocation according to an operator's working requirements or by statistical forecasting based upon historic and population data.

Regulators will find it important to find the right level of management to enable effective implementation of the Numbering Scheme without micromanaging and losing sight of the overall plan. The regulator may be in the position to call on expertise and assistance to enable more effective management. The regulator can also conduct audits, measuring number use, to evaluate the effectiveness of its planning and management. Here it is helpful for the regulator to determine use of its numbering scheme so that early plans to mitigate exhaustion of numbers (whether in a local area or as part of a specific operator's block) can be made in ample time.

3.2.5 Any Numbering Scheme should enable future development

Numbering Schemes can be designed to enable future development, rather than restricting certain digits to specific uses in a narrow fashion. Today, a series of technological and market developments are giving rise to numbering schemes that will enable future development.

Many countries have adopted the digit 7 for mobile, the digit 8 for Freephone and special services and the digit 9 for premium rate and shared revenue. Although such practices are widespread and may be likely to continue for some years, such tight control was more necessary with older equipment. As noted above, such numbering schemes have served the role of making consumers aware of the costs of the calls they are about to dial. Now, however, networks can automatically tell the caller, in speech, the cost of the call before it is connected. Technology can both enable national ICT development and protect callers from unwittingly placing expensive calls.

Likewise, the Internet offers callers the chance to make a greater number of calls at a lower cost, often causing the incumbent carrier to rethink its business plan. Restricting a numbering scheme only to fax or telephone calls can stifle development and, ultimately, cause failure of the operator.

Increasingly, technology provides solutions to issues that in the past could only be addressed by numbering planning. Some countries, for example, have sought to create linked regional codes for neighboring countries to ease dialing for users. The need for such codes has diminished, however, as faster digital networks and the use of press-button (or keypad) dialing becomes more commonplace.

As countries introduce number portability to increase competition, geographic, network and service-based numbering schemes may no longer make sense as customers port their existing numbers to new geographic areas, networks or service providers. However the opportunity to

review the means and the ends of portability in all types of numbering can be very valuable. Those services where digit analysis may be carried out simply and easily, such as mobile, Freephone and Number translation services, are particularly suited. Other fields, such as geographic numbers may incur too great a cost for too little result.

ENUM (**E**lectronic **NU**mber **M**apping**)** will allow a telephone number to be converted into an Internet address. (See Box 3: What is ENUM?). ENUM does not strictly draw on numbering resources, but does offer a further method of using numbers. ENUM trials in Austria and Ireland have shown that the developments are useful. Even while ENUM is under examination, however, there is the simultaneous development of alternative solutions such as proprietary ones and a peer-to-peer system for locating Internet gateways to telephony services like the Distributed Universal Number Discovery (DUNDi).

Voice over IP (VoIP), like ENUM, is causing number managers to examine the use of numbers both as a name and Internet address. Moreover, in many countries the opportunity to take a local geographic number and have it delivered via the Internet for access on a computer anywhere is providing an extra demand on the numbering space. While it may provide effective and high use of a numbering block (whether, 1,000 or 10,000 numbers) it is still a demand that is recognised and can be built into the strategy. Additional information about VoIP numbering issues can be found in Box 4: CEPT Electronic Communications Committee (ECC) Report on VoIP Numbering and Appendix 5.

Numbering managers of course cannot predict everything that will happen, but they may be wise to refrain from making predictions of what they think cannot happen and so leave no option(s) available. The ability to predict the future is rare, but the ability to predict that numbers, or some form of addressing, will be required is innate to all numbering managers.

Box 3: What is ENUM?

ENUM is a protocol that is the result of work of the Internet Engineering Task Force's (IETF's) Telephone Number Mapping working group. The charter of this working group was to define a Domain Name System (DNS)-based architecture and protocols for mapping a telephone number to a Uniform Resource Identifier (URI) which can be used to contact a resource associated with that number. The protocol itself is defined in the standards track document "E.164 number and DNS" (RFC 2916) that provides facilities to resolve E.164 telephone numbers into other resources or services on the Internet. ITU-T Recommendation E.164 is the international public telecommunication telephony numbering plan. The syntax of Uniform Resource Identifiers (URIs) is defined in RFC 2396 (1998). ENUM makes extensive use of Naming Authority Pointer records defined in RFC 2915 in order to identify available ways or services for contacting a specific node identified through the E.164 number.

What is ITU-T E.164? Are there related standards? Recommendation E.164 describes the international public telecommunication numbering plan. Recommendation E.190 describes the general principles to be utilized in the assignment of ITU-T E-Series international numbering resources. Recommendation E.164.1 describes the procedures and criteria for the reservation, assignment, and reclamation of E.164 country codes and associated Identification Code (IC) assignments. The criteria and procedures are provided as a basis for the effective and efficient utilization of the available E.164 numbering resources.

How is the related domain name system (DNS) zone constructed? For example, lets construct the related DNS zone to look up resources associated with the information desk of the Louvre Museum in Paris, France, which can be found at the telephone number +33 1 40 20 51 51.

Write the E.164 number is written in its full form, including the country code.

Example: +33 1 40 20 51 51

Remove all non-digit characters with the exception of the leading '+'.

Example: +33140205151

Remove all characters with the exception of the digits.

Example: 33140205151

Put dots (".") between each digit.

Example: 3.3.1.4.0.2.0.5.1.5.1

Reverse the order of the digits.

Example: 1.5.1.5.0.2.0.4.1.3.3

Considering the recommendation of the Internet Architecture Board, append the string ".e164.arpa" to the end.

Example: 1.5.1.5.0.2.0.4.1.3.3.e164.arpa

For further detailed information about ENUM, please consult ITU-T's ENUM webpage at: http://www.itu.int/ITU-T/inr/enum/index.html

Source: Extracted from the Frequently Asked Questions section of the ENUM webpage of the Strategy and Policy Unit, General Secretariat, ITU. http://www.itu.int/osg/spu/enum/index.phtml

Box 4: CEPT Electronic Communications Committee (ECC) Report on VoIP Numbering

The ECC report on VoIP numbering examines a number of Numbering options for VoIP including:

– relaxing or re-formulating the allocation criteria for existing number ranges and,

– introducing new number ranges.

This approach would leave discretion to national regulatory authorities and allow for VoIP service providers to have a choice of number ranges, provided that they meet the relevant criteria. The study aims to be generally applicable to VoIP services that need interoperability with a traditional voice service.

ECC concluded a modified geographic number range and the opening a new number ranges are most likely to meet the interests of VoIP subscribers, calling end-users, VoIP service providers, and NRAs in a balanced fashion.

ECC based its conclusion on two key requirements for a number range for VoIP services:

– it should support the new service features of VoIP services (where "nomadicity" is the most relevant)

– it should enable competition with traditional voice services.

The committee further indicated that while the geographic number range bestsupports competition, the impact of modifying allocation criteria to support nomadicity needs consideration by national regulatory authorities (NRA). A new number range (or ranges) is able to support nomadicity best, but the ability to support competition needs consideration by the NRA.

ECC recommends that NRAs consider the advantages and disadvantages identified in the report and choose one or several options to achieve a consistent national E.164 numbering plan that supports both VoIP services and traditional voice services.

Source: Numbering for VoIP Services, Report 59, Electronic Communications Committee (ECC) within the European Conference of Postal and Telecommunications Administrations (CEPT), June 2004.

http://www.ero.dk/8E487DA7-1C6C-4E9A-94A8-29861A28F552

3.2.6 Any Numbering Scheme should remember and consider neighbours (continental and world neighbours)

Numbering schemes can be developed to consider regional and global practices. While a single pan-ECOWAS numbering regime is likely impractical, since it would require expensive wholesale renumbering of every subscriber, there is merit in ensuring that some numbering practices are similar throughout the region. The introduction of the ITU single code for emergency use is of great value especially to mobile customers and visitors. Many countries have adopted 999, 911 and 000 for emergency access for a variety of reasons and yet many of them are also seeing the benefit of using 112 alongside their existing specific emergency codes[6]. Most callers dialing emergency codes are doing so under conditions of stress, making ease of calling imperative. This is one example where the WATRA countries might also lead the world by harmonizing adoption of the 112 emergency access number.

[6] There is one further obstacle where business systems are concerned and this is where it is necessary to dial an access digit for a public exchange line. This would, in many instances, cause an emergency call to 112 to fail, unless the initial 8, 9 or 0 external access digit was dialed, by the caller or by the system being correctly programmed.

Technological advances have largely superseded regional numbering practices. As noted above, faster digital networks and the use of keypad dialing means that international access digits and international codes no longer present barriers to making the call. Similarly, automatic warnings on call tariffs can serve to protect consumers.

When the original telephone service for Kenya, Tanzania and Uganda was provided by East African Posts and Telecommunications Corporation (EAPTC) there was an integrated numbering plan among the countries. Area codes beginning with 1, 2 or 3 were in Kenya, area codes beginning with 4 were in Uganda and area codes beginning with 5 and 6 were in Tanzania with codes beginning with 7 being used for mobile/wireless. When the EAPTC dissolved into separate carriers or operators for each country nearly thirty years ago service development and rising demands for numbers eventually meant that the earlier integrated numbering plan could no longer be maintained easily among the three countries. The plan was effectively ended with Tanzania's national renumbering in July 1999. However, in the interest of preserving convenient dialing access within the East African community of interest, the three countries adopted access codes 005 (Kenya), 006 (Uganda) and 007 (Tanzania). Thus, there remains no need within these three East African nations to use international dialing via the more usual (and universal) ITU country codes +254 (Kenya), +255 (Tanzania) and +256 (Uganda).

A similar scheme was mooted for Europe to avoid the need to dial the earlier longer international access codes (e.g. 010 in the UK) followed by the ITU country code, but this fell by the wayside before it could be introduced. The reasons were that it would have required the alteration of most of the Region 3 and 4 country codes and because memory and key phones became more widespread, removing the need.

3.2.7 Any Numbering Scheme should not be anti-competitive to Telecoms Operators

Numbering schemes should be designed so they are not anti -competitive to telecoms operators. The majority of countries have adopted competitive regulatory frameworks to foster the development and expansion of national telecommunication and ICT services. The role of the regulator is to ensure the fair treatment of all competitors and guard against anti-competitive conduct.

Competition may be affected by the allocation of existing or short numbers to the incumbent operator and new numbers of greater length to new operators. This might be illustrated by the allocation of a separate or different code to a new or competing operator or service provider in the same area or village. Regulators seeking to ensure a level playing field among all competitors have required incumbents to relinquish portions of their numbering scheme to competitors.

3.2.8 Any Numbering Scheme should not be anti-competitive to users

A properly functioning numbering scheme is essential to foster a market that will provide end users with the highest quality services at the lowest prices. Users require adequate information about the costs associated with the numbers they dial so they are not shocked by unexpected roaming charges, or calls to premium numbers or dial-up Internet access that users may forget to turn off. This can be provided by oral warnings as users place calls as well as consumer awareness campaigns. As competition leads to lower prices, at least for basic voice services and Internet access, the need to warn consumers of high prices should diminish. Consumers, nevertheless, will continue to require access to comparative tariff analysis as well as reliable information about premium rates.

Without the confidence of users telecommunications will not be developed or even be used to capacity. Confidence can be destroyed by errors, overcharging, poor facilities or poor quality – and, of course, a combination of them all. Operators have a responsibility to charge fair and reasonable tariffs. Users need to have confidence that their calls will be carried clearly and correctly and that

they will be billed in an accurate and timely manner. They also need to know what routes are available for complaint and, if necessary, arbitration, whether provided by the regulator or another entity. Users need to know that the networks and services are not provided simply to take money from them, but that they can expect a working service in return.

3.3 Additional Principles for Numbering Schemes

Additional principles may also be applied to numbering schemes, depending on the nation's ICT development goals. Many of these issues are developed in the sections below. These additional principles include developing numbering schemes to:

- allow for direct assignment of numbers
- allow for rental of numbers – to allow cost recovery of managing the numbering scheme
- allow for sale and differential rental of golden numbers
- allow for short numbers – at a greater cost, because of the extra use of numbering space, even when not currently required
- allow for issue and control of access codes
- allow for accurate and timely audit of numbers
- allow for roaming – locally and intra-nationally
- allow for reclamation of codes and numbers
- allow for auction and allocation – to ensure that full value is gained from a scarce resource
- allow for cost indication where appropriate – where valuable protection would be gained from appropriate warnings and notices
- allow for destination indication where appropriate – this is currently done with initial digits
- allow for barring and restriction by users – so that they could opt in to more expensive types of calls if required
- allow for portability
- allow for competitive directory assistance
- allow for integration with ENUM or other solutions – so as not to exclude users
- allow for Voice over IP services – so that development may continue
- allow for optimisation of number block sizes – so as to extend scheme life
- allow for optimisation of number block issue – so as to enhance operation
- allow for eventual individual number allocation
- harmonise emergency and access codes
- avoid technology prescription
- allow for radio, TV and film use
- prevent abuse of numbering call charging
- require accurate and fair Calling Line Identification – to prevent fraudulent and abusive use

4.1 Assignment of numbers

4.1.1 Who assigns numbers?

The first issue to be addressed by policy makers is to identify which entity will assign numbers. In pre-competitive markets, incumbent fixed line operators were responsible for number assignment and allocation both to end users as well as other operators. Today, worldwide, the mandate to

assign numbers to operators and service providers is frequently given to national regulatory authorities, in order to ensure that numbers are assigned in a pro-competitive manner that meets the needs of service providers and users alike. Number assignment is the mandate of regulators in most ECOWAS countries. This is a key issue that impacts on income earned as a result of assignment. Number fees are addressed in the next section.

While number assignment is increasingly the mandate of regulators, many countries have also established consultative committees, like the Canadian Steering Committee on Numbering (CSCN) to manage the numbering plan. The committee can be placed under the regulator's control or merely report to the regulator, and can include representatives of operators, service providers, ISPs, end users, and all other numbering stakeholders.

ECOWAS may wish to establish a regional numbering resource management committee that could analyze current practices, harmonise management rules for the community and work to develop a database for ENUM or another solution to allow mapping of telephone numbers to the Internet. As noted in 3.2.2 above, the ERO (and its previous work under the ETO) provides one example of where international co-operation can be harnessed to the good of all countries.

Most countries still operate a system where the subscriber or customer requests service and is then allocated a number by the operator. This can be inefficient and lead to the regulator not having full control of the nation's resource unless rules for allocation, issue and use are closely followed. An annual audit by the regulator is necessary and all operators should be required to comply with this, with the time limits laid down in their operating licence or by statute if they are still state-owned. The audit enables the regulator to maintain a measurement of scheme use to evaluate how effective planning and management has been. In this way localised demands or differences can be addressed and plans made to avoid shortage or exhaustion.

While the regulator need not be involved in day-to-day management of the numbering scheme it may choose to take control of the planning of scarce resources such as short codes and short numbers. Developing assignment measures need not be restricted to the annual audit, but may also include use and connection as part of its measurements. The regulatory website can be used to demonstrate levels of use, while respecting appropriate confidentiality.

4.1.2 Traditional Assignment Mechanisms

Once a decision is taken on who assigns numbers, policy makers will then decide how numbers will be assigned (e.g., by block, on an individual basis, by auction, etc), what fees are to be charged for number assignment and who will collect and retain the fees. (Number fees are discussed in the section 5.1, Economic Aspects of Number Regulation, below.)

The traditional approach to number assignment is for a national regulatory authority to assign operators prefixes, blocks of numbers, numbering ranges or numbers on request upon payment of an annual fee to cover the management costs of the numbering plan and the control of its use. As noted above, many numbering practices rose out of technological limitations. In the majority of countries, for example, number assignment for fixed line networks was made on the basis of a geographical area to facilitate circuit switching. Likewise, different numbers have also been assigned to different networks (e.g., 2-5 have been assigned to fixed networks and mobile networks have been assigned 6-9). Countries with limited competition have also assigned specific numbers to individual operators, although this practice is not widespread on a global basis. Regulators have also reserved certain numbers for special services, such as operator information service, credit validation for mobile pre-paid subscribers and voice mail access.

Numbers have traditionally been assigned on a first-come first served basis, with the result that incumbent fixed line operators often have had the advantage of access either to shorter numbers, preferred by end users, or numbers considered more valuable to end users, perhaps because they

have been associated with a long-standing business, or because they reflect personal information such as a birthday. As a result, regulators have frequently been requested to resolve disputes when new market entrants seek equal treatment with legacy operators.

4.1.3 Innovative Assignment Mechanisms

Technological developments as well as increased competition and a growing range of ICT services have led some countries to develop new numbering management practices. Newer practices include the use of auctions to allocate numbers as well as central number databases. Intelligent networks are increasingly rendering redundant the need to assign numbers on the basis of geographic area, network type or operator. Indeed, the exponential rise in the number of ICT users worldwide has placed greater pressure on the ability of national numbering capacity to continue such distinctions. Likewise, wide scale implementation of number portability has resulted in pressure to revise traditional practices. If customers can port their number from one geographic area to another or from one service provider to another, it becomes increasingly difficult to maintain traditional numbering assignment practices.

Some countries are moving towards centralised issue of numbers directly to users from a single database. This can be very efficient in the use of numbers and a tremendous aid to competition, although it does require considerable planning in the rules of allocation, issue and portability. Such a centralised approach, where the end-user can select their own number and then seek service from amongst the competing operators, requires an "Intelligent Network" with a central database. Without such a network the porting of numbers between operators becomes expensive and slow, imposing a burden on the electronic signalling and networks. It does, however, offer a long-term aim that aids competition.

This control of one's "own" number already exists with Internet addresses, where some entities have developed websites enabling users to choose their own address or move their address from one ISP to another. Likewise, in the U.S. there is a central database of Toll Free numbers (or 1-800, 1-888, 1-877 etc. numbers), although the numbers are issued through "Responsible Organisations". The numbers are portable and may not be sold. Such a system works well because the 1-800 number is dialed by the caller and the network looks up the destination (a normal geographic or mobile number) to which the call should be delivered. In the U.S. example the responsible organisation is one licensed by the regulator and plan manager to handle number applications on behalf of users. It has the benefit of enabling allocation to end-users, but with management still available.

4.1.3.1 Number Auctions

Auctions can be used when the government decides to collect and retain number fees itself, rather than allowing the operator or service provider to do so. While auctions can lead to greater revenue for the government, as in the case of certain third generation mobile spectrum auctions, they can also result in higher costs being passed on to consumers. Auctions have also been viewed as a way to achieve greater fairness. Any decision on the use of auctions should carefully weigh these competing goals. Auctions have been used for the assignment of Freephone numbers, short numbers (both mobile and non-mobile) as well as access codes that are used for Directory Enquiries or Directory Assistance, when these are provided on a competitive basis.

Where, for example, Freephone numbers are concerned it might be considered that a number with a particular pattern, such as 0800 800 8000, 1800 800 8000 or 800 8000, depending upon the dialing plan, might be more "valuable" to a commercial user than one with more random digits. (See Section 5.1.2, Golden Numbers, below). The government may decide therefore to assign such numbers through auction to maximize gain by the nation. Auctions also offer the means to enable widespread issue of numbers with greater simplicity and transparency. This was the route taken by

the Australian Communications and Media Authority (ACMA) in 2004 in its online auction of smart numbers, easy to remember numbers used by businesses as a marketing tool.[7]

The ACMA also used a similar auction for the issue of short numbers behind a fixed rate code. In this case the base cost was higher because a number of four digits rather than eight would be using or blocking four times the numbering space. For example 1300 XXXX XXXX would not be possible if the number length was restricted to 1300 XXXX. The latter number might be more valuable to advertisers and so they could be prepared to pay more for it.

Recent auctions in China for short message codes for use with mobile phones have attracted interest. These numbers are currently only used by commercial bodies, generating a great deal of income for the operators and the service providers, and the government has concluded they should be charged accordingly. Auctions may be more appropriate for such mobile short codes that are used for voluntary purposes, such as consumers "voting" on their favourite products, rather than for geographic numbers where there is less option not to call. This use is quite separate from the usual short messaging services (SMS) popular with cost-conscious users.

There are plans to migrate Directory Enquiry or Directory assistance services to a common 118 code (the same concept as migrating emergency calls to 112, as well as existing specific codes individual to each country). In the UK the issue of 118 XXX codes was undertaken as a lottery, although other countries have simply issued the code as 118 with the call being directed to the network used.

4.1.4 Balancing Efficient Number Management and Consumer Needs

Despite the move to new numbering practices, traditional numbering assignment has certain advantages from the customer perspective. Customers have learned to associate certain costs with geographic, network and operator-specific numbers. The challenge for regulators today is to develop a regulatory framework that fosters efficient use of the scarce resource of numbering while protecting consumers from incurring unexpected charges.

There is no benefit in change for change's sake, particularly when existing practices meet a country's planning and needs; the real benefit comes from being prepared to accept development as required.

4.1.5 Assignment Duration

Long-term assignment of numbers is more usual, with short term changes usually only occurring with company failure, as in the UK. However control of number issue provides a safeguard for both commercial and residential users.

Most operators' rules and regulations still contain a note to advise that they can change or withdraw a number without notice for operational reasons. (See Section 7.1.2 below). Nowadays they might have to prove good cause to remove a well-known and well-advertised number, but the option and requirement to manage is still there. This is particularly important where it is necessary to change a number owing to the need for expansion.

Where such change is necessary there are arguments for and against the alternative practices of a flash or snap change where numbers cease overnight and perhaps adopt a different use and where both old and new numbers work in parallel for a period. In both cases the use of automatic announcements and carefully planned publicity can reduce the errors and consequent considerable management costs.

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[7] More information about ACMA's smart number auctions is available at http://www.smartnumbers.com.au/app/action/viewHome

4.1.6 National Numbering Capacity

For many countries, national numbering plans are driven by concerns over exhaustion of national numbering capacity. This may be less of a concern for countries with lower populations or low teledensity rates, although the exponential rise in the number of mobile subscribers in the past few years has increased pressure on numbering capacity, and the advent of low cost IP-based services is expected to generate even greater numbers of ICT users. With the exception of Nigeria, however most ECOWAS countries have a population under 25 million, and eight countries have a population under 10 million. Exhaustion of numbering resources will be unlikely for most countries in the region, even if teledensity in excess of 100% is achieved, (e.g., if individuals subscribe to multiple services, requiring multiple numbers). Numbering capacity concerns are more urgent for Nigeria with a population near 130 million.

While countries with spare capacity are not faced with immediate shortages they have the valuable opportunity to ensure that options are in place as demand and services develop. Innovative services need not be the driver for immediate change, but they can help with framework development and by ensuring that appropriate services are not excluded or denied.

The national numbering plan capacity depends on the number of digits making up the subscriber's significant number (limited to 12 excluding three-digit country code per ITU E.164 recommendation). Numbering plan capacity is a factor of the number of digits assigned to individual telephone numbers, increased exponentially. For example, if each customer has only a four-digit number, the number range includes a total of 10,000 different telephone numbers ($10 \times 10 \times 10 \times 10$) A ten-digit numbering scheme yields a total of 10,000,000,000 numbers. In other words, in a numbering range with "a" digits we would expect to see 10^a numbers made available.

The following total theoretical capacity (Tc) are available for n from 6 to 9:

n = 6	PQ MCDU	Tc	=	1 000 000
n = 7	B PQ MCDU	Tc	=	10 000 000
n = 8	AB PQ MCDU	Tc	=	100 000 000
n = 9	TAB PQ MCDU	Tc	=	1 000 000 000

In practice, all these numbers will not be assigned to subscribers. Numbering plans usually try to leave one digit spare for expansion and another digit for emergency and assistance codes. This means that two tenths of the available numbers are "lost" before a single number is issued. A further proportion of numbers will be eliminated by using 00 for international access and again a further digit, if not already 0, might be used for trunk access.

Thus with a four digit scheme that allows a (theoretical) maximum of 10,000 numbers, removing numbers beginning 1 and 0 (emergency or access codes and the trunk escape code) leaves only 8,000 numbers. Removing one digit for expansion and one for short numbers brings the number range down to having 60% available.

In addition, the use of geographic, network and operator number distribution will also limit the plan's actual usable capacity. Therefore, in establishing the plan, it is important to take into account certain criteria that will help minimize such number losses:

- Whether there will be geographic areas, and if so how many
- Whether different networks will have specific digits attributed to them, and if so how many networks are there
- Whether each operator will be assigned a specific number, and if so, how many national operators exist for a given service
- Monitoring the use of numbers (as with temporary mobile subscribers)

– Equivalence of numbering formats in different geographic areas
– Numbering resource requirements of the various services

Moreover, traditional number allocation practices can be inefficient because numbers may be allocated in blocks of 10,000 or even 100,000. If an operator or service provider seeks certain valuable numbers, however, it might seek issue of an entire geographical or price block just to be able to have perhaps ten or twenty "valuable" numbers. (See Section 5.1.2 Golden Numbers below). While individual or direct assignment, not necessarily by the regulator's office, may enable greater control of number issue it can not always deal with the hoarding of numbers where the costs of reservation or retention are outweighed by the benefits of having a large stock of valuable numbers. In any event such issue directly to end-users, whether business or private, may only be most effectively achieved when there is both a choice of operator and a network that allows full and easy portability between operators. At that stage the operator has less of a stranglehold on the subscriber and more incentive to provide good service. (See Section 5.1.4 Number Portability)

There are also inefficiencies of use. If a telephone number comes out of service, because someone moves or a business closes it may not be possible to reallocate it lest confusion is caused. And if the number is that of a taxi service or a police station then perhaps it should be "sterilised" and removed from issue for a long time to prevent nuisance. This carries a further cost and service implication if the plan or scheme is running short of numbers or where expansion is predicted (or at least planned for).

In associated planning for numbers regulators may like to consider leaving some numbers free to use for television, radio and film use. In this way the authors and actors can quote or make reference to real sounding and looking numbers without an unfortunate subscriber receiving large numbers of calls with each broadcast. The same concerns can apply to the operators experiencing congestion on certain routes.

Where assignments of specific digit levels to particular services or types of service are concerned there is scope for continued harmonisation. Again this can hardly be an overnight change, for which there would be little support or justification, but the long-term, benefits of ease of use are considerable.

5.1 Economic Aspects of Numbering

5.1.1 Number fees

Traditionally, numbers have been assigned without direct charge to the end user. Increasingly, however, countries have concluded that there is merit in charging for at least some numbers. Charging number fees helps to cover the expenses of developing long-term plans that leave sufficient scope for expansion. In addition, governments have decided, since they are paying to manage schemes that enable commercial operators to make a profit, they should recover the costs involved. The charge need not, and perhaps should not, be punitive, but it could cover the administrative cost of number management. As noted above, auctions can also be used, at least for certain "valuable" numbers. Regulators have found they can manage the supply of numbers while also enabling the development of a market in numbers. In most cases the regulator will not wish to micro-manage the numbers, but rather protect the nation's numbering.

The next issue for regulators is how much to charge? National practices vary. The Australian Communications and Media Authority (ACMA), for example, has enabled the government to charge for numbers without getting the regulator involved in collecting each individual fee for each number. ACMA's practices underscore the need for a regular and effective audit or number census since this forms the basis for the charges levied. Audits can also serve another purpose in ensuring

that operators do not hoard too great a quantity of numbers. Australia's practice is also interesting, since it has decided *not* to charge for geographic and social numbers.

ACMA uses an opportunity cost methodology that recognises the value forgone in allocating shorter numbers relative to longer numbers. Under this methodology, a standard charge was set for a 10-digit number and this amount was increased (or decreased) by a factor of ten for each digit reduction (or increase) in a number's length.

On this basis, the amounts of charge in Australian dollars in 2005 for numbers of varying length are:

- $0.0094609328 for twelve-digit numbers;
- $0.094609328 for eleven-digit numbers;
- $0.94609328for ten-digit numbers;
- $9.4609328for nine-digit numbers;
- $94.609328 for eight-digit numbers;
- $946.09328 for seven-digit numbers;
- $9,460.9328 for six-digit numbers;
- $94,609.328 for five-digit numbers.

Three and four digit numbers are charged at $100,000 (the maximum charge allowable under the Telecommunications (Numbering Charges) Act 1997. As in past years, numbers used for incoming-only international services, internal network services and testing services were to be charged at 1/100th of the rate applied to all other numbers. Numbers, which are exempt from charges, are:

- community service numbers;
- geographic numbers;
- telex numbers; and
- international signaling point codes.

In addition, numbers allocated for trials of ENUM and country calling card services are exempt from charges for 2005.

5.1.2 Golden Numbers

Electronically all numbers are equal. Some numbers, however, may be perceived to be more valuable to particular users and end users have demonstrated a willingness to pay for certain numbers. Where numbers attract a charge the government must decide whether to allow operators to control and sell these assets or whether the regulator should do so, either using the income earned from the sale for the benefit of the country, or to fund the costs incurred in regulatory management and planning. Early in legislative planning it is helpful to set out who owns the number(s) and what use will be made of any fees collected from number assignment.

"Golden" or valuable numbers have been described as being valuable simply because they are valuable to one person. The number may match a date of birth, a building address, spell a name[8], or may be considered to bring good fortune. There are also numbers that show a particular sequence or pattern or are especially memorable. Golden numbers also include shorter numbers, which may be considerably more valuable because they are easier to remember and to market, but they also use a great deal of valuable numbering space. The particular reason is less important than the fact that someone wants it and is willing to pay for it. In addition, shorter golden numbers also occupy more numbering space, adding to their cost.

5.1.3 Impact of Numbering Scheme on Tariffs and Tariffing

Prior to implementation of sector reform, calls were divided into two or three types according to the distance involved and the amount of handling required. Callers saw and came to understand that, merely by dialing a number with the same initial digit (and subsequently code), the cost would be at a familiar or easily recognisable level. Users came to learn that differing digits and codes would indicate the cost. For now, the distinctive numbering between mobile and landline is helpful to the caller and to the operator. Cape Verde offers a clear example where all numbers are seven digits and those beginning with a 2 are geographical and those beginning with a 9 are mobile. The signal or indicator for the type of call is clear and easy to understand.

Network operators also like this system because it has enabled them to charge more without complicated analysis – and this applies to international calls as well. In this last case the opportunities for discrimination between fixed and mobile calls delivered internationally can cause costs and charges to vary by a factor of fifteen or more even to the same country. With the rise of competition and pressure from low-cost services like Voice over IP (VoIP), operators will face increasing pressure to lower their tariffs. Regulators will face increasing pressure to reduce discrepancies between calls originating from and terminating on different kinds of networks.

It is now less necessary to charge for calls according to the distance that the call is carried. The greater cost is in providing the telephone line, and there is little extra cost in switching. ECOWAS/UEMOA countries are likely to continue to use mobile networks as their main means of providing voice service. Regulators may therefore find the need to ensure that calls to mobile networks are affordable. While numbering itself does not drive or control tariffing, it can act as the badge or warning to callers (if regulated and controlled properly) that a call may be charged at a specific rate. Number portability, discussed in the next section, is also linked to the pressure for lower end user rates.

5.1.4 Number Portability

Number portability is the ability or the means by which a user is able to retain their number while taking service from a different operator. For landlines it requires there to be more than one operator providing physical or virtual service in an area, for mobiles more than one operator with coverage

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[8] The ability to spell a word is not as widespread in other countries as in the US. Although many countries have letters on their dials or keypads not all countries followed the US standard layout, which has now become accepted, if only by volume and default. A striking difference being that France and the UK, amongst others, used the letter O on the 0 or zero key and the US used it on the 6, together with the letters M and N. This caused a considerable risk of misdialing when international direct access became more widespread and has meant that the practice has become less widespread in many countries, despite the attempts of entrepreneurs. And, of course, not all countries used letters on their dials. Mobile and cellular use has now made this almost universally available, although the letters are used to aid text messaging rather than as a dialing or mnemonic aid.

or virtual coverage (where a second or other provider leases service and markets and sells it under its own banner).

The development of number portability can enhance the value of numbers by making it possible for subscribers to move them to other operators. Where Toll Free or Freephone numbers are concerned the use of a central database offers a more immediately viable solution because each 800 number (for those countries using the now more universal badge or indicator that the caller can be connected without charge) has to be translated to a number for actual delivery, whether mobile or geographic. This was the first type of number to be opened to competitiveness and proved effective in generating traffic and providing visibility for businesses. One route that may be better avoided is that of the UK where several (eleven) free codes were employed, some of which still persist to this day. This led to confusion and was one of the factors to slow the development of the services.

Portability of Premium Rate and Shared Revenue numbers is again easier for the same reasons of translation as with Freephone numbers above; portability of mobile numbers and geographic numbers can be more problematic.

Portability on geographic numbers cannot be so easily achieved because the number dialed is also the address for delivery and unless the delivery is via a "virtual" route such as DSL then a physical route is required. While this physical solution may be more easily achieved in built up urban areas it still requires the duplicate (if not triplicate) cabling to each point where service is or might be required. This method forms a very costly barrier to competition and may also be an inappropriate use of scarce resources. Some analysts have also questioned whether portability of geographic numbers is vital to countries with low fixed-line teledensity since it may distract incumbents from focusing on more important issues such as quality of service as well as lead to new market entrants competing for the incumbent's existing customers rather than offering services to new users.[9]

Using wireless services does avoid the physical requirement, but requires more analysis and switching than is the case with mere translation of Freephone numbers. Not only would each individual number have to be checked to establish whether or not it had been "ported," but it then has to be delivered to its new destination. Although this has been a route to achieving portability in many countries it has only been used as an interim position. There are also risks that operators may compete for lucrative and profitable traffic in highly populated areas without trying to offer service elsewhere. Here there is scope for the regulator to measure the penetration of service in such un(der)served areas and to establish whether duplicating physical circuits is the optimum solution or whether appropriate monitoring of a monopoly provider is more cost-effective.

Where portability is enabled there are differing approaches depending upon the technology and also the vision of the operators concerned. As above there is scope for developing portability in those more modern services (mobile, Freephone, Number Translation, shared revenue and premium rate services) that do not involve alteration of physical connections to a household or building.

Migration to an intelligent network will facilitate portability, and may also be a wise business decision. In the Netherlands, for example, the incumbent operator decided that it should install an Intelligent Network (IN) not because doing so would immediately allow it to make money. Rather, it found that installing an IN was necessary for it to stay in business so it could later make money. Other incumbents, including in the UK, have taken the view that there is too much existing plant to warrant wholesale scrapping for less quantifiable gains.

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[9] See, *Global telecommunications numbering issues review,* Claire Milne, Antelope Consulting, 2002 available at http://www.itu.int/ITU-D/treg/Documentation/Milne_Numbering.pdf

Where implemented, number portability is increasingly leading to flat rate tariffs, a growing trend with the advent of broadband services. Operators in Europe, for example, now offer monthly tariff packages including access to broadband Internet as well as unlimited national VoIP calls. The rise of flat rate tariffs, of course, addresses consumers' concerns about using the numbering system as a proxy for tariff information. There is no need to worry about costs incurred in making long distance calls, for example, where affordable flat rates apply.

6.1 Special Concerns

6.1.1 Directory Publication and Directory Enquiries

An effective telecommunications network requires access to published directories of assigned numbers as well as access to directory enquiries services. In some countries, operators are directly responsible for directory provision and assistance. Operators have found that the cost of directory provision and directory assistance forms a large part of their running costs and have sought to charge those that use it. In other countries, where the government owns numbers, it is the government that is responsible for maintaining the list or database of numbers and then licensing access to the use of that list for Directory Enquiries providers. While a directory database is formed from the records of all operators and is therefore an intrinsic part of their business, access to directory information is also a national asset and may need to be treated as such.

Increasingly, Directory Enquiries has been opened to competition, giving rise to the need for a separate section of the numbering range. New Directory Assistance numbers can be allocated in a variety of ways; some countries have opted for an auction, whereas others have adopted the method of a simple lottery. Regulators will likely wish to restrict transfer of such access numbers to prevent commercial entities from trying to sell or assign it, or at the very least benefit from its value. Countries may either assign a single directory provider, using a standard directory enquiry code; allow many providers using the same code (which then routes their directly connected customers to their assistance operator); or give callers the choice between all operators providing the service. Directory provision need not be so "number-hungry" when the choices are all behind a single code.

Directory provision can lead to customer confusion and accusations of profiteering, where high charges are levied without justification simply because callers are confused about the number to dial. Callers (whether business or residential) require cheap, effective and accurate access to numbers. The Internet, where customers may have access to it, can respond to this need.

6.1.2 Emergency Services

Numbers play an important role for emergency services. ECOWAS/UEMOA countries have established different numbers for callers to access emergency services. As noted above in Section 3.2.6, ECOWAS members may wish to establish a common emergency service number used in all countries, in conjunction with existing numbers and codes. In addition, ambulances often rely upon accurate address information to reach an injured person. While the address and purchase details might be less relevant in an emergency, the network location information can prove of crucial importance in locating the caller.

6.1.3 Roaming

WATRA countries may wish to consider how best to encourage more cost-effective national and international roaming. Subscriber or users need to know whether they can call a particular number and be connected and whether the charge will change for them if the called party is away from their base (it should not).

Most operators have different rates for roaming in different countries, according to agreements made. And the tariffs vary, causing confusion, particularly if the cost incurred either to the caller or

the recipient cannot be determined easily. Where roaming rates are not regulated, the warning signal of one or two specific initial digits, whether in the closed plan number or part of an access code, might be supplemented and strengthened by a free tariff announcement before the call is connected.

An alternative is to regulate roaming rates. Elsewhere many regulators and inter-government bodies are examining the charges currently levied for international roaming, with observations that the profits are excessive. This may be an opportunity for ECOWAS/UEOMA countries to develop a more equitable regional roaming market that meets many of the principles for a Numbering Scheme, particularly that of having a coherent clear and published strategy. This is becoming increasingly important as mobile operators in the region are offering international roaming to their pre-paid customers.[10]

6.1.4 Alternative Routing of calls and Carrier Pre-selection

One of the initial ways countries chose to enable competition, without requiring or allowing every operator to deploy its own network, was to allow competing carriers to handle long distance calls. Customers were then free to use competing networks, on a call-by-call basis, dialing an access code, or by pre-selecting an alternative network operator.

Call-by-call access to alternative networks is achieved by an access code, which tells the local exchange to route the call differently. Such a code was usually in the "assistance levels" beginning with a 1, although this was not an exclusive practice. For example France choose the initial digit as the router, using 0 for France Télécom, and other single digits to identify competing network operators. In the UK, the access codes were three digits, in the range 1XX, allocated and chosen by the incumbent, although now the regulator controls the issue of the 1XXXX codes.

Carrier pre-selection (CPS) enables the subscriber to instruct its operator providing physical service how it wishes the calls to be routed. While this obviates the need to dial a code with each call it lacks flexibility unless an escape or bypass code is used. Technology now offers cheaper routing boxes to perform the necessary digit analysis and provide the subsequent routing digits.

CPS does not affect the requirement for numbers, save for obviating the need to allocate different subscriber number codes in the same town or area. It does, however, require a modest amount of space in the assistance code levels, typically the digit 1. Again early planning, as has been demonstrated with the recent ECOWAS code changes, eases carrier preselection.

7.1 Numbering plan management

Where the regulator seeks to manage the numbering plan consideration of the procedures involved can help reduce or control the work involved. This can improve the administration and reduce the management time and intervention that may otherwise be required.

A standardised procedure stating details required of any party seeking a number, range of numbers or a block can include a form providing all details required and even ensuring that the correct name and address, registered company number and other necessary details are properly provided. This can help to reduce returned or rejected reservation request documents. Regulators can promptly inform applicants if their applications have been refused, based on a set of criteria that are spelled out.

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[10] Balancing Act Issue 260, 5 June 2005, reporting that Togo Cellulaire has set up roaming agreements with over 180 countries and launched a prepaid roaming offer. See http://www.balancingact-africa.com

7.1.1 Request for reservation and assignment

The following example includes suggested content of the reservation request document(s):

- Applicant's contact information such as name, company name, company registration number, position and address;
- Existing licence references, with relevant clauses and, where appropriate, the licence application receipt;
- Description of the numbering resource;
- Reasons for the request and any connection between the use of the resource requested and the resources already reserved or assigned;
- Description of the service and diagram of the architecture of the network and/or service planned;
- Usage rates and conditions of resources currently assigned to the applicant;
- Where appropriate, the planned geographic location of the numbers requested;
- Preferred assignment date;
- Expected date of activation of the resource; and
- Other optional information deemed necessary for the request.

Where an application is to be made to the regulator for numbering resources, either by way of direct and immediate assignment or reservation for future use, the regulator may wish to be assured that the application meets its rules. The regulator can set the terms and conditions of eligibility of numbering resource reservation or assignment with reference to the national and international agreements applicable as well as its own aims for the Numbering Scheme.

Just as the regulator may wish to seek additional information to clarify the application and reassure itself, the applicant may wish to seek confidentiality until or after the application is made. The regulator may wish to offer confidentiality and not make the additional information mandatory for publication.

In drawing up terms and conditions for its own use the Regulator may seek to apply such terms and conditions according to the category of the applicant (telecommunications network operator, telecommunications services provider or end user) and the category of resource being requested (for example geographic, mobile, non-geographic, short numbers, special operator numbers, selection code for carrier network or Premium Rate).

In considering any application prior to making a decision the following points may form a basis for consideration:

- that the applicant is eligible to apply for the number, code or service
- that proper use of the numbering plan is intended
- that no hoarding or blocking is involved
- that long-term strategy is not compromised
- that geographic requirements are met
- that customer protection is appropriate and adequate
- equality of treatment and the maintenance of fair competition conditions
- compliance with relevant sub-regional and international agreements and rules

Where regulators are regularising an existing situation or bringing allocations into line with new legislation they may wish to consider setting appropriate time limits.

7.1.2 Confirmation, Cancellation and Withdrawal

The regulator may wish to ensure that rules for confirmation, cancellation and withdrawal of any numbering resource exist and are published to enable it to manage the nation's numbering plan. This can include prompt confirmation of assignment. Cancellation and withdrawal are not measures that are used lightly. Nevertheless, regulators have found that the power is necessary, albeit limited to the published rules.

7.1.3 Assignment and Release

Generally, assignment implies only the granting of a right to use numbers. A regulator may wish not to allow number trading or transfer between users or operators, but instead require unused numbering resource to be returned to it, with or without refund of any fee. Likewise an operator may be free to relinquish its range.

7.1.4 Activation and Extension

Where the regulator has allowed an application to succeed and notified both the applicant and other parties it may allow extension of reservation if this meets the overall strategy. However return of unused numbering resource can form a powerful part of the audit and help to extend a nation's plan or scheme.

7.1.5 Publication

In the past numbering plans were only available as internal documents, made available to appropriate international carriers and international regulatory bodies. Notwithstanding a nation's need for security and confidentiality it is helpful for number allocations to be made available on a regulator's website. This can have the benefit of ensuring that the work is open to all and can be considerably less expensive to publicise as required.

Such publication can provide the public (users and all interested parties) with a database containing all information on the structure and development of the plan, as well as on the status of reserved and assigned resources, including:

- Geographic numbers
- Mobile non-geographic numbers
- Short numbers
- Special numbers
- Freephone numbers
- Premium Rate numbers
- Shared Revenue numbers
- Carrier selection codes
- Access and emergency codes
- Assignee's identity

Under these circumstances it may not be necessary for the regulator to carry out the day-to-day issue of numbering if the overall strategy is determined and working. The regulator may well wish to consider the long-term implications of "hands-off" management.

8 Conclusion

There are increasing pressures are national numbering plans due to increased demand for ICT services, including multiple usage of individual fixed lines to accommodate voice, fax and Internet access, the exponential growth in mobile services, and the rise in innovative new services such as short numbers used for commercial SMS, freephones and other services as well as VoIP. At the same time, technology offers many solutions to conventional numbering problems, meaning that number managers can exercise more freedom in developing and designing their numbering plans. While number managers can use technology to resolve traditional numbering issues, newer challenges are arising from the migration of traditional switched networks to IP-based networks and the rise of VoIP. There is a growing need to map telephone numbers onto the Internet to create a global addressing scheme that applies across all networks, including traditional PSTN, mobile and IP-based networks. Since number management is most effectively addressed through advanced planning, number managers will closely follow developments in the coming years on VoIP numbering and the need to map telephone numbers on the Internet, so they can most effectively continue to manage their national numbering scheme.

Appendix 1

Guidelines for Numbering

Although numbering practices vary widely among countries, there are several common features that are considered to be among the best numbering practices which apply both to circuit-switched and IP-based networks.

The following general approaches can be identified:

1) numbers are a national resource.
2) the mandate for managing this national resource for the public good is vested in the national regulatory authority.
3) the national regulatory authority can delegate administrative responsibility for this national resource.
4) numbering plans should be developed following public consultations led by the national regulatory authority with all stakeholders, including operators, service providers and end users.
5) national regulatory authorities should develop a single national database for the assignment of numbers.
6) national numbering plans can adopt 112 as an emergency code alongside existing national emergency code(s).
7) promoting number portability where considered appropriate by the national regulatory authority.
8) assigning lower initial digits to fixed lines and higher to mobile.
9) allocating number blocks against a rental charge.
10) planning for direct allocation to end users.
11) assigning numbers using geographical, network or service codes.
12) allowing for migration to a closed plan

These general approaches can be used to ensure that development meets eight key points that can be applied to any Numbering Scheme.

Any Numbering Scheme should:

- be long-term and balanced
- have support from the industry (operators, users and the regulator)
- have a coherent, clear and published strategy
- be capable of adequate management
- enable future development
- remember and consider neighbours (continental and world neighbours)
- not be anti-competitive to Telecommunications Operators
- not be anti-competitive to users

Appendix 2

Glossary of useful terms

Access Code

A code of one or more digits, that is not part of a subscriber number, used to route the call to a different service

Area Code

The code required to identify and dial a specific local area within a country. Area codes are also expanded to included non-geographic numbers (e.g. Freephone or mobile). Not all countries use Area Codes.

Barring

The ability to prevent a line from being used to make specific types of call, whether long distance, mobile, shared revenue or Premium Rate

Caller Display Unit

The subscriber apparatus (integral to the telephone or in a separate unit) used to display the number or type of incoming call

Calling Line Identification (CLI)

The electronic identification of the originating line (land or mobile) used to make the call

Charge Card

A card provided by the Telecoms Operator to enable a subscriber to make calls away from base and have them charged to their home station or line

Closed Dialing Plan

A closed dialing plan refers to a national requirement to use all digits of a national number (often including a trunk prefix) to place a call, whether local or long distance. The current systems in France (as of October 1996), Belgium (as of January 2000) and Cabo Verde (as of 3 July 2004) are examples of closed dialing plans.

Closed Numbering Plan

A closed numbering plan refers to a telephone numbering plan (or scheme, the terms are interchangeable) that has a fixed number of digits, not counting access or special service codes. The North American Numbering Plan +1 is an example, because there are always ten digits associated with each national number – 3 digits of area code followed by 7 digits of subscriber number. Norway +47 and Senegal +221 are other examples of a closed numbering plan.

Country Code

Specified by the ITU as part of E-164, the country code is the digit or group of digits used to dial a country after the originating country's international access code, today this is frequently 00. See also **World Zone**.

It is also the pair of letters (no other characters being permitted) used to identify a country. There are other non country specific codes such as .int and .com.

Directory

The list of telephone, fax, mobile and service numbers.

Emergency Call

A call, typically free to the caller, to alert and summon one or more of the emergency services.

ENUM

Electronic Numbering and Mapping. The method by which a telephone number may be converted into an Internet address so enabling web access and service control.

Freephone

A series of numbers, often behind the code 800, where the call is paid for by the receiving party. Also known as Toll Free.

International Access Code

The code used to access a country's international circuits and is the digit or group of digits, frequently 00, that replaces the + sign.

World Zone

The initial digit of the Country Code which generally identifies the region or continent, e.g. 2 for Africa. However +299 was assigned to Greenland, at a time when there were no free codes in either of Europe's two world zone codes (3 and 4). Others do not follow the plan for other reasons, e.g. The Canary Islands are behind Spain's country code of +34 and Cyprus has a different code for each of the two parts.

Appendix 3

Country plans and announcements – Numbering[11]

Benin (country code +229)

Communication of 30.VI.2003:

The *Office des postes et des télécommunications (OPT),* Cotonou, announces the current numbering plan of Benin:

Telephone – Format: PQMCDU

Department or service	P in use	Q in use	Q reserved	M in use	Town or service
Atacora and Donga	8	0	1, 4	0,1 and 2	Djougou and surrounding area
		2		1 and 2	Natitigou and surrounding area
		3		0	Tanguiéta
Atlantic and coastal area	3	0		0 - 9	Cadjèhoun
		1		0 - 9	Ganhi
		2		0 - 8	Jéricho
		3		0 - 9	Akpakpa
		4		1, 7, 8 and 9	Ouidah and surrounding area
		5		0 - 3	Godomey
		6		0 - 2,7 and 8	Abomey-Calavi
		7		0,1, 7 and 8	Allada
		8		0 - 9	Kouhounou
Borgou and Alibori	6	1	0, 4, 8 and 9	0 - 4 and 9	Parakou
		2		6	Nikki
		3		0	Kandi
		5		0	Banikoara
		6		0	Ségbana
		7		0	Malanville
Mono and Couffo	4	1	5, 7 and 8	0 and 1	Lokossa and surrounding area
		3		0	Comé
		6		3	Dogbo
Ouémé and Plateau	2	1	0, 3, 8	0 - 5	Porto-Novo Oganla
		2		0 - 6	Porto-Novo Kandévié
		4		0	Sèmè-Podji
		5		0 and 3	Pobè and Kétou
		6		3 and 6	Igolo and Sakété
		7		3	Adjohoun

[11] All country reports in Appendix 3 are from the National Numbering Plan Notifications provided by ITU Member States and published on the ITU-T website at http://www.itu.int/ITU-T/inr/nnp/index.html

Department or service	P in use	Q in use	Q reserved	M in use	Town or service
Zou and Collines	5	0	6 - 8	0 and 1	Abomey
		1		0 and 1	Bohicon
		2		0	Covè
		3		0	Dassa
		4		0	Savalou
		5		0	Savè
Mobile GSM	0	1 - 4		0 - 9	Libercom
	8	9		0 - 9	Libercom
	9	0 - 4		0 - 9	Libercom
	0	5 and 6		0 - 9	Telecel
	2	8		0 - 9	Telecel
	4	0, 2, 5 and 6		0 - 9	Telecel
	8	5 and 6		0 - 9	Telecel
	9	5 and 6		0 - 9	Telecel
	0	7 - 9		0 - 9	Benincel
	4	4, 7 and 8		0 - 9	Benincel
	6	0, 4, 8 and 9		0 - 9	Benincel
	8	7 and 8		0 - 9	Benincel
	9	7 and 8		0 - 9	Benincel
	2	0 and 3		0 - 9	BBCOM
Cellulaire fixe	2	9		0 - 9	Ouémé
	3	9		0 - 9	Atlantique + Littoral
	4	9		0 - 9	Atlantique + Mono
	5	9		0 - 9	Zou
Services	7	0	3, 4, 7 and 8	0, 1 and 9	Maritime Radio
		1		0	Plate-forme pre-paid
		2		0	Plate-forme pre-paid
		3			Plate-forme pre-paid
		5			LC2
		6		1	Béninpac
		9			Reserved for GLOBALTEL
Test hyppsométriques	9	9		9	
Special services	1	0			International operators
		1		2	
		1		3	Plate-forme
		2			Inquiries
		3			Marketing
		4			Actel
		5			Local operators
		6			Youth Brigade
		7			Police
		8			Fire brigade
		9			Fault
Access code to international	0	0			International prea
Other	8	1 and 4			LC2

Telex – Numbers are comprised of four (4) digits

Service	Thousand M	Hundred C	Dozen D	Unit U
OPT Services	1	1	0 - 9	0 - 9
Private subscribers	5	0 - 9	0 - 9	0 - 9

Contact:

Office des postes et des télécommunications (OPT)
Direction générale
01 B.P. 5959
COTONOU
Bénin

Tel: +229 312045 / +229 312049
Fax: +229 313843

Burkina Faso (country code +226)

Communication of 5.II.2004:

The *Autorité Nationale de Régulation des Télécommunications (ARTEL),* Ouagadougou, announces the transition from the present six (6) digit numbering plan to a new eight (8) digit numbering plan, as from 30 April 2004 at midnight. The details are given below:

A Mobile telephone networks

The subscriber numbers of the three mobile telephone operators will be modified as follows:

Operator	Former numbers PQ MC DU	New numbers AB PQ MC DU
TELMOB	20 XX XX	70 20 XX XX
	21 XX XX	70 21 XX XX
	22 XX XX	70 22 XX XX
	23 XX XX	70 23 XX XX
	24 XX XX	70 24 XX XX
	25 XX XX	70 25 XX XX
	26 XX XX	70 26 XX XX
	27 XX XX	70 27 XX XX
	28 XX XX	70 28 XX XX
	29 XX XX	70 29 XX XX
	72 XX XX 73 XX XX 74 XX XX 75 XX XX	70 72 XX XX 70 73 XX XX 70 74 XX XX 70 75 XX XX
CELTEL	60 XX XX	76 60 XX XX
	61 XX XX	76 61 XX XX
	62 XX XX	76 62 XX XX
	63 XX XX	76 63 XX XX
	64 XX XX	76 64 XX XX
	65 XX XX	76 65 XX XX
	66 XX XX	76 66 XX XX
	67 XX XX	76 67 XX XX
	68 XX XX	76 68 XX XX
	69 XX XX	76 69 XX XX
	47 XX XX	76 47 XX XX
	50 XX XX	76 50 XX XX
	51 XX XX	76 51 XX XX
	57 XX XX	76 57 XX XX
	58 XX XX	76 58 XX XX
	59 XX XX	76 59 XX XX
TELECEL	80 XX XX	78 80 XX XX
	81 XX XX	78 81 XX XX
	82 XX XX	78 82 XX XX
	83 XX XX	78 83 XX XX
	84 XX XX	78 84 XX XX
	85 XX XX	78 85 XX XX
	86 XX XX	78 86 XX XX
	87 XX XX	78 87 XX XX

B Fixed telephone networks

Three trunk codes will be used for the three areas into which the national territory has been divided for the purpose. The former fixed network subscriber numbers with the format PQ MC DU become AB PQ MC DU as indicated in the following table:

Area	PQ	Former numbers PQ MC DU	New numbers AB PQ MC DU
1	52	52 XX XX	20 52 XX XX
	53	53 XX XX	20 53 XX XX
	90	90 XX XX	20 90 XX XX
	91	91 XX XX	20 91 XX XX
	97	97 XX XX	20 97 XX XX
	98	98 XX XX	20 98 XX XX
	99	99 XX XX	20 99 XX XX
2	30	30 XX XX	50 30 XX XX
	31	31 XX XX	50 31 XX XX
	32	32 XX XX	50 32 XX XX
	33	33 XX XX	50 33 XX XX
	34	34 XX XX	50 34 XX XX
	35	35 XX XX	50 35 XX XX
	36	36 XX XX	50 36 XX XX
	37	37 XX XX	50 37 XX XX
	38	38 XX XX	50 38 XX XX
	39	39 XX XX	50 39 XX XX
	40	40 XX XX	50 40 XX XX
	41	41 XX XX	50 41 XX XX
	42	42 XX XX	50 42 XX XX
	43	43 XX XX	50 43 XX XX
	44	44 XX XX	50 44 XX XX
3	45	45 XX XX	40 45 XX XX
	46	46 XX XX	40 46 XX XX
	55	55 XX XX	40 55 XX XX
	70	70 XX XX	40 70 XX XX
	71	71 XX XX	40 71 XX XX
	77	77 XX XX	40 77 XX XX
	79	79 XX XX	40 79 XX XX

Contact:

Monsieur Mathurin Bako
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Autorité Nationale de Régulation des Télécommunications (ARTEL)
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Tel: +226 33 4198 (as from 30.IV.2004, +226 50 33 4198)
Fax: +226 33 5039 (as from 30.IV.2004, +226 50 33 5039)
E-mail: secretariat@artel.bf

Communication of 21.III.2005:

The *Autorité Nationale de Régulation des Télécommunications (ARTEL),* Ouagadougou, announces the following assignment of new mobile number series that will be opened shortly:

Mobile telephone network

Operator	Mobile number series
Celtel Burkina Faso	76 13 XXXX 76 16 XXXX to 76 17 XXXX 76 20 XXXX to 76 25 XXXX 76 40 XXXX to 76 45 XXXX 76 52 XXXX to 76 54 XXXX 76 55 XXXX to 76 56 XXXX 76 70 XXXX to 76 75 XXXX
Telecel Faso	78 00 XXXX 78 01 XXXX to 78 02 XXXX 78 90 XXXX
Telmob	70 10 XXXX to 70 19 XXXX 70 70 XXXX to 70 71 XXXX 70 76 XXXX to 70 79 XXXX

Contact:

Monsieur Mathurin Bako
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Cape Verde (country code +238)

Communication of 17.VI.2004:

The *Direction Générale des Communications-DGC-ICTI,* Praia, announces the introduction of a new telephone numbering plan for the fixed and mobile telephone networks of Cabo Verde (country code +238) as from 3 July 2004 at 0300 hours UTC (0200 hours local time) .

The new numbering plan will change from six digits to seven digits for all subscribers to the Cabo Verde network.

The change consists of adding, in front of the existing number: digit 2 for fixed telephone, and digit 9 for mobile telephone.

Examples:

- Fixed telephone:
  +238 2XX XX XX
- Mobile telephone:
  +238 9XX XX XX

Where +238 is the country code for Cabo Verde

Islands	Towns and villages	Old subscriber numbers	New subscriber numbers
Santo Antão	Ribeira Grande	21XXXX	221 XXXX
	Porto Novo	22XXXX	222 XXXX
	Paul	23XXXX	223 XXXX
	Coculi	24XXXX	224 XXXX
	Ponta Sol	25XXXX	225 XXXX
	Manta Velha/Châ de Igreja	26XXXX	226 XXXX
	Lajedos/Alto Mira	27XXXX	227 XXXX
São Vicente	Mindelo	30XXXX	230 XXXX
	Mindelo	31XXXX	231 XXXX
	Mindelo	32XXXX	232 XXXX
São Nicolau	Ribeira Brava	35XXXX	235 XXXX
	Tarrafal São Nicolau	36XXXX	236 XXXX
	Faja	37XXXX	237 XXXX
	Praia Branca	38XXXX	238 XXXX
Sal	Espargos	41XXXX	241 XXXX
	Santa Maria	42XXXX	242 XXXX
Boa Vista	Sal Rei	51XXXX	251 XXXX
	Fundo das Figueiras	52XXXX	252 XXXX
Maio	Vila Maio	55XXXX	255 XXXX
	Calheta do Maio	56XXXX	256 XXXX
Santiago	Praia	60XXXX	260 XXXX
	Praia	61XXXX	261 XXXX
	Praia	62XXXX	262 XXXX
	Praia	63XXXX	263 XXXX
	Praia	64XXXX	264 XXXX
	Santa Catarina	65XXXX	265 XXXX
	Tarrafal Santiago	66XXXX	266 XXXX

Islands	Towns and villages	Old subscriber numbers	New subscriber numbers
	Cidade Velha	67XXXX	267 XXXX
	São Domingos	68XXXX	268 XXXX
	Pedra Badejo	69XXXX	269 XXXX
	Órgãos/São Jorge	71XXXX	271 XXXX
	Picos	72XXXX	272 XXXX
	Calheta São Miguel	73XXXX	273 XXXX
Fogo	São Filipe	81XXXX	281 XXXX
	Cova Figueira	82XXXX	282 XXXX
	Mosteiros	83XXXX	283 XXXX
	São Jorge	84XXXX	284 XXXX
Brava	Nova Síntra	85XXXX	285 XXXX
Cellular network		91XXXX	991 XXXX
		92XXXX	992 XXXX
		93XXXX	993 XXXX
		94XXXX	994 XXXX
		95XXXX	995 XXXX
		96XXXX	996 XXXX
		97XXXX	997 XXXX

For all additional information or to order copies of the new National telephone numbering plan, contact:

Direction Générale des Communications
Ministère des Infrastructures et Transportes
BP 07, Praia
Cape Verde

Tél.: +238 261 57 79
Fax: +238 261 30 69
E-mail: DGComunicacoes@mih.gov.cv

For operational information, contact :

Commercial and Marketing Department
Cabo Verde Telecom
Rua Cabo Verde Telecom
CP 220
Várzea - PRAIA
Santiago
Cape Verde

Tel: +238 260 9200
Fax: +238 261 3725

Communication of 17.I.2005:

Cabo Verde Telecom (CVT), Praia, announces the introduction of the following new mobile codes:

Mobile Service: +238 98 XXXXX
+238 99 XXXXX

Contact:

Mr Francisco Moreira
Cabo Verde Telecom (CVT)
Interconnection with carriers
C.P. 220 – Varzea – PRAIA
Cape Verde

Tel: +238 260 9200
Fax: +238 261 3725
E-mail: francisco.moreira@cvt.cv

Côte d'Ivoire

As submitted by the Agence des télécommunications de Côte d'Ivoire in September 2005 (ITU/EC/WATRA ICT Market Harmonization Validation Workshop, Accra, Ghana, September 2005).

Côte d'Ivoire's numbering plan is a closed eight digit plan, of an ABPQMCDU format. It is composed of three numbering groups:

- Geographic numbers: 2BPQMCDU (Abidjan and surroundings) and 3BPQMCDU (inland) allocated to fixed telephony.
- Non geographic mobile numbers: 0BPQMCDU and allocated to GSM mobile telephony.
- Service numbers: 8BPQMCDU and 9BPQMCDU allocated to "free call" and value added services such as "kiosk", etc.

Note: the international access code is 00.

Summary numbering plan

Geographic numbers (fixed telephony)		
Abidjan and surroundings 2BPQMCDU		
Operator	**Bloc ABP**	**Percentage allocated**
Côte d'Ivoire Telecom	202, 203, 212, 213, 215, 224, 225, 234, 235, 243 et 245	11 %
Arobase Telecom	200, 210, 220, 230, 240	5 %
Total		**16 %**
Inland 3BPQMCDU		
Operator	**Bloc ABP**	**Percentage allocated**
Côte d'Ivoire Telecom	306, 316, 319, 327, 328, 337, 347, 359 et 368	9 %
Arobase Telecom	300, 310, 320, 330, 340, 350 et 360	7 %
Total		**16 %**

Non geographic mobile numbers (GSM mobile telephony)		
GSM operator	**Bloc ABP**	**Percentage allocated**
Orange Côte d'Ivoire	070 à 085	16 %
Loteny Telecom	050 à 064	15 %
Cora de Comstar	030	1%
Atlantique Cellulaire	010	1%
Total		**33%**

Service numbers		
« Free call » service 80PQMCDU		
Operator	**Bloc ABP**	**Percentage allocated**
Côte d'Ivoire Telecom	800 à 802	30%
Total		**30%**
Revenue sharing services 900QMCDU « kiosk»		
Operator	**Bloc ABPQ**	**Percentage allocated**
Côte d'Ivoire Telecom	9001 à 9003	30 %
Total		**30 %**
Internet access services 905QMCDU		
ISP	**Bloc ABPQM**	**Percentage allocated**
Globe Access	90500	1%
Africa Online	90501	1%
Aviso	90502	1%
AFNET	90503	1%
Comète	90504	1%
BNETD	90505	1%
NETAFRIC	90506	1%
GSAM Holding	90507	1%
Africom	90508	1%
Publicom	90509	1%
CI-Online	90510	1%
Kompas	90511	1%
Satlink	90512	1%
Globix-CI	90513	1%
OST-CI	90514	1%
I-village	90515	1%
Powerlines	90516	1%
IntelAfrique	90517	1%
Total		**17%**

Contact:

Agence des Télécommunications de Côte d'Ivoire (ATCI)
Rue Lecœur – Plateau 18
B.P. 2203
ABIDJAN 18
Côte d'Ivoire

Tel: +225 20 344255
Fax: +225 20 344258
E-mail: ekouatchi@globeaccess.net

Gambia (country code +220)

Communication of 10.II.2004:

Department of State for Communication and Information Technology, Banjul, announces that the telephone numbering plan in Gambia will be changed from six to seven digits on 28 February 2004. The changes will be done as follows:

– Add digit 4 in front of numbers now starting with 2, 3 or 4
– Add digit 5 in front of numbers now starting with 5, 6 or 7
– Add digit 9 in front of Gamcel mobile numbers
– Add digit 7 in front of Africell mobile numbers

Service	Old number PQMCDU	New number BPQMCDU as from 28 February 2004	Comments
Fixed	2XXXXX	42XXXXX	Digit 4 added as first digit
	3XXXXX	43XXXXX	Digit 4 added as first digit
	4XXXXX	44XXXXX	Digit 4 added as first digit
	5XXXXX	55XXXXX	Digit 5 added as first digit
	6XXXXX	56XXXXX	Digit 5 added as first digit
	71XXXX	571XXXX	Digit 5 added as first digit
	72XXXX	572XXXX	Digit 5 added as first digit
	73XXXX	573XXXX	Digit 5 added as first digit
	74XXXX	574XXXX	Digit 5 added as first digit
Mobile (GAMCEL)	9XXXXX	99XXXXX	New series
Mobile (AFRICELL)	70XXXX	770XXXX	Digit 7 added as first digit
	75XXXX	775XXXX	Digit 7 added as first digit
	76XXXX	776XXXX	Digit 7 added as first digit
	77XXXX	777XXXX	Digit 7 added as first digit
	78XXXX	778XXXX	Digit 7 added as first digit
	79XXXX	779XXXX	Digit 7 added as first digit
Indeterminate number withRDC = 5	61XXX	Not used	
	68XXX	Not used	
	715XX	Not used	
	716XX	Not used	
	717XX	Not used	
	718XX	Not used	
	719XX	Not used	

A closed numbering plan is used for the entire country.

Contacts:

Mr Sulayman Suso
Gambia Telecommunications Company Ltd. (Gamtel) (Fixed Operator)
3, Nelson Mandela Street
P.O. Box 387
BANJUL
Gambia

Tel: +220 22 2800 (after 28 February 2004 +220 422 2800)
Fax: +220 22 8004 (after 28 February 2004 +220 422 8004)
E-mail: gen-info@gamtel.gm

Lamin Drammeh
Gamcel (Mobile Operator)
Tel: +220 39 5888 (after 28 February 2004 +220 439 5888)
Mobile: +220 98 6888 (after 28 February 2004 +220 998 6888)

Serge Khalil
Africell (Mobile Operator)
Tel: +220 37 6022 (after 28 February 2004 +220 437 6022)
Mobile: +220 75 0062 (after 28 February 2004 +220 775 0062)

Communication of 1.VI.2005:

Gambia Telecommunications Company Ltd. (Gamtel), Banjul, announces the introduction of the following new series of mobile numbers:

Service	New number series as from 4 April 2005
Mobile (Africell)	70 *XXXXX*, 77 XXXXX
Mobile Gamcell	98 XXXXX

Contacts:

Mr. Absoulie Barrow
Gambia Telecommunications Company Ltd. (Gamtel) (Fixed Operator)
3, Nelson Mandela Street
P.O. Box 387
BANJUL
Gambia

Tel: +220 437 1962
Fax: +220 422 8004
E-mail: abarrow@gamtel.gm

Mr Khalil Abou Haidar
Telecom Engineer
Africell (Mobile Operator)

Tel: +220 437 6022
Mobile: +220 775 0062
E-mail: kabouhaidar@africell.gm

Ghana (country code +233)

Communication of 16.XII.2003:

The *National Communications Authority,* Accra, announces the following National Numbering Plan (NNP).

Ghana is currently divided into fifty-two numbering areas with the following arrangements:

ABC-DEF	(three-digit subscriber number)	e.g. Ada
ABC-DEFG	(four-digit subscriber number)	e.g. Hohoe
ABC-DEFGH	(five-digit subscriber number)	e.g. Kete-Krachi
AB-CDE	(three-digit subscriber number)	e.g. Ho
AB-CDEF	(four-digit subscriber number)	e.g. Bolgatanga
AB-CDEFG	(five-digit subscriber number)	e.g. Kumasi
AB-CDEFGH	(six-digit subscriber number)	e.g. Accra North

The existing subscriber numbering scheme for the whole country comprises of three, four, five and six-digit numbers. The digits used for A are from 2 – 9.

Region	Location	Existing Area code	Existing Subscriber Number
ASH	Ashanti		
ASH	Agogo	–	–
ASH	Akumadan	–	–
ASH	Bekwai	572	2XX, 3XX
ASH	Buokrom1	51	7XXXX
ASH	Buokrom2		
ASH	Effiduasi	–	
ASH	Ejura	565	2XXXX
ASH	Jamasi	–	–
ASH	Juaben	–	–
ASH	Konongo	531	2XX, 3XX
ASH	Kumasi1	51	20XXX-34XXX
ASH	Kumasi2	51	4XXXXX
ASH	Kumawu	–	–
ASH	Mampong-Ashanti	561	2XX, 3XX
ASH	Nkenkaso	–	–
ASH	Obuasi	582	2XX, 4XX
ASH	Odumase	–	–
ASH	Sekodumasi	–	–
ASH	Tanos1	51	5XXXX
ASH	Tanoso2	–	–
ASH	Tepa	–	–
ASH	UST1	51	6XXXX
ASH	UST2		
ASH	Wiamoase	–	–
BRA	Brong Ahafo	567	2XXX
BRA	Atebubu	–	–
BRA	Bechem		
BRA	Berekum	642	2XXXX
BRA	Dormaa-Ahenkro	648	2XXXX
BRA	Duayaw Nkwanta	–	–
BRA	Goaso	–	–
BRA	Kenyase	–	–

Region	Location	Existing Area code	Existing Subscriber Number
BRA	Kintampo	–	–
BRA	Kyeraa	–	–
BRA	Mim	–	–
BRA	Nkoraza	–	–
BRA	Nsuatre	–	–
BRA	Sunyani (Neax)	–	–
BRA	SunyaniI (UV)	61	2XX-6XX
BRA	SunyaniII (HDX1)	61	70XX-74XX
BRA	Techiman	653	2XXX
BRA	Techimantia	–	–
BRA	Tuobodom	–	–
BRA	Wamfie	–	–
BRA	Wenchi	652	2XXX
BRA	Yeji	568	2XXXX
CEN	Central Region		
CEN	Asikuma	–	–
CEN	Assin Foso	–	–
CEN	Besease	–	–
CEN	Bodwoase	–	–
CEN	Cape Coast1	42	32XXX-34XXX
CEN	Cape Coast2	42	35XXXX
CEN	Dunkwa	372	2XX-4XX
CEN	Elmina	–	–
CEN	Kasoa		
CEN	Kwanyarku	–	–
CEN	Mankesim	–	–
CEN	Moree	–	–
CEN	Mumford	–	–
CEN	Nyaakrom	–	–
CEN	Saltpond	–	–
CEN	Senya Bereku	–	–
CEN	Swedru	41	2XX-4XX
CEN	Winneba1	432	22XXX
CEN	Winneba2		
EAS	Eastern Region		
EAS	Aburi	876	22XXX
EAS	Adumasi	–	–
EAS	Agomenya	–	–
EAS	Akim Oda1	882	2XX
EAS	Akim Oda2	–	–
EAS	Akosombo	251	2XX-7XX
EAS	Akropong	–	–
EAS	Akroso	–	–
EAS	Akuse	–	–
EAS	Akwatia	–	–
EAS	Asamankese	–	–
EAS	Asuom	–	–
EAS	Begoro	–	–
EAS	Bepong	–	–
EAS	Donkorkrom	848	22XXX
EAS	Effiduase	–	–
EAS	Kade	–	–

Region	Location	Existing Area code	Existing Subscriber Number
EAS	Kibi	–	–
EAS	Koforidua1	81	22XXX-25XXX
EAS	Koforidua2		
EAS	Kpong	–	–
EAS	Krobo Odumasi	–	–
EAS	Kukurantumi	–	–
EAS	Mampong-Akwapim	872	22XXX
EAS	Mpraeso	846	22XXX
EAS	Nkawkaw1	842	22XXX
EAS	Nkawkaw2	–	–
EAS	Nkwatia	–	–
EAS	Nsawam1	842	22XXX
EAS	Nsawam2	–	–
EAS	Suhum	–	–
EAS	Tafo	–	–
GRA	Greater Accra		
GRA	Accra Central	21	66XXXX-69XXXX
GRA	Accra-North	21	22XXXX-25XXXX
GRA	Achimota	21	40XXXX-41XXXX
GRA	Ada	968	2XX-3XX
GRA	Cantonments	21	76XXXX-78XXXX
GRA	Dansoman	21	30XXX-31XXX
GRA	Dodowa		
GRA	Gbawe		
GRA	Lashibi1	22	40XXX
GRA	Lashibi2	–	–
GRA	Madina	21	50XXXX-51XXXX
GRA	Redemption Valle	22	30XXXX-31XXXX
GRA	Baatsonaa	–	–
GRA	Tema	22	20XXXX-21XXXX
GRA	Teshie-Nungua	21	712XXX
GRA	Weija		
NOR	Northern Region		
NOR	Bimbilla	–	–
NOR	Bole	746	22XXX
NOR	Buipe	716	22XXX
NOR	Damongo	717	22XXX
NOR	Gambaga	762	22XXX
NOR	Gushiegu	–	–
NOR	Kumbugu	–	–
NOR	Nalerigu	–	–
NOR	Salaga	752	22XXX
NOR	Savelugu	–	–
NOR	Tamale	71	22XXX-23XXX
NOR	Walewale	715	22XXX
NOR	Yendi	–	–
NOR	Zabzugu	–	/
UPE	Upper East Region		
UPE	Bawku	743	2XXX
UPE	Bolgatanga	72	2XXX-4XXX
UPE	Navrongo		
UPE	Zebilla		

Region	Location	Existing Area code	Existing Subscriber Number
UPW	Upper West Region		
UPW	Jirapa		
UPW	Wa1	756	22XXX
UPW	Wa2		
VOL	Volta Region		
VOL	Aflao	962	2XX-4XX
VOL	Akatsi		22XXX
VOL	Amedzofe	931	
VOL	Anloga	–	–
VOL	Dzodze	–	–
VOL	Ho		
VOL	HoI	91	2XX-7XX
VOL	HoII	91	8XXX
VOL	Hohoe	935	2XXX
VOL	Kadjebi	–	–
VOL	Keta	966	2XX-3XX
VOL	Kete-Krachi1	953	22XXX
VOL	Kete-Krachi2		
VOL	Kpandu	–	–
VOL	Kpase	–	–
VOL	Peki	–	–
VOL	Tegbi	–	–
WES	Western Region		
WES	Asankragua1	392	22XXX
WES	Asankragua2	–	–
WES	Axim	342	2XX
WES	Bibiani	–	–
WES	Effia-Kuma	–	–
WES	Elubo1	345	22XXX
WES	Elubo2	–	–
WES	Enchi	395	22XXX
WES	Half Assini	–	–
WES	Kwesimintsim	–	–
WES	Prestea	–	–
WES	Samreboi	394	22XXX
WES	Sekond1	31	46XXX
WES	Sekond2	–	–
WES	Shama	–	–
WES	Takoradi1	31	21XXX-26XXX
WES	Takoradi2	362	2XX-5XX
WES	Tarkwa		
zzCLO	Cellular Operators		
zzCLO	Celltel	28	21XXXX
zzCLO	GT – Ashanti Region		
zzCLO	GT – Brong Ahafo		
zzCLO	GT – Central Region		
zzCLO	GT – Eastern Region		
zzCLO	GT – Greater Accra		
zzCLO	GT – Nor, Upe, Upw, Region		
zzCLO	GT – Volta Region		
zzCLO	GT – Western Region		
zzCLO	Mobitel	27	55XXXX
zzCLO	Scancom	24	YYXXXX
zzCLO	GT-ONETOUCH	20	8XXXXXX
zzCLO			
zzCLO			

Region	Location	Existing Area code	Existing Subscriber Number
zzSPS ZzSPS ZzSPS ZzSOS/6 ZzSPs/6 ZzSPS7 ZzSPS7 ZzSPS	Special Services Personal No. Share Cost Special Services / premium rate Prem Rate Services Special Services / Freephone Freephone Toll Free		
ZzSPS1	Special Services / International		
ZzSP1 ZzsPS1 ZzSP1 ZzsPS1 ZzSP1	International Prefix International Call Booking International Call Enquiries International Call Complaints International Call Booking	00 0171 0172 0174 0175	
ZzSP1 ZzsPS1 ZzSP1 ZzsPS1	International Call Booking Information On C USA Direct UK Direct	0176 0177 0191 0194	
ZzSP2 ZzsPS2 ZzSPS2 ZzSPS2 ZzSPS2 ZzSPS2	Special Services / Emergency Protected Emergency Police Fire Ambulance	 999 191 192 193	
ZzSPS3 ZzSPS3 ZzSPS3 ZzSPS3 ZzSPS3 ZzSPS3 ZzSPS3 ZzSPS4	Special Services / Internet Access Internet (Africa On-Line) Internet (Ghana Classified) Internet Access (GT) Internet Access (NCS) Internet Ghana ./Special Services/GT Customer Care		
ZzSPS4 ZzSPS4 ZzSPS4 ZzSPS4 ZzSPS4	Fault Reporting General Enquiries Time Announcement Directory Assistance Phonogram	101 102 104 105 106	

Contact:

National Communications Authority
P.O. Box C1568 - Cantonments
ACCRA
Ghana

Tel: +233 21 776 621
Fax: +233 21 763 449
E-mail: nca@ncs.com.gh

Guinea (country code +224)

Communication of 21.XI.2002:

The *Direction nationale des Postes et Télécommunications,* Conakry, announces that the following numbering plan is currently in force in Guinea:

Area code	Subscriber number	Service
11	21 XXXX 22 XXXX 23 XXXX 25 XXXX 26 XXXX 27 XXXX 28 XXXX 29 XXXX 33 XXXX 34 XXXX 54 XXXX 55 XXXX 57 XXXX 58 XXXX 59 XXXX	Mobile Sotelgui
12	66 XXXX 67 XXXX 69 XXXX	Mobile Spacetel
13	10 XXXX 35 XXXX 40 XXXX	Mobile Intercel
None	41 XXXX 42 XXXX 43 XXXX 45 XXXX 46 XXXX	FW/Câble Conakry
None	24 XXXX 31 XXXX 32 XXXX 51 XXXX 52 XXXX 53 XXXX 61 XXXX 68 XXXX 69 XXXX 71 XXXX 81 XXXX 91 XXXX 94 XXXX 97 XXXX 98 XXXX	Fria Boke CBG Kamsar Labe RillLabe Pita Kindia Mamou Dalaba Kankan Faranah Nzerekore Macenta Gueckedou Kissidougou

Contact

Télécommunications Guinéennes (Sotelgui S.A.)
CONAKRY
Guinée

Tel: +224 45 0235
Fax: +224 41 2000

Guinea-Bissau (country code +245)

Communication of 16.VII.2003:

The *Instituto das Comunicações da Guiné-Bissau (ICGB)*, Regulatory Agency for Telecommunications and Post, Bissau, announces that the numbering plan (NP) in use in the territory of Guinea-Bissau, is a plan of six (6) digits and is applicable to the national fixed telephony network.

Numbering Plan (NP) of Guinea-Bissau

Province	Locality	Subscriber Numbers (SN)	Comments
Autonomous Sector of Bissau	Bissau	20XXXX 21XXXX	Guiné Telecom
	S. Luzia	22XXXX	Guiné Telecom
	Brá	25XXXX	Guiné Telecom
East/Bafatá	Bafatá	41XXXX	Guiné Telecom
	Bambadinca	41XXXX	Guiné Telecom
East/Gabú	Gabú	51XXXX	Guiné Telecom
	Pirada	53XXXX	Guiné Telecom
	Sonaco	52XXXX	Guiné Telecom
North/Cacheu	Bigene	32XXXX	Guiné Telecom
	Ingore Bula	33XXXX	Guiné Telecom
	Cacheu	92XXXX	Guiné Telecom
	Canchungo	91XXXX	Guiné Telecom
	S. Domingos	93XXXX	Guiné Telecom
North/Oio	Bissorã	32XXXX	Guiné Telecom
	Farim	35XXXX	Guiné Telecom
	Manssabá Mansoa	31XXXX	Guiné Telecom
South/Bolama	Bolama	81XXXX	Guiné Telecom
	Bubaque	82XXXX	Guiné Telecom
	Caravela	83XXXX	Guiné Telecom
	Uno	84XXXX	Guiné Telecom
South/Quinara	Buba Fulacunda Tite	61XXXX	Guiné Telecom
South/Tombali	Bedanda Catio Cacine	61XXXX	Guiné Telecom
	Quebo	62XXXX	Guiné Telecom.

Iternational prefix = 00

Contact:

Instituto das Comunicações da Guiné-Bissau (ICGB)
Av. Domingos Ramos, 53
CP 1372
BISSAU
Guinée-Bissau

Att.: Teófilo Lopes, Chief of Registrations and Licensing Department

Tel: +245 204 873 / +245 204 874
Fax: +245 204 876
E-mail: icgb@mail.bissau.net / icgb@gtelecom.gw

Communication of 13.IV.2004:

Instituto das Comunicações da Guiné-Bissau (ICGB), Bissau, announces that a ten-year license has been assigned to *Sociedade SPACETEL Guiné-Bissau S.A.*, for use in operation of its GSM mobile cellular telecommunication service in Guinea-Bissau, with the number series +245 66 XXXXX.

Contact:

Instituto das Comunicações da Guiné-Bissau (ICGB)
Av. Domingos Ramos, 53
Cx Postal 1372
BISSAU
Guinée-Bissau

Tel: +245 20 48 73
Fax: +245 20 48 76
E-mail: icgb@mail.bissau.net
URL: www.icgb.org

Liberia (country code +231)

Communication of 13.V.2003:

The *Liberia Telecommunications Corporation (LIBTELCO),* Monrovia, recalls that the LoneStar Communications Corporation has introduced a new GSM cellular mobile telephone service in Liberia with the access codes 64 and 65.

International dialing format:

+231 64XXXXX
+231 65XXXXX

All Administrations and Recognized Operating Agencies (ROAs) are requested to urgently programme their switches to enable immediate access to these number series.

Contact:

Mr William Samnal
Operations Manager
Liberia Telecommunications Corporation (LIBTELCO)
Telecommunications Building
Lynch Street
PM Bag 9039
1000 MONROVIA 10
Liberia

Tel: +231 226001
Fax: +231 226356

Communication of 25.II.2004:

The *Ministry of Posts and Telecommunications,* Monrovia, announces that a new GSM cellular mobile telephone service has been introduced in Liberia by Libercell, the operating arm of the *Atlantic Wireless Liberia Inc.* with the following access codes “46” and “47”.

International dialing format:

+231 46 XXXXX
+231 47 XXXXX

All Administrations and Recognized Operating Agencies (ROAs) are requested to programme their switches to enable immediate access to these number series.

Contact:

Mr Kolubahzi T. Howard
Department of Telecommunications and Technical Services
Ministry of Posts and Telecommunications
MONROVIA
Liberia

Tel: +231 226 079
Fax: +231 226 356

Communication of 8.IX.2004:*

The *Ministry of Posts and Telecommunications (MPT)*, Monrovia, announces that the numbering plan of the mobile GSM service of *CELCOM Telecommunications Inc.*, is as follows:

International dialing format:

+231 7 XXX XXXX

All Administrations and Recognized Operating Agencies (ROAs) are requested to programme their switches to enable immediate access to the new number series.

Contact:

Ministry of Posts and Telecommunications
Department of Telecommunications and Technical Services
MONROVIA
Liberia

Tel:+231 226 079
Fax: +231 226 356

Communication of 11.X.2004:

The *Ministry of Posts and Telecommunications (MPT),* Monrovia, announces that the National Destination Code (NDC) 5 has been allocated to the GSM mobile network of *Comium Liberia Inc.*

International dialing format:

+231 5 XXX XXX

All Administrations and Recognized Operating Agencies (ROAs) are requested to programme their switches to enable immediate access to these number series.

Contact:

Ministry of Posts and Telecommunications (MPT)
Department of Telecommunications and Technical Services
MONROVIA
Liberia

Tel: +231 226 079
Fax: +231 226 356

* This information cancels and replaces that published in ITU Operational Bulletin No. 814 of 15.VI.2004, pages 10 and 11.

Mali (country code +223)

Communication of 5.I.2005:

The *Comité de Régulation des Télécommunications (CRT),* Bamako, announces the National Numbering Plan (NNP) in force in Mali:

Tables of telephone network subscriber call numbers for Mali

A Customer assistance services and emergency services

Number	Service
00	International access

- *Customer assistance services*

Number	Service
120	Semi-automatic trunk
122	Directory inquiries
123	Fault reporting
124	Commercial inquiries
126	Semi-automatic international

- *Emergency services*

Number	Service
15	Health
17	Police
18	Fire brigade

B Access numbers for Internet service providers

Number	Service
7250	Internet node Sotelma
7251	Malinet
7252	CEFIB
7255	Afribone
7256	Bureaucratic service
7257	Cyfed refer
7258	Djom consulting
7260 7261	Datatech
7263	Spider
7266	RIB
7269	I&D
7265	Technolab
7262	SIPRES
7264	ARC informatique

C Access numbers for value-added services

Number	Service
7211	ILT prepaid service access
7222	Access to prepaid service TELTRADE
7299	Talking clock
7220	MALIPAC
7230 7235 7236	MINITEL
7234	Son et lumière server
7200	Numéro vert (free phone)
7221	Information on supplementary services
7223	Inquiries: Billing and voice telegram delivery

D Table for subscriber numbers in Sotelma's telephone network

District/Region	Type of network	Numbers
Bamako	Fixed Conventional	220 XXXX 221 XXXX 222 XXXX 223 XXXX 224 XXXX 225 XXXX 226 XXXX 227 XXXX 228 XXXX 229 XXXX
	Radio local loop	269 XXXX
	AMPS (Fixed and mobile)	277 XXXX 299 XXXX
Segou	Fixed Conventional	232 XXXX 233 XXXX 234 XXXX 235 XXXX 236 XXXX 237 XXXX 238 XXXX 239 XXXX
Mopti	Fixed Conventional	242 XXXX 243 XXXX 244 XXXX 245 XXXX 246 XXXX 247 XXXX 248 XXXX 249 XXXX 252 XXXX 256 XXXX

District/Region	Type of network	Numbers
Kayes	Fixed Conventional	253 XXXX 254 XXXX 255 XXXX 257 XXXX 258 XXXX 259 XXXX 262 XXXX 266 XXXX
Sikasso	Fixed Conventional	263 XXXX 264 XXXX 265 XXXX 267 XXXX 268 XXXX 282 XXXX 286 XXXX
Gao and Kidal	Fixed Conventional	283 XXXX 284 XXXX 285 XXXX 287 XXXX 288 XXXX 289 XXXX
Tombouctou	Fixed Conventional	292 XXXX 293 XXXX 294 XXXX 295 XXXX 296 XXXX 297 XXXX 298 XXXX

E Table for subscriber numbers in Sotelma's mobile network – Malitel

- *Mobile network of Sotelma mobile (Malitel)*

District/Region	Operator	Subscriber Numbers (seven digits)
Bamako	Sotelma mobile (Malitel)	65 XXXXX 66 XXXXX 67 XXXXX 68 XXXXX 69 XXXXX

F Table for subscriber numbers in the Ikatel S.A. telephone network

- *Ikatel S.A. mobile network*

Operator	Subscriber Numbers (seven digits)
Ikatel mobile	60 XXXXX 61 XXXXX 62 XXXXX 63 XXXXX 64 XXXXX

- *New number series for the mobile service starting 15 February 2005*

Operator	Subscriber Numbers (seven digits) From 15 February 2005
Ikatel mobile	90 XXXXX 91 XXXXX 92 XXXXX 93 XXXXX 94 XXXXX

- *Fixed network of Ikatel S.A.*

Operator	Subscriber Numbers (seven digits)
Ikatel fixed	40 XXXXX 41 XXXXX 42 XXXXX 43 XXXXX 44 XXXXX 45 XXXXX 46 XXXXX 47 XXXXX 48 XXXXX 49 XXXXX

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Niger (country code +227)

Communication of 19.IV.2005:

The *Société Nigérienne des Télécommunications (SONITEL),* Niamey, announces the following numbering plan of Niger:

Numbering Plan of Niger

Service	Operator	Region	Number series
Fixed (PSTN)	SONITEL	Niamey	31XXXX 32XXXX 33XXXX 34XXXX 35XXXX 36XXXX 37XXXX 20XXXX 722XXX 723XXX 724XXX 725XXX 732XXX 733XXX 734XXX 735XXX 736XXX 737XXX 738XXX 739XXX 740XXX 741XXX 742XXX 743XXX 744XXX 752XXX 753XXX 754XXX 755XXX
		Agagdez	440XXX 441XXX
		Arlit	452XXX
		Birni N'Konni	640XXX
		Diffa	540XXX
		Dosso	650XXX
		Gaya	680XXX
		Maradi	410XXX 411XXX
		Say	784XXX
		Tahaoua	610XXX
		Tillabery	711XXX

Service	Operator	Region	Number series
Fixed (PSTN) *(Cont.)*	SONITEL *(Cont.)*	Zinder	510XXX 511XXX 512XXX 513XXX 514XXX 515XXX 516XXX 517XXX
Fixed cellular	SONITEL	Niamey	903XXX
Mobile GSM 900	SAHELCOM	Niamey	80XXXX 81XXXX 82XXXX 91XXXX 92XXXX 93XXXX
Mobile GSM 900	CELTEL-NIGER	Niamey	26XXXX – 29XXXX 40XXXX 49XXXX 50XXXX 55XXXX 56XXXX 59XXXX 87XXXX 88XXXX 89XXXX 96XXXX 97XXXX 98XXXX 99XXXX
Mobile GSM 900	TELECEL-NIGER	Niamey	84XXXX 85XXXX 94XXXX 95XXXX
Test telephone number: +227 73 66 66			

Contact:

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National numbering plan of Nigeria

Terminology

i)	Numbering Plan:	A plan for allocation of a unique National Number to each Subscriber connected to the national telephone system.
ii)	Numbering Area:	A part of the country to which a Trunk Code (or area code) has been allocated, and within that area only the Directory Numbers are dialed.
iii)	Trunk Prefix:	The code "0" has been allotted as the Trunk Prefix for automatic National dialing. Trunk Prefix is defined as the digit or a combination of digits to be dialed by a calling subscriber so as to obtain access to a trunk code and the numbering area.
iv)	Trunk Code:	A digit or a combination of two digits identifying the called Numbering Area within the country. E.g. "82" for Aba numbering Area "1" for Lagos Numbering Area The prefix "0" is not part of this code
v)	Directory Number:	It is the subscriber's telephone number, which is to be dialed to reach a subscriber in the same Numbering Area. It may consist of 5, 6 or 7 digits. E.g. 2691522 - Ikoyi Hotel, Lagos
vi)	National Number:	Trunk Code and the subscriber telephone number taken together. e.g. 1-2691522 - Ikoyi Hotel, Lagos. The maximum length of the National number is limited to 8 digits for Nigeria (i.e. Trunk Code plus subscriber Number) in the present 11-n numbering plan format.
vii)	International Prefix	The international code is 009
viii)	Country Code:	A combination of one or two or three digits for identifying the called country. e.g. Country code for Nigeria is 234" while the Country code for Federal Republic of Germany is 49"
ix)	International Number	The number to be dialed following the International Prefix to obtain a subscriber in another country. The International number consists of the country code of the required country followed by the National number of the called subscriber, but does not include the Trunk prefix used in the national network of the called subscriber
x)	Exchange Code:	It is the first one, two or three digits of the subscribers Telephone number (i.e. the Directory Number) which is made use of for identifying the Telephone Exchange to which the subscriber's Telephone is connected, e.g.. 269" for Ikoyi Telephone Exchange 497" for Ikeja Telephone Exchange. This code is made use of for routing calls between Exchanges within the same numbering area.
xi)	Local Exchange:	It is the Exchange to which the subscriber lines are connected.

xii) Primary Centre: It is the Trunk switching centre of the lowest hierarchy to which Local Exchanges are connected for transmitting of subscriber Trunk Dialing (S.T.D) calls. The charge determination for S.T.D. calls normally takes place in the Primary Centre.

xiii) Primary Area: It is the area served by a Primary switching centre. It may be co-terminus with a single Numbering Area or may cover several adjoining numbering areas.

xiv) Secondary Centre: It is the trunk-switching centre of higher hierarchy for transiting of traffic between primary centres. It carries only overflow traffic between Primary centres if direct high usage routes are provided between them.

xv) Secondary Area: It is the area served by a Secondary centre. It covers several Primary areas depending on the number of Primary centres connected to that particular Secondary centre.

Telephone Number Composition

a) National Calls

National (significant) Number

Trunk prefix + Trunk Code + LE Code + subscriber No.

b) International Calls

International Number

International Prefix	+ Country Code	+ Trunk Code	+ Subscriber Number

The international Prefix in Nigeria is 009 Nigeria belongs to the world numbering Zones 2 and the country code is 234.

c) Border Communication

There are two possibilities for border communications between the Federal Republic of Nigeria and the Niger republic:

(i) From Sokoto (Nigeria) to Birnin Nkoni (Niger Republic)

(ii) From Katsina (Nigeria) to Maradi (Niger Republic)

The prefix for calls to Birnin Nkoni and Maradi is the digit 9". It is shown in the Numbering Plan at Area Codes 060 and 065.

Subscriber Number

The subscriber number is that part of the National (significant) Number which follows the Area code. It identifies the subscriber inside his numbering Area. By adding the Area code, the number becomes unique inside Nigeria and forms the National (significant) Number. The combination of this National (significant) Number with the Country Code identifies the subscriber unambiguously all over the world.

Dialing Procedure

1) Local Call:

Dial Directory Number of the wanted subscriber. It may consist of 5 digits as in Wukari area or 6 digits as in Enugu area, or 7 digits as in Abuja area.

2) STD Call:

Dial Trunk Prefix □0" followed by the Trunk Code of the called numbering area, and followed by the Directory number of the wanted subscriber. In other words, dial trunk prefix 0" followed by the National number of the wanted subscriber. E.g.

0	2	2417890
Trunk Prefix	Trunk code for Ibadan	Directory number of a subscriber of Ibadan Exchange
0	1	2691531
Trunk Prefix	Trunk Code for Lagos	Directory number of a Subscriber of Ikoyi, exchange, Lagos
0	9	5237890
Trunk Prefix	Trunk code for Abuja	Directory number of a subscriber of Abuja Exchange

3) International Calls:

Dial international prefix 009"

Followed by the country code for the required country, and followed by the national number of the wanted subscriber e.g.

009	41	22	995111
International Prefix	Country code for Switzerland	Trunk code Geneva	Directory number of ITU

4) Incoming International Call:

For example, to a subscriber of Ibadan (Nigeria), say from Germany.

00	234	2	2467890
Inter-National prefix to be dialed by Germany subscriber to get access to their international exchange	Country code for Nigeria	Trunk code of Ibadan	Directory number of an Ibadan Subscriber

5) For traffic within a Numbering area only the Directory Number is dialed. For traffic to other areas the complete National Number preceded by the Trunk prefix Is dialed. For subscriber dialing international traffic, the International Trunk prefix is dialed followed by the country code for the destination country and the wanted subscriber's national number.

6. For border calls from Katsina to Maradi (Niger Republic) and Sokoto to BirninNkoni (Niger Republic) the prefix 9" has to be dialed from the subscribers of Katsina or Sokoto. After the Prefix 9" the subscriber number of the subscriber of Niger Republic follows.

Existing national numbering plan on zonal basis

1.0 LAGOS ZONE

Primary centre	Area code
LAGOS	01

2.0 NORTH WEST ZONE

Primary centre	Area code
SOKOTO	060
KAFANCHAN	061
KADUNA	062
GUSAU	063
KANO	064
KATSINA	065
BRININ-KEBBI	068
ZARIA	069
HADEJIA	078

3.0 CENTRAL ZONE

Primary centre	Area code
ABUJA	09
ILORIN	031
MAKURDI	044
LOKOJA	058
MINNA	066
KONTAGORA	067
NEW BUSSA	033

4.0 NORTH EAST ZONE

Primary centre	Area code
WUKARI	041
MAKURDI	044
LAFIA	047
PANKSHIN	070
AZARE	071
GOMBE	072
JOS	073
YOLA	075
MAIDUGURI	076
BAUCHI	077
JALINGO	079

5.0 SOUTH WEST ZONE

Primary centre	Area code
IBADAN	02
ADO-EKITI	30
AKURE	034
OSHOGBO	035
ILE-IFE	036
IJEBU-ODE	037
OYO	038
ABEOKUTA	039
IKARE	050
OWO	051
BENIN	052
WARRI	053
SAPELE	054
AGBOR	055
ASABA	056
AUCHI	057
OKITIPUPA	059

6.0 SOUTH EAST ZONE

Primary centre	Area code
ENUGU	042
ABAKALIKI	043
OGOJA	045
ONITSHA	046
AWKA	048
ABA	082
OWERRI	083
PORT-HARCOURT	084
UYO	085
AHOADA	086
CALABAR	087
UMUAHIA	088
YENOGOA	089

7.0 CELLULAR (ETACS) – ANALOG: 090

8.0 CELLULAR (GSM): 080

8.1 ECONET WIRELESS: 0802xxxxxxx

8.2 MTN: 0803xxxxxxx

8.3 NITEL: 0804xxxxxxx

8.4 GLOBACOM: 0805xxxxxxx

Special service codes

Digital Dialed	Type of Service	Remarks
115	National Emergency	
191	Speaking Clock	A
192	Repair Service	A
193	Information Service (Local)	A: 1 4
194	Directory Information (Local)	A: 1 4
195	Directory Information (Non-Local)	A: 1 4
196	Phonogram	A
197	Test Desk	A
198	Test Frame for field maintenance personnel	A
118	Emergency Ambulance	A: 3,4,5
199	Emergency Police	A: 3,4,5
119	Emergency Fire Services	A: 3,4,5
190	Call Booking (National)	A 1 2 4
171, 175	Call Booking (International)	A 4
Area Code + 121	Calling Distant Operator	B: 1 4
Area Code + 125	Directory Information	B: 1 4
International code + 120	International Call Booking	B: 1 4
International code + 165	International Information	B: 1 4
International code + 161	International Time and Charge	B: 1 4
101	Test Trunk to Toll Test Board (TTB)	C
102	1000HZ Test Trunk	C
105	Local Test Trunk	C
100	Noise Balance Test	C
13 (xxxx)	NITEL Technical Department (Indialing)	D
14 (xxxx)	NITEL Marketing Department (Indialing)	D
15 (xxx)	ISPs and Prepaid Services	E
18 (xxxx)	Mass Announcement (Advertisement)	E
18X	Weather Forecast, Stock Exchange, etc.	E
188	USA Direct AT&T Operator	E
110	Voice Mail System	
113	Fault Report Business	
114	Fault Report Residential	
116	Call Barring (Enhanced Network Service)	
143	Credit Control (Accounts) – Business	
144	Credit Control (Accounts) – Residential	

Remarks

a) Subscriber Codes

b) Operator Codes

c) Maintenance and Test Codes

d) Administrative Codes

e) Customer Service Codes (Subscriber Access)

1) Can be routed to the same operator and on the same route.
2) This code shall be routed to call Booking positions with a switch over possibility to positions intended for use at low traffic periods.
3) Emergency Services are centralized per area.
4) These codes shall be routed to the relevant operator positions.
5) Calls to these services are not charged.

Senegal (country code +221)

Communication of 13.I.2004:

Société Nationale des Télécommunications du Sénégal (SONATEL), Dakar, announces the following numbering plan for Senegal:

Codes in service in Senegal and number formats

Country code	Prefix	Status	Routing to	Length N(S)N
+221	51	Valid	Mobile GSM (Alizé) New prefix	seven
+221	53	Valid	Mobile GSM (Alizé)	seven
+221	54	Valid	Mobile GSM (Alizé)	seven
+221	55	Valid	Mobile GSM (Alizé)	seven
+221	56	Valid	Mobile GSM (Alizé)	seven
+221	57	Valid	Mobile GSM (Alizé) New prefix	seven
+221	58	Valid	Mobile GSM (Sentel) New prefix	seven
+221	59	Valid	Mobile GSM (Sentel) New prefix	seven
+221	62	Valid	Audiotex (Non accessible from abroad)	seven
+221	63	Valid	Mobile GSM (Alizé)	seven
+221	64	Valid	Mobile GSM (Alizé)	seven
+221	65	Valid	Mobile GSM (Alizé)	seven
+221	66	Valid	Mobile GSM (Sentel)	seven
+221	67	Valid	Mobile GSM (Sentel)	seven
+221	68	Valid	Mobile GSM (Sentel)	seven
+221	69	Valid	Mobile GSM (Sentel)	seven
+221	82	Valid	PSTN	seven
+221	83	Valid	PSTN, ISDN	seven
+221	84	Valid	PSTN, ISDN	seven
+221	85	Valid	PSTN	seven
+221	86	Valid	PSTN	seven
+221	87	Valid	PSTN	seven
+221	88	Valid	PSTN	seven
+221	89	Valid	PSTN	seven
+221	90	Valid	WLL/VSAT	seven
+221	93	Valid	PSTN	seven
+221	94	Valid	PSTN	seven
+221	95	Valid	PSTN	seven
+221	96	Valid	PSTN	seven
+221	97	Valid	PSTN	seven
+221	98	Valid	PSTN	seven
+221	99	Valid	PSTN	Seven
NOTE – PSTN:Public Switched Telephone Network. ISDN: Integrated Services Digital network. WLL/VSAT: Wireless Local Loop/VSAT.				

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Sierra Leone (country code +232)

Communication of 5.IV.2005:

The *Ministry of Transport & Communications,* Freetown, announces the updated E.164 national numbering plan of Sierra Leone, as follows *:

Overview:

E.164 Country code	232
International prefix	00
National (long distance) prefix	0
Length of area code	Two digits
Length of subscriber number	Six digits: • Fixed/geographic: two digit exchange code + four digit subscriber number, in the form NN XXXX • Mobile/non-geographic: six digits, in the form YXXXXX
Short codes	Three to four digits

Geographical numbering (fixed operators):

Locality	Operator	Area code	Exchange code	Subscriber number
Freetown	Sierratel	22	2N-4N	XXXX
	PCS Ltd		7N	XXXX
Bo y Kenema	Sierratel	32	2N-4N	XXXX
	PCS Ltd		7N	XXXX

Mobile and non-geographic numbers:

Network	Area code (National Destination Code (NDC))	Subscriber number
Celtel S.L. Ltd	76	YXXXXX
Millicom S.L. Ltd	30	YXXXXX
PCS Ltd	35	YXXXXX

* X = 0 – 9; Y = 1 – 9; N = 2 – 9

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Togo (country code +228)

Communication of 5.VII.2001:

The *Autorité de Réglementation des Secteurs de Postes et de Télécommunications,* Lomé, announces that a new seven-digit closed telephone numbering plan will be introduced in Togo on 1 October 2001. The format of the number is BPQMCDU.

The transition to the new numbers will be made with the addition of a digit "B" before the numbers (PQMCDU) of the plan currently in use.

– *Fixed telephony*

The blocks of numbers for fixed telephony will be assigned in such a way as to distinguish the economic regions of the country and the subscribers of the various telecommunication operators.

The new numbers for fixed telephony in the seven-digit format are as follows:

Locality	Subscriber numbers (BPQ MC DU)
Lomé Municipality	2XX XXXX
Maritime region	3XX XXXX
Plateaux region	4XX XXXX
Central region	5XX XXXX
Kara region	6XX XXXX
Savannah region	7XX XXXX

– *Mobile telephony*

The blocks of numbers for mobile telephony are assigned in such a way as to distinguish only the subscribers of the various operators and do not take into account the economic regions.

Two digits, B = 9 and B = 0, are reserved for mobile operators. The digit B = 9 will be used when the numbering changes.

The current numbers for Togo Cellulaire will be preceded by the digit B = 9.

The current numbers for Telecel Togo will be preceded by the digit B = 9, and the second digit "P = 0" (zero) will be replaced by P = 4, giving the format 94X XXXX.

– *Special services*

The digits B = 1 and B = 8 are reserved for the special services:

B = 1 for emergency services
B = 8 for other services

– *Number format for administrative services*

The format 8 PQ MC DU is reserved for administrative services (office and domestic) throughout the territory. The second digit (P) of numbers in this format identifies the economic region:

P = 2 Lomé municipality
P = 3 Maritime region
P = 4 Plateaux region
P = 5 Central region

P = 6 Kara region
P = 7 Savannah region

Number format for other services

Other services, i.e. freephone numbers, Internet numbers or other value-added service numbers, will take the format 8 PQ MC DU, with the second digit "P" taking only the values 0, 1, 8 or 9.

Togo Telecom, the incumbent fixed network operator, will maintain the blocks of numbers currently used in its network, preceded by the regional digit "B". The detail of the number formats is as follows:

New numbering plan for Togo

Locality	Networks served	New numbers B PQ MC DU	Comments
Savannah region	Dapaong and cantons	7 70XXXX	Togo Telecom
	Mango and cantons	7 71XXXX	Togo Telecom
	Mandouri and cantons	7 74XXXX	Togo Telecom
	Tandjoaré and cantons	7 75XXXX	Togo Telecom
	Sinkassé and cantons	7 76XXXX	Togo Telecom
	Regional DDI number	7 23XXXX	Togo Telecom
Kara region	Kara and cantons	6 60XXXX	Togo Telecom
	Bassar and cantons	6 63XXXX	Togo Telecom
	Pagouda and cantons	6 64XXXX	Togo Telecom
	Niamtougou and cantons	6 65XXXX	Togo Telecom
	Bafilo and cantons	6 66XXXX	Togo Telecom
	Kant' and cantons	6 67XXXX	Togo Telecom
	Pya and cantons	6 68XXXX	Togo Telecom
	Regional DDI number	6 23XXXX	Togo Telecom
Central region	Sokodé and cantons	5 50XXXX	Togo Telecom
	Tchamba and cantons	5 51XXXX	Togo Telecom
	Sotouboua and cantons	5 52XXXX	Togo Telecom
	Blitta and cantons	5 53XXXX	Togo Telecom
	Regional DDI number	5 23XXXX	Togo Telecom
Plateaux region	Atakpamé and cantons	4 40XXXX	Togo Telecom
	Kpalimé and cantons	4 41XXXX	Togo Telecom
	Notsé and cantons	4 42XXXX	Togo Telecom
	Badou and cantons	4 43XXXX	Togo Telecom
	Elavagnon, Anié and cantons	4 44XXXX	Togo Telecom
	Amlamé, Ounabé and cantons	4 46XXXX	Togo Telecom
	Agou and cantons	4 47XXXX	Togo Telecom
	Adéta, Danyi, Govié and cantons	4 48XXXX	Togo Telecom
	Regional DDI number	4 23XXXX	Togo Telecom
Maritime region	Tsévié and cantons	3 30XXXX	Togo Telecom
	Aného and cantons	3 31XXXX	Togo Telecom
	Vogan and cantons	3 33XXXX	Togo Telecom
	Tabligbo and cantons and Kouvo	3 34XXXX	Togo Telecom
	Agbodrafo and Afagnan	3 35XXXX	Togo Telecom
	Kavé and cantons	3 37XXXX	Togo Telecom
	Regional DDI number	3 23XXXX	Togo Telecom

Locality	Networks served	New numbers B PQ MC DU	Comments
Lomé municipality	Lomé centre	2 21XXXX	Togo Telecom
	Lomé centre	2 22XXXX	Togo Telecom
	PABX DDI	2 23XXXX	Togo Telecom
	Cacavelli	2 25XXXX	Togo Telecom
	Hédzranawoé	2 26XXXX	Togo Telecom
	Port	2 27XXXX	Togo Telecom
Mobiles	National	9 01XXXX	Togocel
	National	9 02XXXX	Togocel
	National	9 03XXXX	Togocel
	National	9 04XXXX	Togocel
	National	9 05XXXX	Togocel
	National	9 46XXXX	Telecel
	National	9 47XXXX	Telecel
	National	9 48XXXX	Telecel
	National	9 49XXXX	Telecel
Freephone and other services	Gulf administrative services	8 2XXXXX	
	Maritime region administrative services	8 3XXXXX	
	Plateaux region administrative services	8 4XXXXX	
	Central region administrative services	8 5XXXXX	
	Kara region administrative services	8 6XXXXX	
	Savannah region administrative services	8 7XXXXX	
Emergency and special services	Police rescue	1 17	Togo Telecom
	Fire brigade	1 18	National Service
	Police rescue	1 70	ITU
	Fire brigade	1 80	ITU
	Emergency medical services (SAMU)	1 85	ITU
DDI: Direct Dialing In. International prefix = 00			

Contact:

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Appendix 4

CEPT ECC Recommendation (05)03
Numbering for nomadic "Voice over IP" services

Adopted by the Working Group Numbering Naming and Addressing (WG NNA) in 2005:

"INTRODUCTION

New types of voice services are being developed that use the internet rather than the public telephone network to deliver calls and providers are starting to offer a range of these services and capture a share of the voice services market. These services are commonly referred to as "Voice over IP" (VoIP) services, even though services should be described in technological neutral terms. For many of these new services the interoperability with traditional voice services (i.e. telephone voice services supported by PSTN, ISDN, or mobile networks like GSM) is a critical success factor and this means that these services need adequate access to numbers for their subscribers. Although many of these new services started by offering outgoing calls only, some are now asking for numbers to support incoming calls and so the issue is now high on the agendas of many regulators.

"The European conference of Postal and Telecommunications Administrations,

considering

a) that many providers of new services based on VoIP technology aim these services to be a substitute for traditional voice services (PSTN, ISDN, GSM);

b) that such services have significant potential to increase competition;

c) that such services are in most cases not linked to a particular physical location and that the services can be provided from potentially any fixed network endpoint in the world for incoming and outgoing communication ("nomadicity");

d) that numbering allocations should be

- technology neutral,
- user-friendly,
- non-discriminatory between providers,
- informative to the user, especially with regard to tariff transparency,
- compatible with service provider portability;

e) that although a certain degree of harmonisation in Europe is desirable, numbering arrangements cannot be standardised as the national numbering plans (E.164) have to take into account legacy aspects and differences in market conditions of the country;

f) that national numbering plans were not designed to take into account the nomadicity aspect;

g) that national regulatory authorities should design their numbering plans in such a way that competition of these nomadic services with traditional voice services is supported;

h) that the following two options for allocation numbers for the new services are most likely to meet in a balanced way the interests of subscribers, calling end-users, service providers, and national authorities:

(1) allocate geographic numbers;

(2) allocate numbers from a new number range;

i) that the first option (the geographic number range) supports competition better, but the impact on number exhaustion needs consideration,

recommends

1 that national regulatory authorities decide in the short term on whether and how to adapt their national E.164 numbering plan to support these new services in their countries in order to promote competition and not to block innovative services from entering the market;

2 that national regulatory authorities should consider as the two main options for accommodating such services:

- allocating numbers in the geographic range, in many countries requiring a modification of the allocation criteria for the geographic range,
- modifying the numbering plan by adding a new number range for services with nomadic features;

3 that national regulatory authorities should consider implementing both options;

4 that national regulatory authorities consider all advantages and disadvantages of the various options as listed in ECC Report no 59 “Numbering for VoIP Services”, 16 December 2004.”

Source: http://www.ero.dk/documentation/docs/doc98/official/pdf/REC0503.PDF

Appendix 5

Useful websites

- www.acma.gov.au
  Australian Communications Authority
- www.art.sn
  L'Agence de Régulation des Télécommunications du Sénégal
- www.art-telecom.fr
  L'Autorité de Régulation des Communications Electroniques et des Postes (République Française)
- www.artel.bf
  L'Autorité Nationale de Régulation des Télécommunications du Burkina Faso
- www.artp.tg
  L'Autorité de Réglementation des secteurs de Postes et de Télécommunications (ART&P)
- www.artp.tg/telecom/arretes/art20011.htm
  Togolese Republic - telecom
- www.atci.ci
  L'Agence des Télécommunications de Côte d'Ivoire
- www.cnac.ca
  Canadian Number Administrator
- www.comreg.ie
  (Ireland) Commission for Communications Regulation
- www.erg.eu.int/doc/publications/erg0512_voip_common_statement.pdf
  European Regulators Group VoIP statement
- www.ero.dk/8E487DA7-1C6C-4E9A-94A8-29861A28F552
  ERO VoIP draft
- www.ero.dk/documentation/docs/doc98/official/pdf/REC0503.PDF
  ERO VoIP Recommendation on Numbering for Nomadic VoIP services
- www.ficora.fi
  Finnish Communications Regulatory Authority
- www.itu.int
  International Telecommunication Union
- www.itu.int/ITU-T/studygroups/com02/index.asp
  ITU Study Group 2 home page
- www.itu.int/ITU-D/treg/related-links/links-docs/numbering.html
  ITU Regulatory Reform Unit link to numbering resources
- www.itu.int/ITU-T/inr/enum/index.html
  ITU-T Enum resources

- www.nanpa.com
  North American Numbering Plan Administration
- www.ncc.gov.ng
  Nigerian Communications Commission
- www.ofcom.org.uk
  (UK) Office of Communications
- www.opta.nl
  Regulator for posts and telecommunications in The Netherlands
- www.urtip.gov.pl
  Urząd Regulacji Telekomunikacji i Poczty (Office of Telecommunications and Post Regulation)
- www.watra.org
  West African Telecommunications Regulators Association
- www.wtng.info
  World Telephone Numbering Guide

Appendix 6

ITU Presentation, Networks in Action, Overview of ENUM

Networks in Action: Overview of ENUM

FORUM ON TELECOMMUNICATION REGULATION IN AFRICA
Kampala, Uganda
3-5 November 2004

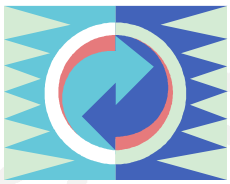
Robert Shaw
ITU Internet Strategy and Policy Advisor
Strategy and Policy Unit
International Telecommunication Union

The views expressed in this presentation are those of the author and do not necessarily reflect the opinions of the ITU or its Membership.

Agenda

- Networks in Action: Waves of Convergence
- Network Technology Paradigm Shift
- Next Generation Networks
- Emerging Regulatory Imperatives
- Case Study: VoIP
- Case Study: ENUM
- What problem is it trying to solve?
- Why is ENUM important for regulators?
- Current Status

2

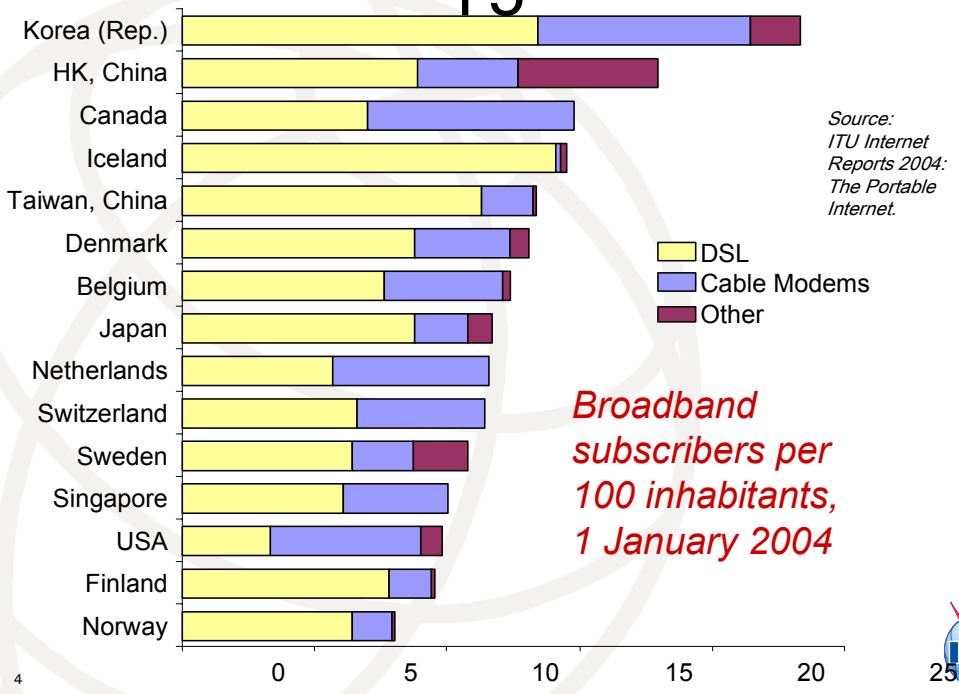


Networks in Action: First Wave

- Growth of Internet and other IP-based networks with their requirements for bandwidth and capacity has driven rapid innovation in telecommunication access and transport networks, examples:
  - leveraging copper wire "last-mile" networks through digital subscriber line ("DSL") technologies
  - re-architecturing of cable networks to support IP services
  - advances in optical networking technologies (e.g. PON)

3

Fixed-line broadband: Top 15



Source: ITU Internet Reports 2004: The Portable Internet.

Broadband subscribers per 100 inhabitants, 1 January 2004

4

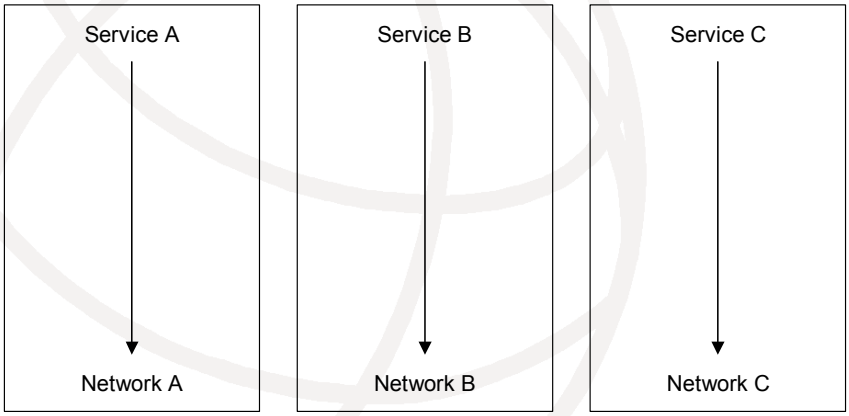
Networks in Action: Second Wave

- Ongoing trend towards integration & interoperability of IP-based and PSTN network services and applications
- Emergence of differentiated Quality of Service ("QoS") IP-based services
- Managed end-to-end performance needed for new applications requiring real-time traffic (e.g., video, voice)
- New network management, QoS, traffic engineering, pricing & accounting models

5

Network Technology Paradigm Shift

- Current scenario: services tied to specific technologies and networks



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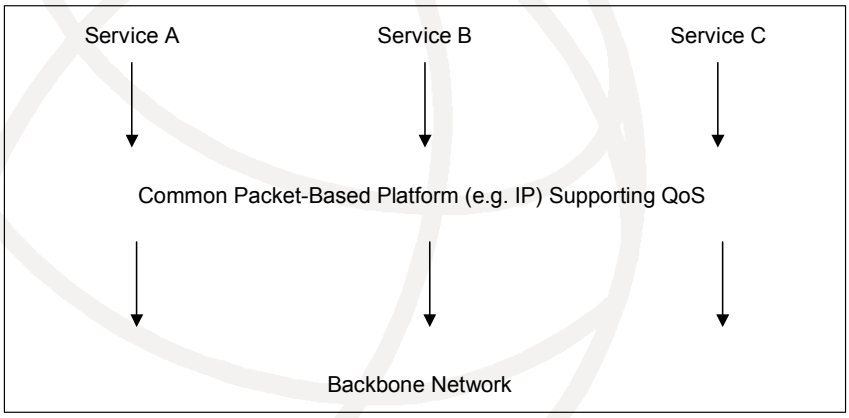
Network Technology Paradigm Shift

- Future scenario: shift from multiple service specific networks to multi-service NGN



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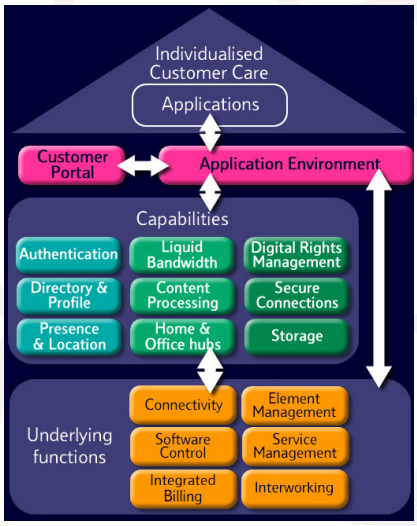
Next Generation Networks



- Evolution of current PSTN, mobile, wireless and IP-based networks to unified **Next Generation Networks** providing both Internet and carrier-grade telecommunication network and service offerings with QoS

Source: Mick Reeve, BT

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ITU-T Definition of NGN (Feb 2004)

- "A **Next Generation Network (NGN)** is a packet-based network able to provide services including Telecommunication Services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different service providers. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users."

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Next Generation Networks

- Requires substantial:
  - standards work and resource investment by operators and equipment manufacturers
  - significant policy and regulatory review
- ITU under reorganization around NGN technical and regulatory frameworks
  - Recent WTSA-04 focus on NGN
  - Area of intensive standardization by operators and equipment manufacturers in ITU-T
- Transition to Next Wave: Phase Three - Ubiquitous & Pervasive Networks
  - anybody, anytime, anywhere

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Emerging Regulatory Imperatives

- The days when legislation and regulation could assume distinct services running over distinct technologies and networks are disappearing fast
- Co-existence and continued intersection of NGN and Internet in terms of technological and regulatory developments should be foreseen

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Emerging Regulatory Imperatives

- Growing concerns about public interest and national critical network infrastructure (CNI) vulnerabilities (e.g. widespread fraud, spam, phishing, security flaws, cybercrime, zombie armies, spyware)
- Transition of Internet to public infrastructure and services will continue to invoke further government and intergovernmental mandates and oversight

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"List of 13" Public Interest and National Security Mandates

- public safety (E911) needs
- disability assistance
- law enforcement support
- competition (Computer III/number portability/1996 Act requirements)
- fraud prevention
- reliability and reporting obligations
- restoration after failures
- call prioritization during emergencies
- privacy and data protection
- consumer protection against unwanted intrusions
- universal service and other contributory obligations
- intercarrier compensation
- nondiscriminatory regulatory treatment

Source: Tony Rutkowski, Verisign

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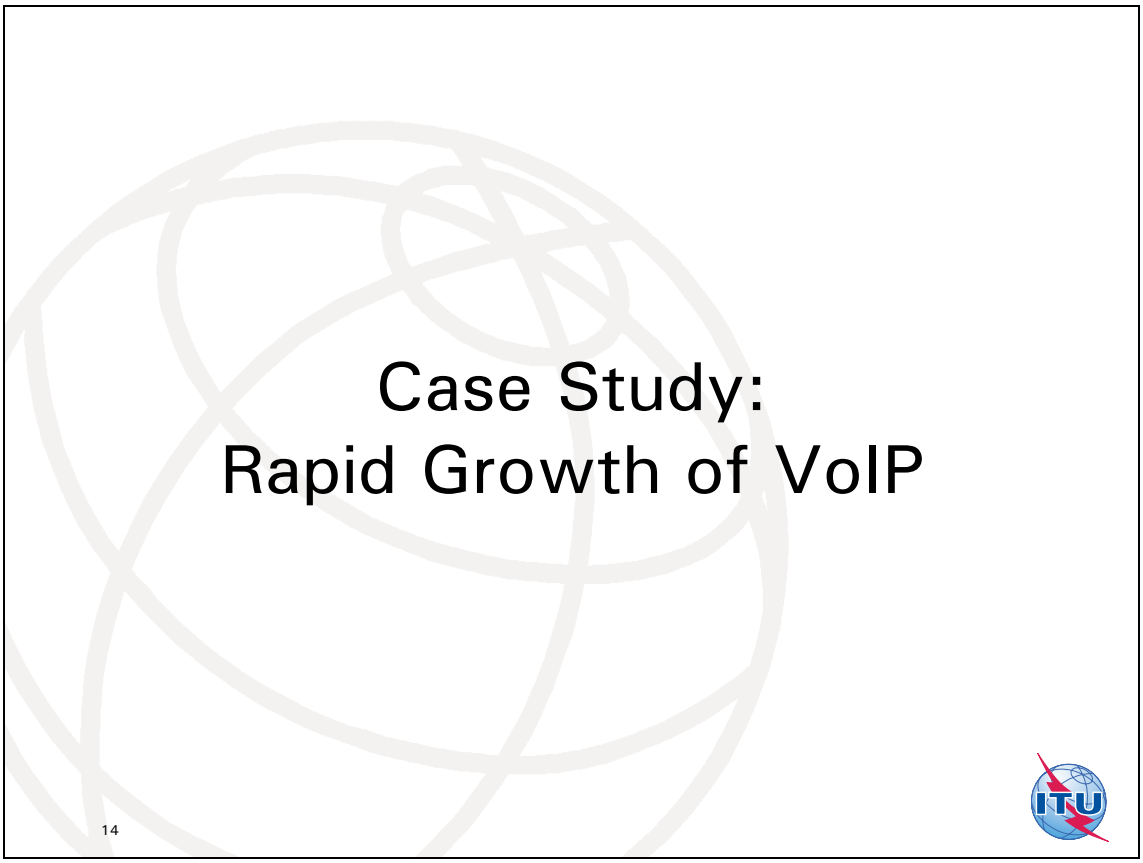
Case Study:
Rapid Growth of VoIP
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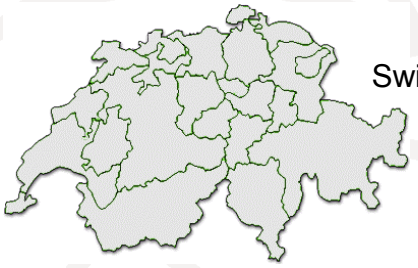
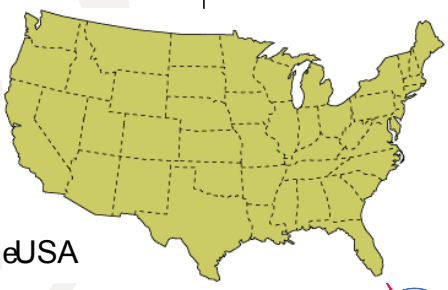
User dreams can be regulator's nightmares





- USA phone number (number exhaust?)
- Rings in Switzerland
- Flat-rate monthly price ($20-$35) to and from the US
- Cheaper to call next door in CH from the US number than CH phone
- Requires broadband in CH and functions as fixed line

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This is only the beginning

- Currently
  - Broadband allows access to other voice markets using VoIP
  - Users can avoid fixed-line and mobile carriers to make voice calls around the world
- Future
  - Indications that voice bundled in palette of multimedia services
  - Regulators need to rethink universal service requirements on voice carriers - possible move towards universal "ICT" service?

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Chinese saying: "Fallen leaves return to the root"*

- While VoIP has long been an issue for developing economies
  - where it was mostly about price arbitrage
  - topic of ITU World Telecommunication Policy Forum 2001
- It has now also become a major issue for developed economies
  - Threatens US multi-billion dollar intercarrier compensation scheme, extensive cross-subsidies, universal service funds, etc.
  - tipping point for urgent revision of regulatory frameworks

* English equivalent: "The chicken has come home to roost"

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Headline: "Battle Brews Over Rules for Phones on Internet"

- USA: "Fierce battle is emerging among rival companies and between federal and state regulators over the shape of the new government regulations and control of the service, which has the potential to be the most significant development in telecommunications since the breakup of the AT&T monopoly 20 years ago."
  - *New York Times, July 28 2004*

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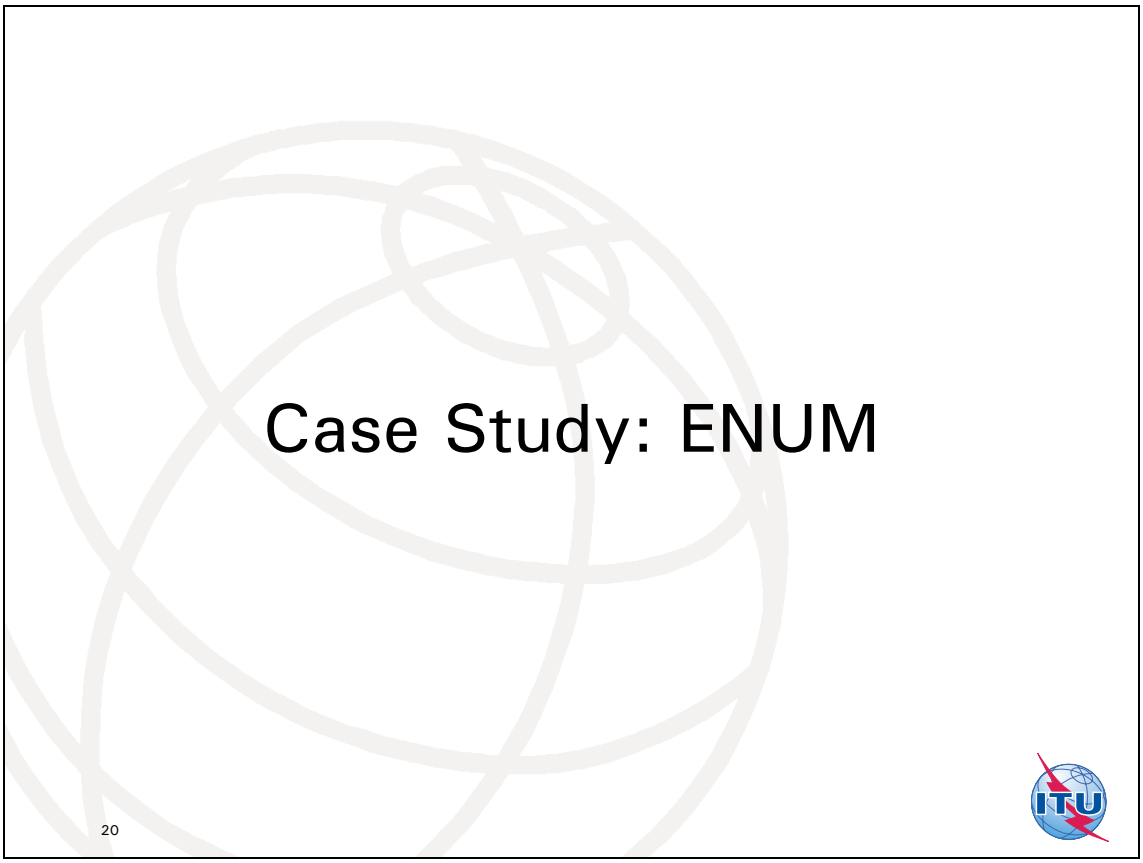
A few European VoIP Regulatory Proceedings

- CEPT: http://www.ero.dk/voip
- European Commission: http://europa.eu.int/information_society/topics/ecomm/doc/useful_information/library/commiss_serv_doc/406_14_voip_consult_paper_v2_1.pdf
- DE – RegTP: http://www.regtp.de/imperia/md/content/en/voiceoverip/2.pdf
- ES – CMT: http://www.cmt.es/cmt/centro_info/c_publica/pdf/cp_VoIP.pdf
- http://www.cmt.es/cmt/centro_info/c_publica/pdf/Consultation_VoIP.pdf
- IE – ComReg: http://www.comreg.ie/whats_new/default.asp?ctype=5&nid=101674
- UK – OFCOM: http://www.ofcom.org.uk/ind_groups/ind_groups/telecommunications/vob/vobqa/?a=87101

19


Case Study: ENUM
20

ENUM as a Case Study

- ENUM is a good case study of how complex the technological and regulatory intersection of the Internet and PSTN can be…
- This is against backdrop of wider debate as to what will be the predominant global addressing scheme?
  - Telephone Numbers (billions in place, language neutral…)
    - +41 22 730 5338
  - Internet style addresses (Uniform Resource Indicators = URIs)
    - mailto:robert.shaw@itu.int, sip:robert.shaw@itu.int

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Issues of Convergence

- Problems of addressing calls that pass from one network service to another:
  - Now widely possible to originate calls from IP address-based networks to other networks
  - But uncommon to terminate calls from other networks to IP address-based networks
  - To access a subscriber on an IP address-based network, some sort of global addressing scheme across PSTN and IP address-based networks needed
- ENUM is one (of many possible) solution(s)…

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What is ENUM?

- A protocol defined by IETF in RFC 3761
- Originally conceptualized as database in the public Domain Name System to find specific services (URIs) associated with E.164 numbers to be managed by 'end-users'
- Rooted in a specific public part of the DNS (currently e164.arpa)

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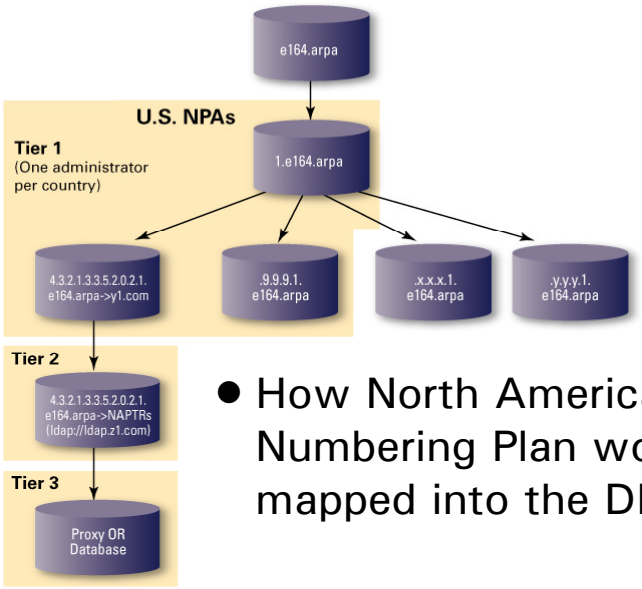
Example: ENUM Tiers for +1



- How North American Numbering Plan would be mapped into the DNS

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Why is this topic so important to regulators?

- Mapping of telephone numbers onto Internet
- Could allow conventional telephones to call IP terminals (PCs)
- Another option is to assign numbering resources to IP terminals (e.g, Japan, Korea)
- Should telephone numbers used in this way be subject to government oversight and regulation?
- Who should exercise control over telephone numbers used in this way?

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Complexities

- In telecommunication numbering, regulatory tradition with government involvement (e.g. number portability, consumer protection)
- In the Internet, management of naming and addressing often left to “industry self-regulation”
- National numbering/regulatory authorities required to be involved to some extent in coordinating overall responsibility for ENUM for their portion of E.164 resources

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Roles and Responsibilities

- Most ENUM service and administrative decisions are national issues under purview of ITU Member States, since most E.164 resources are utilized nationally
- ITU has defined interim procedures for trials
- ITU ensures that Member States specifically opt-in for their E.164 country code resources to be placed in the DNS

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ITU Past Activities

- Preparation and circulation of tutorial papers
- ITU-T SG 2 Supplement on issues that need to be addressed by national and international authorities
- ITU-T SG 2 Meetings from 2001
- Discussion with IETF and RIPE NCC on roles and responsibilities

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ITU Responsibilities

- Define and implement administrative procedures that coordinate delegations of E.164 numbering resources into the agreed DNS name servers
  - ➢ Draft Recommendation E.A-ENUM is being prepared by Study Group 2 for approval

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Recommendations for National Consideration Issues

- Consultation process
- National deployment Issues
  - How do you authenticate the identity of the subscriber for ENUM services?
  - Who are ENUM Registrars and what are they responsible for?
  - How do you validate ENUM data for potential users (Add - Modify – Delete) NAPTR list of services and preferences?
  - How is data provisioned in the country code name servers?
  - Portability of services/data across providers
  - Competition issues

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Is there a rush?

- To date, both industry and national administrations have taken considerable amounts of time to work through numerous complex issues that need to be addressed
- Some frustration at slow progress
- Why the delay?

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What the critics say…

- No clear business case for ENUM
- Wrong technology and routing solution for wrong problem…
- Why? Large installed based of telephone numbers (billions) which users & service providers understand…
- Complexity of telephone numbers increasingly hidden in modern devices
- Only for 'techies' – few consumers would "opt-in" even if available
- Growing general Internet security and privacy concerns
- Carriers will never expose their number resources and customers to public vulnerabilities

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ENUM Mutating into "Carrier/Operator ENUM"?

- Carriers could use ENUM 'technology' to find within their network
  - VoIP servers hosting their subscribers
  - Interworking servers (e.g. SIP/H.323)
  - egress border elements to other IP-based networks
  - egress gateways to PSTN-based networks
- This ENUM database could also
  - interwork with existing IN (NP) databases
  - be provisioned from same core administrative database
  - in any private or public DNS root
- Could also be across carriers/operators
- Solutions may not necessarily use ENUM technology (DNS) or protocols so 'ENUM' might be misnomer

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Source: Thanks to Richard Stastny, Austria

ENUM: Some Barriers

- Laudable goal but many difficult business and policy issues
- Public DNS based solution requiring 'opt-in' very unlikely as global authoritative source for IP routing information for phone numbers
- But 'opt-out' (automatic provisioning of all numbers by operators/service providers) only likely in non-public databases
- PSTN/NGN telephone number routing schemes to continue for foreseeable future
- Impact of growing assignment of national number resources to IP terminals?
  - although not exact substitute

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ENUM: Some Barriers

- Number of alternative solutions appearing (e.g. proprietary, peer-to-peer like Dundi, unclear impact…)
- Yet in NGN, there remains requirement to associate different naming, numbering, addressing and routing (NNAR) information across supported platforms
- Will other solutions emerge as part of work on NGN/IP-enabled signalling and directory issues?

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ITU Future ENUM Activities

- Cooperate with IAB/IETF to make final choice of TLD (currently e164.arpa), registry, requirements for registry operations
- Continue interim administration
- Determine ITU-T Recommendation E.A-ENUM, May 2005?

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Current Status

- Some References
  - http://www.itu.int/ITU-T/inr/enum/
  - http://www.itu.int/ITU-T/worksem/enum/
  - http://www.itu.int/osg/spu/newslog/categories/enum/
- Interim procedures:
  - http://www.itu.int/ITU-T/inr/enum/procedures.html
- Over 25 approved delegations:
  - http://www.itu.int/itudoc/itu-t/enum/enum-app.html

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Current Status

- Dissemination of experiences
  - http://www.itu.int/ITU-T/inr/enum/trials.html
- Also see ITU handout here on a number of country experiences
  - NB: Poland's offer to provide ENUM and Number Portability software solutions free of charge to developing countries

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Thank you

International
Telecommunication
Union

Helping the world communicate

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