

FINAL REPORT
ON
NUMBERING RELATED TO
THE TOPIC OF USER-FRIENDLINESS

3 October 1996

This study has been prepared by ETO on behalf of ECTRA for the Commission of the European Union.

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This report has been prepared by Jukka Kanervisto and Gerd Wiedenhaupt from ETO with the kind assistance of experts from the ECTRA Project Team on Numbering, ECMA, ECTUA, ETNO, ECTEL, EIIA, and ETSI and GSMMoU EIG. It is to be noted however that the report does not necessarily reflect the official opinions of the said organisations.

EXECUTIVE SUMMARY

The study on "Numbering related to the topic of user-friendliness" has been prepared by ETO on behalf of ECTRA for the Commission of the European Union.

Telecommunications is a highly important means of communication at present and will contribute to be so in the future society. On the 22 July 1993 the Council of Ministers of the European Union adopted a Council Resolution on the review of the situation in the Telecommunications sector. The Council Resolution set the future agenda for the further liberalisation of public voice telephony. User-friendly numbering is one of the key issues to ensure that complexity of numbering and dialling arrangements does not hinder the take-up of new services and use of network. It is also important to ensure that user-friendly numbering can be maintained and promoted in a dynamic environment. User-friendly numbering is the key to effective telecommunications.

In accordance with the work requirements contained in the Commissions work order, the main objectives of ETO's studies are defined as follows:

1. To examine aspects of user-friendliness and its effects on numbering. To make proposals on how user-friendliness of numbering schemes can be promoted, for example by dialling arrangements, memorability, stability of numbering schemes, harmonisation of service codes, use of short codes, market sector or tariff oriented numbering logic and portability of numbers.
2. To examine the issue of alphanumeric dialling and opportunities for keypad harmonisation and to make proposals for keypad harmonisation if found appropriate.
3. To examine code allocations and numbering arrangements arisen by the implementation of Calling Line Identification (CLI) facilities into the network. To make proposals for harmonisation of CLI numbering procedures and codes

Results and findings

The study deals with separate areas of user-friendliness: User-friendly numbering in general, alphanumeric dialling and numbering related to the use of CLI. The conclusions and proposals have been made for each topic. In the course of the work the need arose for further studies on specific numbering issues related to user-friendly numbering. Before presenting this final report, ETO has already signed several work orders with the CEC with regard to harmonisation issues, guidelines on reviewing the numbering schemes and to the European numbering strategy.

User-friendliness in numbering

Europe consists of different countries with different cultures and languages. Also network technology, penetration of subscriber lines and competitive environments differ from country to country. Furthermore, users in one country have a preconception of how telecommunication services and networks operate. This preconception may be different for users in another country. User's previous experience and familiarity in using telecommunications services also has some value when developing services. Although these differences may make it difficult to consider end users in Europe as a single group, some attributes could be found which are common to all users. The following attributes have been chosen to characterise user-friendly numbering:

EASY TO LEARN
 EASY TO REMEMBER
 SUBJECTIVELY PLEASING
 EFFICIENT TO USE
 FEW ERRORS

Two main issues have been found that facilitate user-friendly numbering and that are in compliance with the chosen attributes. These are 1) logical, understandable and simple numbering schemes and 2) user-friendly individual numbers.

Structured and logical numbering schemes are a prerequisite of user-friendly numbering. On a national level, due to the lack of numbering resources and to the new demands set by the competitive environment, all European countries face the fact that in order to adapt to the present demands, a comprehensive rethinking in numbering schemes has to be carried out. Numbering new emerging services from old numbering schemes is often like “putting patches on patches”.

On a European level numbering between European countries is still inconsistent and fragmented and will stay as such if nothing is done. It may be questioned whether more consistent numbering is necessary? Is future harmonisation of numbering really necessary within Europe? What happens if harmonisation is not achieved? Can telecommunications in Europe develop at a faster or slower rate than telecommunications in other corresponding economical areas, e.g. North America? What are the short term and long term benefits of harmonisation? Shall we continue putting patches on patches, now on a European level, when trying to find numbering resources to respond to the demands of European users?

If Europe really is integrating, it is difficult to see why this integration does not involve the numbering sector. Numbering is a key to user-friendly telecommunications within Europe. European numbering should be as clearly structured as numbering schemes can be structured on a national level. It would be easier for European numbering to develop if the numbering schemes of European countries were structured in a harmonised and more consistent way.

As regards the national numbering schemes, ETO makes the following proposals:

1. National numbering schemes which do not fulfil the present demands of number capacity and open numbering conditions, should be reviewed and modified as soon as possible in a way that guarantees capacity, openness and user-friendly numbering in the long term.
2. However, comprehensive numbering changes in national numbering schemes should be delayed, where possible, until the common guidelines on revising numbering schemes and the European numbering strategy has been defined by the end of 1997.
3. Common guidelines on revising numbering schemes and the European numbering strategy should be defined as soon as possible in order to enable European countries to plan their national schemes and guarantee the long term stability of these schemes.

ETO has already signed two work orders with the European Commission with regard to harmonisation of national numbering schemes. These work orders are: “Review of national numbering schemes on their openness for competition” (end date 2/97) and “A long term strategic plan for the numbering and addressing of telecommunications services in Europe” (end date 12/97) and they will result 1) criteria for the structure of open and user-friendly numbering schemes and guidelines for national administrations when revising their national numbering schemes and 2) a long term strategy for moving towards a unified numbering plan for Europe. The work will be done in close co-operation with the ENF.

As regards user-friendliness in individual numbers, the terms as market segment or tariff oriented numbering logic, short numbers, “sounding” and “image” numbers and stability of numbers have been found as issues to be supported. Short numbers are, however, a scarce resource and should be used very carefully with the strict control of the NRA.

ETO makes the following conclusions and proposals:

1. When numbering services, market and tariff oriented numbering logic, using Service Access Codes, should be preferred instead of short numbers
2. NRAs should reserve a set of SACs for present and future national use (e.g. freephone, shared cost, shared revenue, personal numbers, spare codes for future services etc.)
3. NRAs should reserve a set of short numbers for future national use (like that already reserved for emergency services, 112)

4. Short numbers should be used very carefully under strict control by NRAs
5. Subscribers should have some say in selecting numbers in accordance with rules defined by the NRA
6. Geographical numbering should be retained as far as possible.
7. Non-geographical numbers should be clearly distinguished from geographical numbers
8. For geographical numbers number portability should be allowed as long as geographical information defined by the public numbering plan is preserved
9. Full portability (geographical, operator) should only be made available with non-geographical numbers

ETO has already signed several work orders with the European Commission with regard to harmonisation of short codes in Europe, number portability for pan-European services and the numbering requirements of corporate telecommunications networks. Issues of user-friendliness play an important role in these studies. The work will be done in close co-operation with the ENF and it will be finished in 1997.

Alphanumeric dialling

The requirement of alphanumeric dialling is market driven especially for services like freephone, premium rate and personal telecommunications. Names of organisations or “brands” of products are easier to remember than their telephone numbers (for example 0800-RAILWAYS instead of 0800-72459297).

It seems that alphanumeric dialling, in principle, is supported by all interested parties; users, service providers, network operators and the manufacturing industry. The problems of alphanumeric dialling are related to the fact that in the market there are so many different types of keypads that the utilisation of alphanumeric dialling is not available in the short term. If from now on all the new keypads to be produced followed the same standard, after a period in which the old terminals would be replaced with the new ones, the alphanumeric dialling would be applicable in the telephone network.

Harmonising the manufacturing of keypads is not a question of missing standards - ITU-T Recommendation E.161 already exists for it on a global level. The need for global adoption of the standard is due to the globalisation of services, like international freephone service. ITU-T Recommendation E.161, Option A, is likely to be also supported in the US market. The problem is how to encourage the utilisation of the existing standard? Standards are not mandatory. How can the manufacturing industry and all the market participants be influenced to apply the standard.

As regards alphanumeric dialling, ETO makes the following conclusions and proposals:

1. There is a clear market demand for alphanumeric dialling
2. At the moment, use of alphanumeric dialling causes confusion and misdialling due to the different keypads on the market. It should not be recommended at present.
3. The change of existing keypads in the market is not advisable at this point of time.
4. The standard for alphanumeric dialling is ITU-T Recommendation E.161, Option A. There is no need for any new standards. The use of E.161 Option A should be highly encouraged and it should be applied globally.
5. Mechanisms should be created to support the implementation of E.161, option A
6. These mechanisms could be:
 - amending the appropriate EU directives on terminal equipment or direct contacts from CEU and ECTRA to European manufacturing industry and European equipment resellers to produce and procure only E.161 Option A compatible keypads
 - direct contacts from NRAs to national manufacturing industry and national resellers to produce and procure only E.161 Option A compatible keypads
 - standardisation of alphanumeric dialling at a national level

Code allocation and numbering of Calling Line Identification (CLI)

Transfer of CLI is a normal internal function of a modern telephone network. CLI is utilised by network operators for charging, routing and administrative purposes. CLI also gives the called party the possibility to recognise where the call is originating from. The telephone number of the calling party can be displayed to the called party before the call is answered. The number displayed can also be used for call-back purposes by the called party.

Two main functions have to be distinguished: the CLI Presentation (CLIP) and the CLI Restriction (CLIR). The introduction of CLIP and CLIR is a national matter. It is related to privacy and data protection issues and it has to be implemented in accordance with privacy regulations applicable in the country.

CLIP provides the called party with the possibility of receiving the identification of the calling party. According to the ETSI standard the service is to be activated and deactivated by the service provider.

CLIR enables the calling party to prevent presentation of his/her number to the called party. Two alternatives for CLIR are identified:

1. To set CLIR on a permanent basis. In this case the caller may ask the telephone operator not to present a number on a permanent basis on all his/her calls.
2. To set CLIR on a call-by-call basis. In this case the caller may restrict the presentation of his/her CLI on a call-by-call basis by dialling a specific prefix before dialling the telephone number.

For the CLIR prefix two alternatives exist: 1) using a short code taken from the numbering resources of the national telephone numbering plan or 2) using * and # symbols on the keypad in compliance with the ETSI standards. When using * and # symbols the use of CLIR prefix is limited to those terminal equipment and telephone exchanges utilising * and #. These limitations do not exist using short codes taken from numbering resources.

Harmonisation of numbering resources is usually difficult. The * and # used for dialling procedures of ISDN supplementary services are being standardised by ETSI. These standards are applicable in ISDN networks and partly in non-ISDN, networks throughout Europe. As old networks and terminal equipment are being modernised rapidly, the possibilities using * and # are expanding quickly. The * and # dialling procedure could facilitate the use of CLIR in a harmonised and simple way throughout Europe. However, for the networks and terminals which cannot utilise * and #, an alternative dialling procedure for CLIR activation/deactivation should be implemented.

For the privacy and data protection issues it is of importance that CLIR is easy to use, and the procedures for activation and deactivation are unambiguous in all conditions and that they are the same in all networks. Furthermore, when CLI is used for call-back services by the called party it is also important that the number format displayed is exactly the same as needed for calling back to the calling party.

Today the dialling procedures using * and # are used in different countries and in different networks in different ways. It may be questioned whether ETSI standard Draft prETS 300738 or previously CEPT Recommendation T/SF 2(T/CAC 02) are clear enough to guarantee unambiguous use of codes and procedures. Does it give rise for different interpretations? ETO considers it highly important that * and # dialling procedures are used in the same manner in all public networks, fixed and mobile, in every CEPT country.

ETO makes the following conclusions and proposals:

1. The number format of CLI supplied to the called party should be exactly the same as the one which the called party uses when calling the calling party
2. ETSI standard ETS 300738 (not finally adopted yet) using * and # dialling procedures should be applied for harmonised CLIR activation/deactivation in all CEPT countries

3. For networks and terminal equipment which cannot utilise * and # dialling, an alternative solution using national numbering resources for CLIR activation/deactivation should be implemented in all CEPT countries. The decision on reserving and using these codes in national networks should be a national matter. There is no need for European harmonisation of these codes.
4. The codes for activating and deactivating CLIR (whether reserved from national resources or using ETSI standard procedures with * and #) should be unambiguous and mean the same function in all networks, fixed and mobile, in all circumstances.
5. ETSI should urgently study reasons for different use of * and # procedures for CLI activation/deactivation and revise CLI standards if deemed appropriate.

CHAPTER 1 - PRESENTATION OF THE STUDY

1.1 - ETO presentation

The European Telecommunications Office (ETO) was created by the European Committee on Telecommunications Regulatory Affairs (ECTRA) which is one of the three committees of the CEPT¹ Conférence Européenne des Postes et Télécommunications. The Memorandum of Understanding (MOU) on the establishment of ETO has been signed by 24 countries, 15 of which have also signed the arrangement on the One-Stop-Shopping on licensing^{2,3}.

ETO has two functions, one concerned with licensing and one with numbering. With regard to numbering, ETO's functions are to undertake studies, including studies for the Commission of the European Communities, to advise ECTRA on the development of European numbering policies, to manage European numbering schemes where relevant and to co-ordinate national numbering schemes.

For the work orders between the CEU and ETO, ETO signed a framework contract with the Commission on 9 September 1994.

1.2 - Presentation of the work order

Numbering is the means by which networks, services and customers are reached. With the proliferation of new services and the growth of subscriber numbers, dialling is likely to become more complicated. Therefore, it is necessary to ensure that developments in telecommunications networks and services are not constrained by unnecessarily difficult dialling or access arrangements. These challenges need to be addressed by careful management of the overall numbering schemes on global, European and national levels. ETO's work requirements are the following:

- 1) to examine aspects of user-friendliness and its effects on numbering. To make proposals on how user-friendliness of numbering schemes can be promoted; for example by dialling arrangements, memorability, stability of numbering schemes, harmonisation of service codes, use of short codes, market, sector or tariff orientation of numbering logic and portability of numbers.
- 2) to examine the issue of alphanumeric dialling and opportunities for keypad harmonisation and to make proposals for keypad harmonisation if found appropriate.
- 3) to examine code allocations and numbering arrangements that will arise when Calling Line Identification (CLI) facilities are implemented into the network, and to make proposals for the harmonisation of CLI numbering procedures and codes.

¹ The others are the ERC, the European Committee on Radio Communications and the CERP, the Comité Européen des Régulateurs Postaux

² Countries who signed the MOU and the arrangement on the One-Stop-Shopping : Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland and the United-Kingdom

³ Countries who signed only the MOU on the establishment of ETO: Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Greece, Poland, Portugal and Slovak Republic

1.3 - Schedule and methodology

This study has been carried out by ETO in close co-operation with the ECTRA Project Team on Numbering and the parties represented in the European Numbering Forum (ENF)⁴.

These parties are:

- CEU (Commission of the European Union)
- ECMA (Standardizing Information and Communication Systems)
- ECTEL (The European Telecommunications and Professional Electronics Industry)
- ECTRA (European Committee for Telecommunications Regulatory Affairs)
- EIIA (European Information Industry Association),
- ETNO (European Public Telecommunications Network Operators' Association),
- ETSI (European Telecommunications Standards Institute)
- GSM MoU EIG (GSM MoU Association European Interest Group)
- INTUG Europe (International Telecommunications Users Group)

The first interim report was presented during the course of this study. It contained different aspects of 1) user friendliness, 2) issues concerning alphanumeric dialling and 3) numbering aspects of Calling Line Identification. The first interim report was delivered to the ECTRA Project Team on Numbering and the European Numbering Forum (ENF) for their comments. It was delivered to the Commission in July 1995.

The second interim, containing findings and proposals, was delivered to ECTRA, the ECTRA Project Team on Numbering and the ENF for comments. It was delivered to the Commission in March 1996.

The final report delivered to the Commission contains findings and proposals, as approved by CEPT/ECTRA and also includes any comments individual CEPT/ECTRA members have on these issues in their respective national regimes. The final report was delivered to the Commission in October 1996.

⁴ The European Numbering Forum (ENF) has been established as a forum for the exchange of information and expertise, co-ordination and consultation, discussion and common studies on European numbering, addressing and related issues, according to European Union Council Resolution 92/C318/02 on the promotion of Europe-wide co-operation on numbering of telecommunication services.

CHAPTER 2 - BACKGROUND AND DEFINITION OF STUDY ITEMS

2.1 - User-friendliness in numbering

User-friendly numbering is important to subscribers wanting access to other users, services or networks. Moreover, user-friendly numbering is also of great importance to network operators and service providers, whose objective is to ensure maximum use of their networks and services.

Some concern exists that the complexity of numbering and dialling arrangements may hinder the establishment of new services and the use of networks. Therefore, investigation is needed into how user-friendliness in numbering schemes can be maintained and promoted in a dynamic environment. Work on user-friendliness should aim to promote the simplicity of dialling rules, memorability of service numbers, stability of numbering schemes, harmonisation of service codes, the use of short codes where practical, the use of market or sector orientation of numbering logic and the portability of numbers between services. User-friendly numbering is studied in more detail in chapter 3.

2.2 - Alphanumeric dialling

The addressing mechanism of the telephone network, and consequently the dialling of a telephone numbers, is based on numbers. However, in order to facilitate the memorability of numbers, in some terminal equipment numbers have designated letters (e.g. letters A, B and C corresponding to the digit 2). In this way, words may be converted to numbers. For example PIZZA may correspond to the digits 74992).

It is obvious that letters can help users when dialling telephone numbers. However, converting letters to numbers involves many unsolved problems: ITU-T has made a recommendation⁵ for the arrangement of digits, letters and symbols on telephones and other devices. However, different manufacturers have applied schemes that do not comply with the existing recommendations and standards. This means that there are a number of different versions of alphanumeric keypads on the market. Utilisation of alphanumeric dialling in these circumstances may cause a lot of difficulties and misdialling.

Alphanumeric dialling is only related to keypad harmonisation of terminal equipment. The aim of this study is to characterise the problems of alphanumeric dialling and to propose ways in which a common procedure minimising the difficulties of alphanumeric dialling may be obtained. Since services are becoming more and more global in nature, the harmonisation issue must be studied with the global context in mind. The issue of alphanumeric dialling is studied in more detail in chapter 4.

2.3 - Code allocation and numbering of Calling Line Identification (CLI)

Calling Line Identification (CLI) includes aspects of data protection. The regulations on the use of the CLI are stated in the CEU proposal for directive concerning the processing of personal data and protection of privacy⁶. The proposal includes rules to activate or deactivate the presentation of CLI on a per-call and a per-line basis. It is obvious that while common rules are needed for CLI, there should also be common procedures for practical activation/deactivation of the CLI.

⁵ ITU-T Rec. E.161 "Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network", Helsinki 1993.

⁶ Common position by the Council on "Modified proposal for a Directive of the European Parliament and of the Council concerning the processing of personal data and protection of privacy in the telecommunications sector, in particular in the integrated Services Digital Network (ISDN) and in the digital mobile networks (former COM(94) 128 final-COD 288); Brussels, 3 July 1996.

When implementing the Calling Line Identification facility in the network, at least the following different questions arise, which have to be studied in more detail:

- 1) by which code/number to activate/deactivate the transmission of CLI in the originating end on a per-call basis,
- 2) procedures, whether technical or administrative, to limit the acceptance of incoming calls to those where the identification of the calling subscriber's number has not been eliminated,
- 3) on which number is CLI itself based on?: geographical number of the subscriber, number(s) of forwarded calls, IN-number(s).

The aim of this study is to identify the coding/numbering issues concerning the implementation of CLI and to make proposals and guidelines for harmonising the procedures within Europe. CLI is studied in more detail in chapter 5.

CHAPTER 3 -USER-FRIENDLINESS IN NUMBERING

Telecommunications is a highly important means of communication at present and will contribute to be so in the future society. It is one of the key factors in promoting competition in a market economy. User-friendly numbering is the key to effective telecommunications.

Every telephone number has some value. The value of a number is different for different interested parties. For business and residential users, numbers are a means of communication. For them the value of a number is related to its memorability, and to its user-friendliness.

As far as network operators and other service providers are concerned, numbers have values other than that of communication only. They use numbers to brand their services and to differentiate services according to different tariffs and different geographical locations. User-friendly numbering plays an important role here.

1. Telecommunication is one of the key factors in promoting competition in market economies
2. User-friendly numbering is a key to effective telecommunications

3.1 - Attributes for the usability of Telecommunication services

Europe consists of different countries with different cultures and languages. Also network technology, penetration of subscriber lines and competitive environment differ from country to country. Furthermore, users in one country have a preconception of how telecommunication services and networks operate. This preconception may be different for users in another country. User's previous experience and familiarity on using telecommunications services has also some value when developing services. Although these differences may make it difficult to consider end users in Europe as a single group, some attributes could be found which are common to all users.

Generally, user-friendly numbering is related to the usability of services. There are of course a lot of different definitions regarding the usability of telephone services. Based on the different studies carried out on usability⁷, the following attributes have been chosen to characterise user-friendly numbering:

EASY TO LEARN
EASY TO REMEMBER
SUBJECTIVELY PLEASING
EFFICIENT TO USE
FEW ERRORS

These attributes may be considered common to all numbering schemes. In this study the aspects of user-friendly numbering are studied against these attributes.

⁷ Nielsen Jacob 1993: Usability Engineering. San Diego 1993. Academic Press Inc. 358p.
Isometsä Kyösti 1994: User-friendly access to Intelligent Network services. Master Thesis.
Helsinki University of Technology.

3.2 - Factors of user-friendly numbering

Two main factors can be identified as regards user-friendly numbering:

- 1) Logical, understandable and simple numbering schemes
 Logical, understandable and simple numbering schemes are a prerequisite of user-friendly numbering. Issues related to logical schemes are 1) a general structure of the numbering scheme and 2) a logic by which numbers are allocated within the scheme
- 2) User-friendliness in an individual number
 User-friendliness in a number may be related, for example, to the length of a number, "soundness" or "image" of a number, alphanumeric dialling of a number, harmonisation of numbers

The following factors were found to fit the selected attributes, table 3.1.

EASY TO LEARN	EASY TO REMEMBER	SUBJECTIVELY PLEASING
Issues related to numbering schemes:		
- logical numbering schemes * structured schemes * market oriented numbers * tariff oriented numbers * geographical numbers * non-geographical numbers	- logical numbering schemes * structured schemes * market oriented numbers * tariff oriented numbers * geographical numbers * non-geographical numbers - stability of schemes	
Issues related to individual numbers:		
- short numbers	- short numbers	
- harmonised service codes	- harmonised service codes	
- alphanumeric dialling	- alphanumeric dialling	- alphanumeric dialling
- sounding number - "image" numbers - "golden" numbers	- sounding numbers - "image" numbers - "golden" numbers	- sounding numbers - "image" numbers - "golden" numbers
- presentation of numbers	- presentation of numbers	- presentation of numbers
	- embedding of old numbers	- embedding of old numbers

Table 3.1 Attributes of user-friendly numbering

There seems to be no major difference between "Easy to learn" and "Easy to remember". It is obvious that what is easy to learn is also easy to remember. It can be stated that numbers which are easy to learn and easy to remember are usually also efficient to use and cause few errors. Some of the factors are subjectively pleasing but in most cases they are also easy to learn and easy to remember.

The following factors of user-friendly numbering will be studied in more detail: A structure of numbering schemes, Numbering logic, Short numbers, "Sounding" and "Image" numbers, Harmonisation, Fixed number length, Presentation of numbers, Geographical numbers, Non-geographical numbers, Aspects of number portability, Stability of numbers and User-friendly number changes. The difficulties encountered when carrying out number changes are also analysed, in order to have some guidelines on user-friendly implementation of new numbering schemes.

3.3 - User-friendliness in numbering schemes

3.3.1 - A general structure of the numbering scheme

Generally, numbering schemes of European countries are based on ITU-T recommendation E.164, which defines the structure of the international telephone number. The structure of a national numbering scheme is a national matter.

Telephone numbers are usually used to access different types of users, services and gateways. A **structured** numbering scheme is understood here as a scheme which helps the user easily distinguish between and remember different types of numbers and services.

A fictive example:

- long distance calls	start with digit 0
- international calls	start with digits 00
- service numbers	start with digit 1
- subscriber numbers	start with digits 28
- access to different gateways	start with digit 9

No study is needed to understand the importance of structured and logical schemes. Structured schemes help users learn, remember and use numbers. A logical and structured numbering scheme is a prerequisite of user-friendly numbering.

3. A logical and structured numbering scheme is a prerequisite of user-friendly numbering.

History of numbering schemes

The old numbering schemes in most European countries date back to the 40's and 50's. Until recently, no major changes were made to these schemes. At the very beginning, schemes were structured to number subscribers and some services. Emerging new services, (local, national, international), mobile communication (GSM, DCS1800, CTM, UMTS, FPLMTS, satellites), competition aspects in both networks and services (local competition, number portability, trunk and international competition, carrier selection, VPNs), accesses to other gateways (data networks) etc. have put pressure on administrations to change old numbering schemes. It is clear that the structure of old schemes does not necessarily fulfil today's demands.

Changes in national numbering schemes

Taking into account technical developments and competition aspects of networks and services, all European countries face the fact that in order to adapt to the present demands, a comprehensive rethinking in numbering schemes has to be carried out. This demand is due to the lack of numbering capacity to number new services. In a competitive environment open numbering schemes is a prerequisite. When planning new schemes, the structure of the scheme is of great importance, since it is that which facilitates user-friendly numbering and guarantees flexibility and capacity for present and new, even yet unforeseeable demands.

Changes in present numbering schemes may cause comprehensive changes to present subscriber and service numbers. One may ask whether it is necessary or not to change present numbers? The short term answer may be no. We have managed so far, we can also manage in the future. The long term answer may, however, be yes. Numbering new emerging services from old numbering schemes is like "putting patches on patches". It does not necessary solve the real problems of the old schemes. This would lead to an inconsistent and fragmented scheme structure with no or very little logic, which would consequently

lead to long term non-user-friendly numbering. If we postpone reviewing the schemes, we neglect the development of efficient telecommunications.

User-friendly numbering is a key to efficient telecommunications. Well-structured numbering schemes are a prerequisite of user-friendly numbering. Today we are still in the early stages of development of these services. Changes in numbering schemes usually results in number changes for subscribers. It would be easier to change numbers now than wait until a large amount of new services have been numbered from old schemes. At that time we would have to change not only subscriber numbers, but also service numbers.

4. National numbering schemes that do not fulfil the present demands of number capacity and open numbering conditions, should be reviewed as soon as possible in order to guarantee user-friendly numbering in the long term.

European aspects

In those countries where numbering schemes have been changed or are to be changed in the near future, changes have been based totally on national solutions where the key issue has been the minimising of number changes for subscribers while still restructuring schemes to respond to present demands. The basis for all changes has been the old numbering scheme. Every country has planned its own changes individually by studying solutions made in other countries and then making a good compromise. This procedure has maintained fragmented and inconsistent numbering between European countries. There has been no real co-ordination between the countries and no common guidelines in planning the schemes.

Europe with its free movement of goods and people, its common European market area and its planned common currency, is slowly moving towards integration. As regards to the numbering of telecommunications services, some harmonisation has already taken place (00 for international prefix and 112 for European emergency call number). Demands have been expressed for harmonised European carrier selection mechanisms and for harmonised Virtual Private Network (VPN) access codes. The decision on pan-European numbering has already been made in principle but no real discussion has taken place on the future European numbering strategy or on the harmonisation of numbering schemes of European countries.

Numbering between European countries is still inconsistent and fragmented and will stay as such if nothing is done. Is more consistent numbering necessary, however? Is future harmonisation of numbering really necessary within Europe? What happens if harmonisation is not achieved? Can telecommunications in Europe develop at a faster or slower rate than telecommunications in other corresponding economical areas, e.g. North America? What are the short term and long term benefits of harmonisation? Shall we continue to put patches on patches, now on a European level, when trying to find numbering resources to respond to the demands of European users?

If Europe really is integrating, it is difficult to see why this integration does not involve the numbering sector. Numbering is a key to user-friendly telecommunications within Europe. European numbering should be as clearly structured as numbering schemes can be structured on a national level. It would be easier for European numbering to develop if the numbering schemes of European countries were structured in a harmonised and more consistent way. When developing national schemes today, developmental work should be conducted in such a way that schemes converge at a European level. The first and simplest step would be to prepare guidelines on the development of national numbering schemes. This work should be conducted by ECTRA with the assistance of the European Numbering Forum (ENF). In European thinking also global development of numbering should be taken into account.

5. Guidelines on the development of national numbering schemes should be devised by ECTRA with the assistance of the European Numbering Forum (ENF)

3.4 - User-friendliness in individual numbers

3.4.1 - Numbering logic for services

The structure of the numbering scheme should define the basic principles of number use for subscribers and services. As regards the numbering space reserved for services, numbering logic is understood here as a mechanism for clearly distinguishing between different type of services/service groups, different types of tariffs etc.

The question is how to distinguish between different services within this group. Different services / service groups can be separated by defining a numbering logic based on market, tariffs etc.

3.4.1.1 - Market-oriented numbering logic

The market-oriented or market segment oriented numbering logic is understood here as services/service groups which are clearly identified by a number or service access code.

Fictive examples:	entertainment services	0500 xx xx xx
	information services	0600 xx xx xx
	freephone services	0800 xx xx xx

User's point of view

Market-oriented numbering logic makes it easier for the user to remember the service group. The service group may be identified by a Service Access Code (SAC), like 0800 for freephone. However, a user can easily identify only a limited number of groups. If the number of market groups grows significantly, the value of market oriented numbering logic diminishes.

Network operator's point of view

Users demand call barring facilities for telecommunications services. Calls can be barred without any major difficulties if the number of barring classes is limited. The more classes exist, the more difficult it is to implement call barring. A technically reasonable number of barring classes could be estimated at less than 20, including all kinds of call barring (traffic and services). Call barring does not only consider network operators but also users, CPE producers and manufacturers.

Service provider's⁸ / Service subscriber's⁹ point of view

The service provider's point of view follows that of the user. If numbers are easy to use, this is of benefit not only to the user but also to the service provider. Individual service branding can be carried out with the individual number following the Service Access Code, if required.

It seems clear that market oriented numbering logic helps users learn and remember numbers. It also facilitates call barring, when the number of market groups is limited. Market orientation facilitates user-friendly numbering and should therefore be supported.

⁸ **Service Provider** is understood here as the entity providing the service, for example 0800 service. The Service Provider assigns numbers for Service Subscribers (for example individual 0800 numbers)

⁹ **Service Subscriber** is understood here as the entity subscribing a number from a Service Provider in order to provide telephone services to his/her customer. For example a flight company having a number 0800-747 747 is a Service Subscriber.

3.4.1.2 - Tariff-oriented numbering logic

Since telephony first began, tariffs and numbering have been closely related.

Users are aware of the relationship between tariffs and numbers in normal telephone calls:

- local calls are cheaper than long distance calls
- long distance calls are usually more expensive than local calls but cheaper than international calls
- international calls are usually more expensive than national calls, whether local or long distance calls

and regarding the telecommunication services:

- calls to specific service numbers differ in price to normal telephone calls

Network Operators use numbers for routing and tariff purposes. Tariff classes are also used for call barring, according to subscriber needs.

The old tariff-oriented numbering logic may now be reconsidered for the following reasons:

- the cost of connection, particularly in long distance and international calls is decreasing and the price difference between local, long distance and international calls seems to be diminishing in the long run
- the competitive environment may change the tariff balance between different types of calls. Furthermore, it is obvious that tariffs are becoming more cost-based. The old familiar tariff logic may turn completely in the opposite direction in the long run
- some countries have encountered difficulties with new high-priced services causing a lot of complaints and demands for efficient call-barring procedures and subscription arrangements

As regards telephone traffic, the relation between numbering and tariffs seem to lose its importance. This has also been found to be true for those countries which use closed numbering schemes, where long distance calls are difficult to distinguish from a number.

Today's real problems relate to highly-priced premium rate services rather than to the pricing of telephone traffic. This is due to the fact that services are easy to use and users find it too difficult to calculate the total price of a service. It seems clear that tariff-oriented numbering logic is of importance when considering user-friendly numbering.

Tariff-oriented numbering logic is not independent from market-oriented numbering logic. In market-oriented numbering, one service group (e.g. premium rate services) may consist of several tariff groups. When considering user-friendly numbering in relation to numbering schemes, both areas have to be considered in parallel.

3.4.1.3 - Short numbers

What is a short number?

No exact definition for short numbers exist. From the user's point of view, a short number has at least two recognisable characteristics: 1) a number length that is easy to remember and easy to dial and 2) a number that is shorter than the numbers the user is accustomed to dialling.

The length of a normal subscriber number varies from country to country. In Germany the length of a subscriber number (SN) varies from 3 to 8 digits, in UK and Spain from 6 to 7 digits. In Denmark and Norway subscriber numbers are fixed at 8 digits. Short numbers are usually only used for services. Some countries have started discussions on how to make short numbers available to subscribers at a special price.

Numbers with 1 to 3 digits are clearly short numbers. Numbers from 4 digits onwards are only short numbers if they are shorter than the usual subscriber numbers in the surrounding area. However, in

certain areas in Germany, subscriber numbers are only 3 digits and can generally be considered as short numbers. 6- digit numbers are not often considered as short numbers, though in an area of 10 digit numbers they may be seen as such. Examples of some existing short numbers are presented in Annex 3.

6. In this study a short number is defined as a number which, when dialled, directly accesses a specific service. The length of a short number is defined as a number with a maximum of 5 dialled digits, not including the possible trunk prefix.

Advantages of short numbers

It is clear that short numbers are easier to learn and easier to remember than longer ones. They are efficient to use. When they are easy to learn, easy to remember and short to dial, they may also cause less errors than long numbers. Short numbers may be considered as user-friendly numbers and the use of short numbers should be supported.

Disadvantages of short numbers

Short numbers waste numbering resources. Wide use of short numbers may lead to lengthening other numbers. Short numbers may be considered as a scarce resource.

3.4.1.4 - “Sounding” and “image” numbers

“Sounding” and “image” numbers are numbers which “sound” or “look” good, which give the user an image of the service or service subscriber. Examples of such numbers: 69 69 69 69; 23 45 67 89; 4711 4711; 747 747; 2222 3333; 22 33 44 55; alphanumeric dialling e.g. HILTONS (corresponding digits 44 58 667). These numbers are defined by the subscriber.

These numbers are often easy to learn, easy to remember, and usually they are subjectively pleasing. Numbers may give the user some image to assimilate service provider / service subscriber.

“Sounding” and “image” numbers are user-friendly numbers. They are highly subjective. A number which pleases one service provider / service subscriber may not necessarily please another. In order to build up services which utilise “sounding” numbers, subscribers should have some freedom in choosing their numbers in accordance with the rules defined by the NRA.

As regards national services¹⁰, NRAs should reserve a set of numbers from national numbering schemes to be used for national services, for example for so-called “golden”¹¹ numbers and for access codes of national services.

A fictive example:

The following numbers could be reserved for national purposes to be allocated by the NRA:

X0 and X9, where X=1-9 and
0X0, where X=1-9

7. “sounding” and “image” numbers should be considered user-friendly numbers

¹⁰ National services are understood here as non-competitive public services (like for example 112 for emergency services) or competitive services where public access to these services is obtained through a common access code, for example 0800 for freephone.

¹¹ “Golden” numbers are understood here as a limited amount of individual short numbers to be allocated for a limited amount of competitive services, where the limitation is made for example by pricing or by some other appropriate mechanism.

8. A subscriber should have some freedom in selecting numbers in accordance with the rules defined by the NRA
9. In the national scheme a set of “sounding” numbers should be reserved by the NRA to be used for national services, for example for
 - * national short numbers for non-competitive services
 - * so called “golden” numbers for limited competitive services
 - * Service Access Codes for national services

3.4.1.5 - Harmonisation

Harmonisation is an important but at the same time very sensitive issue. Harmonisation may help travellers in using telecommunications services but also competing network operators and service providers to obtain reciprocity in schemes of different countries. On a European level several different levels of harmonisation can be distinguished: 1) harmonisation of certain numbers / access codes 2) harmonisation of national numbering schemes 3) harmonisation of regulatory issues on numbering.

Harmonisation of numbers / access codes

Harmonisation of numbers is advocated to allow travellers to have the same user interface where ever they are. Harmonisation of numbers/codes is also advocated to allow access to the pan-European service provider with the same service number wherever they are located. Harmonisation can be achieved either by 1) using European Telephony Numbering Space (ETNS) for services or 2) harmonising service numbers / service access codes in the national numbering schemes of European countries.

Harmonisation in itself is a valid point and related to user-friendly numbering, but it may be difficult to achieve against a situation where those that benefit are in the minority, and the majority of users who do not travel will be inconvenienced. The harmonisation of service numbers may also be in contradiction with competition aspects of service provision. It is not clear how many and what kind of services really require harmonised numbering procedures. In Europe today only the common emergency number 112 and international prefix 00 have been harmonised.

ETO has signed a work order with the European Commission on 8 July 1996 on the topic of “Harmonisation of short codes in Europe”. The work will be carried out in close co-operation with the ENF and will be finished by the end of 1997.

Harmonisation of national numbering schemes

As mentioned earlier, numbering between European countries is inconsistent and fragmented. Europe comprises a single market area within EU and telecommunications will be opened to competition from the beginning of 1998. When countries are revamping their numbering schemes today, it is a great opportunity to carry out this work in a consistent and harmonised way, not in isolation, in order to achieve a convergence of schemes. The importance of harmonisation and convergence will be emphasised in a competitive environment where reciprocity plays an important role. Convergence of schemes could benefit European telecommunications users, network operators and service providers in the long run.

ETO has signed two work orders with the European Commission on 8 July 1996 with regard to harmonisation of national numbering schemes. These work orders are: “Review of national numbering schemes on their openness for competition”(end date 2/97) and “A long term strategic plan for the numbering and addressing of telecommunications services in Europe” (end date 12/97). These studies will result 1) criteria for the structure of open and user-friendly numbering schemes and guidelines for national administrations when revising their national numbering schemes and 2) a long term strategy for moving towards a unified numbering plan for Europe. The work will be done in close co-operation with the ENF.

Harmonisation of rules on numbering

At present the rules and principles of number use differ from one European country to another. In a competitive environment, in order to guarantee reciprocity and non-discriminatory and transparent access to numbering resources, it is important to define the basic rights of users, service providers, network operators and administrations. This is important not only within a country but also within Europe when Europe is considered as a single telecommunications market.

ETO has signed a work order with the European Commission on 8 July 1996 on the topic of "European Numbering Conventions". The work will be done in close co-operation with the ENF and will be finished by the end of February 1997. The study will result a detailed proposal for European Numbering Conventions.

3.4.1.6 - Fixed number length

A majority of European countries use Subscriber Numbers (SN) and National Destination Codes (NDCs) which vary in length. In some countries, full National (Significant) Number (N(S)N) is of a fixed length but the length of a local Subscriber Number (SN) is variable. In some countries the length of N(S)N is also variable. Variable number length has been a flexible way of keeping a subscriber number as short as possible. At the same time, however, it has efficiently wasted the resources of available subscriber number blocks.

Example: With 6 digit numbers, and using digits 1 to 9 as the first digit of the number, the total numbering capacity is 900.000 individual numbers. If all the numbers are allocated, no free numbers or free number blocks are available in the 1 to 9 range.

With 8 digit numbers, and using only digit 1 as the first digit of the number, the total capacity in 1 range is 10. 000.000 individual numbers. Numbers starting with digits 2 to 9 remain free to be used for other purposes

Fixed number length has some advantages:

- number structure is logical. If a number length differs from the fixed length, the user knows that there may be some problem with the number
- subscribers are in an equal position as regards number length
- rules or guidelines on how to display the number are simple

Fixed number length has some disadvantages:

- it limits the flexibility in allocating NDCs and SNs depending on whether SN, NDC or both are fixed length

Both variable length numbers and fixed length numbers have been used in present schemes. Number structure is different in different countries and users are usually familiar with their national schemes. No major problems exist under present circumstances. Although fixed number length seems to offer some benefits for users, (particularly in countries with no NDCs), fixed or variable length of number does not seem to be the key issue of user-friendliness

3.4.1.7 - Presentation of numbers

Even a long number may be easy to learn and easy to remember if it consists of several consecutive sections, each representing a short number and with some logic related to each section. The number itself may include some logical parts but users and other interested parties may have different views regarding the logic of a number. The following examples highlight the issue:

Example 1:

The structured 10 digit subscriber number XXX YYY ZZZZ is easier to learn compared to a completely random 10 digit number, if we know that the first 3 digits refer to geographical area, the second three refer to the exchange in the area and the last 4 refer to the subscriber's number.

Example 2:

In Germany 0 is the trunk prefix and digits 180 after the trunk prefix indicate the Service Access Code for shared cost services in Germany. 180 is followed by a one digit tariff indicator (for example digit 3). The rest of the number identifies the individual service subscriber.

The number for Lufthansa in Germany is: 0 180 3 803803,
Lufthansa advertises the number as: 01 803 803 803

At the same time service providers marketing
international services announce adult services
by the number (in Caribbean): 00 180 9XXXXXXX

It seems clear that the final presentation of a number is made by the holder of the number. However, a standard number presentation helps a user to present his/her telephone number and it is therefore recommended. An ITU-T standard ¹² exists with regard to the presentation of international prefix and the Country Codes in connection with the national numbers. Some countries have national standards for the presentation of national numbers. Because of the different number structures of national numbers it is difficult to recommend one harmonised European way for number presentation

10. It may be difficult to obtain a European standard for the presentation of numbers because of the different number structures in European countries
11. A national standard for presenting national numbers would help the users to present his/her number and is, therefore, recommended
12. The final presentation of a number is made by the holder of the number.

3.4.1.8 - Geographical numbers

Geographical numbers indicate subscribers location. At a local level geographical area equals the exchange area, i.e. the area in which subscribers are connected to the same telephone exchange. On a national level, geographical area may correspond to a numbering area, covering many exchange areas.

Subscribers are usually characterised by their geographical subscriber number. The country code tells the caller the country of the called party. The area code, in front of the Subscriber Number, tells the caller the location of the called party within the country. The first two or three digits of the Subscriber Number may even tell the professional user the city area of the subscriber.

Geographical identification is of importance to subscribers. Some subscribers want to be recognised as belonging a capital area even when located outside that area. For a caller, geographical identity is an issue of assimilation, a way of memorising the number. In some studies on number portability, users and service providers were asked about the importance of geographical and non-geographical numbers. The answers were contradictory: some users preferred geographical numbers but at the same time the same users wanted geographically portable numbers. Geographical number portability destroys the idea of geographical numbers being used to identify the location of a subscriber.

¹² ITU-T: Recommendation E.123 (1988) Notation for national and international telephone numbers

Benefits of uniformity in geographical numbering (for example the same NDC for a certain area for all network operators/service providers) are that possibilities are maximised for local dialling, for number portability between operators, for geographic number portability within the geographical area (for example NDC) and for recognition of geography and tariff.

The importance of geographical numbers may decrease in the future due to the lower costs of transmission and the introduction of personal telecommunications services, where telephone numbers denote persons rather than their location in the network. However, as geographical numbers have some aspects which help users learn and remember numbers, they should be considered as user-friendly numbers. Geographical numbers should be retained in parallel with non-geographical numbers to give users an opportunity to choose numbers according to their needs. If users prefer non-geographical numbers in the long run, geographical numbers will then automatically lose their value.

13. Geographical numbers have some aspects which help users learn and remember them. They should be considered as user-friendly numbers. Geographical numbers should be retained in parallel with non-geographical numbers to give users an opportunity to choose numbers according to their needs.

3.4.1.9 - Non-geographical numbers

Non-geographical numbers have no geographic identity within their operating area and they offer a natural platform for number portability within this area. Local numbers may be non-geographical numbers within an exchange area or within an NDC, national numbers may be non-geographical numbers within the country, global numbers within the globe. In order to distinguish between geographical numbers and non-geographical numbers, non-geographical numbers should carry an identity of its non-geographic nature. This could be done by allocating a number block of their own for non-geographic numbers. The first digit(s) of non-geographical numbers would tell the user that the number in question is a non-geographical number, not a geographical number.

Benefits of uniformity in non-geographical numbering (i.e. the same NDC(s) for a certain service type for all network operators/service providers) are that possibilities are maximised for number portability between operators and for recognition of the service type and tariff.

Non-geographical numbers are identified as having no geographic identity. In a similar way as geographical numbers help users learn and remember numbers with the aid of geography, non-geographical numbers, with their own identity, help users to remember their non-geography. Non-geographical numbers should be distinguished from geographical numbers.

14. Non-geographical numbers should be distinguished from geographical numbers.

3.4.1.10 - Aspects of number portability with regard to geographical numbers

As discussed before, geographical numbers are of some value to users. They are not necessarily easy to learn or easy to use, they are not necessarily subjectively pleasing but geographic identity gives some added value to the number which helps users remember them. Call-forwarding and geographical number portability has some impact on geographical numbers.

In call-forwarding, calls to geographical numbers can be forwarded to other destinations, to other geographic areas or to non-geographical numbers. In this case the destination does not correspond to the number dialled. However, call-forwarding is a service to facilitate the called person to be reachable. Basically it is not intended to be used for transferring calls permanently to other geographical or non-geographical areas. It is not seen to be in contradiction with geographic numbering. Also pricing mechanism of call-forwarding, where the called party pays the cost of transfer, supports the temporary nature of the service.

Geographical number portability has more impact on geographical numbers. Geographical numbers are geographically portable within the exchange area today. They are usually not portable to other exchange areas or other geographical areas. If geographical numbers are made geographically portable in a wide sense, they lose their geographic identity. Should this be allowed or not? Should we keep geographic numbers and not make them geographically portable. Or should we allow geographical portability with geographic numbers and then have no geographical numbers at all?

New network operators usually obtain new local number blocks (within the NDC) from the numbering administrator. Those number blocks differ from the blocks of incumbent or other operators. New operators may create their own geographical identity which does not necessarily comply with the geographical identity of other operators. The common geographical identity is then lost in a way.

Should geographical number portability with geographical numbers be limited? When discussing number portability in Europe today, portability at a local level is very often limited to portability between operators and not allowed between geographical areas (e.g. in the UK). However, technically it becomes possible to do away with geographical numbers and this becomes more attractive as tariff becomes more independent from distance. At the same time the restriction on geographical number portability disappears (instead of portability within a numbering area you may have nation-wide portability, depending on the national numbering plan).

When promoting user-friendly numbering, we should make all possible efforts to maintain issues, even minor ones which support user-friendliness and leave the decision up to the subscriber on whether to apply for geographical or non-geographical numbers. Because of the fact that geographic identity gives some added value for remembering the number, we should maintain geographic identity in number as far as possible. Although the introduction of competition at a local level obscures the common geographical identity of a subscriber number between the operators, it, however, retains the value of geography within every operator. For geographical numbers number portability should be allowed as long as geographical information defined by the public numbering plan is preserved.

Geographical numbering area as defined by a geographical NDC could offer a solution for an area which is common to all operators and where numbers could be made geographically portable. However, some problems may emerge in countries where the whole country is one numbering area.

15. Geographical numbers should remain geographical numbers
16. Non-geographical nature of numbers should be recognised from the number
17. Non-geographical numbers offer a natural platform for number portability
18. For geographical numbers number portability should be allowed as long as geographical information defined by the public numbering plan is preserved

3.4.1.11 - Stability of numbers

It is clear that any kind of number change causes confusion, misdialling and extra cost. This alone is a sufficient reason to minimise number changes. However, number changes cannot be totally avoided.

Therefore any new plan should take into account the stability of numbers so that this plan may remain unchanged for as long as possible.

Stability of numbering schemes is a crucial issue for users. National numbering schemes should remain as stable as possible. When planning new numbering schemes these plans should take into account the future development of services and networks and guarantee flexibility in number allocation and also sufficient resources so that the life time of the new scheme could be some decades. Numbering schemes should not be planned in isolation. National plans, in addition to country based requirements, also should take into account the development of European numbering. Common guidelines on reviewing the schemes is an important issue.

Today we have no European numbering strategy. National plans are impossible to take into account European numbering issues, because those issues are not defined. However, national consultations on strategic options of European numbering, conducted by ECTRA, clearly showed that the present inconsistent situation within Europe can not continue. Something must be done. The first decision of ECTRA was made to establish an ETNS (European Telephony Numbering Space), without making any changes to national numbering plans. No actions are needed on a national level. However, the ETNS, as defined today, only gives a partial solutions to European numbering problems. The issues of harmonisation of European numbers are not studied (services, carrier selection, VPNs etc.) so far. The issues of user-friendly numbering as described in this study are not very well met by the ETNS.

In order to fulfil the stability of numbering schemes, European numbering strategy should be defined as soon as possible so that they can be taken into account when developing national numbering schemes. Comprehensive number changes in national numbering schemes should be delayed where possible until the guidelines on revising numbering schemes and the European numbering strategy have been created.

19. European numbering strategy should be defined as soon as possible to enable European countries to plan their national schemes and guarantee long term stability of national numbering schemes.
20. Comprehensive numbering changes in national numbering schemes should be delayed, where possible, until the common guidelines on revising numbering schemes and the European numbering strategy has been defined by the end of 1997

ETO has signed two work orders with the European Commission on 8 July 1996 with regard to harmonisation of national numbering schemes. These work orders are: "Review of national numbering schemes on their openness for competition"(end date 2/97) and "A long term strategic plan for the numbering and addressing of telecommunications services in Europe" (end date 12/97). These studies will result 1) criteria for the structure of open and user-friendly numbering schemes and guidelines for national administrations when revising their national numbering schemes and 2) a long term strategy for moving towards a unified numbering plan for Europe. The work will be done in close co-operation with the ENF.

3.4.1.12 - User-friendly number changes

Number changes always cause inconvenience to users, service providers and operators. This inconvenience can be minimised by careful planning, timing and publicity.

Based on experience from the UK and Finland, main elements in carrying out comprehensive number changes are:

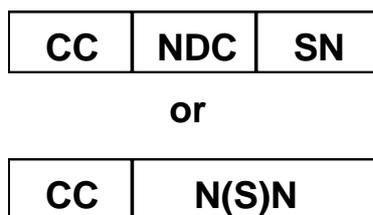
- early decision
- full operator co-operation

- strategic plan
- industry co-operation
- efficient awareness campaigns
- generally parallel running

Number changes should be planned so that a call to the old number could be routed to a new number or to an announcement giving the new number. The language of the announcement should take into account not only national but also international calls.

3.5 - Number structure and available numbers capacity

The format of the international telephone number (E.164) is presented in figure 3.2.



where

CC = Country Code;

NDC = National Destination Code;

SN = Subscriber Number

N(S)N = National (Significant) Number (=NDC+SN)

Figure 3.2. Format of the international telephone number

There are two ways to use national numbers for services: 1) using the National (Significant) Number (N(S)N) or 2) using the Subscriber Numbers (SN). The difference between these two alternatives are the following:

The use of N(S)N resources

When using N(S)N resources, numbers are unambiguous at a national level and they can be used as national service numbers without any difficulty. Even access from outside of the country is available if deemed necessary.

The total numbering capacity of N(S)N resources is dependent on the length of the country code. In countries of 2 or 3 digit country codes the total theoretical numbering capacity of an N(S)N is between 1000 and 10 000 million individual numbers.

The use of SN resources

When using SN resources, they are unambiguous in the numbering area only. They may denote different services in other numbering areas. If SN resources are to be used nationally, the use of SN resources for services should be harmonised throughout the country to denote the same service in all numbering areas (for example 112). In this case access from other countries is invalid because numbers do not have any NDC.

The total numbering capacity of SN resources in each numbering area is dependent on the length of the subscriber number. If the length of the subscriber number is 6 digits, the total theoretical numbering capacity is 1 million individual numbers and with 9 digits length 1000 million individual numbers in each numbering area.

3.6 - Implications of short numbers/access codes in numbering schemes

As defined in section 3.2.3, a short number is defined as a number which, when dialled, directly accesses a specific service. The length of a short number is defined as a number with a maximum of 5 dialled digits, not including the possible trunk prefix.

A short number has to be distinguished from the Service Access Code (SAC). In this study SAC is defined as a code indicating the type of service involved. The actual service number includes the SAC in front of the number, followed by digits indicating the individual service. The SAC identifies only the type of the service, not the individual service itself.

A short number:



SHNU = denotes a short number (e.g. 112 or 01188)
 (XXX...X) = denotes the unusable numbering capacity behind each short number

A Service Access Code:



SAC = denotes the Service Access Code, identifying the service type (e.g. premium rate, for example 900 or 0900)
 XXX...X = denotes the individual service number (e.g. 0900 1234567)

Figure 3.4. A short number and a Service Access Code

The number capacity for short numbers or service access codes is studied in more detail in Annex 3. The study results in the following conclusions:

Generally:

21. Short numbers waste number capacity very efficiently and they should be used very carefully. For numbering of services, instead of using short numbers, the use of access codes and individual numbers behind each access code should be preferred
22. Short numbers should not be used without any limitations for numbering of individual commercial services .

N(S)N resources using the trunk prefix:

23. To be used for numbering of geographical or non-geographical NDCs in the country, including NDCs for personal numbers and access codes for national services.
24. Three first digits could be used for access codes for commercial services (e.g. 0800) as defined by the NRA

25. Four first digits could be used for numbering of individual non-commercial services as defined by the NRA (e.g. 0ABCD, where 0 is the trunk prefix and ABCD a non-commercial service)
26. The five first digits of an N(S)N could be used for numbering of limited amount of individual commercial services as defined by the NRA (e.g. 0BCDEF), with rules which limit the demand of such numbers (e.g. pricing etc.).

SN resources:

27. To be used mainly for numbering of local subscribers and local services. The first digits of a subscriber number (up to 4 digits) could denote subscriber blocks of different local operators.
28. Three digit subscriber numbers should be used only for very a limited number of non-commercial services as defined by the NRA (like 112). Three digit codes could be used for access codes for commercial services.
29. Four digit subscriber numbers could be used for individual non-commercial services as defined by the NRA.
30. Five digit subscriber numbers could be used for numbering of individual commercial services as defined by the NRA with rules which limit the demand of such numbers (e.g. pricing etc.).

3.7 - Conclusions and recommendations

The following conclusions can be drawn from the study:

CONCLUSIONS AND RECOMMENDATIONS WITH REGARD TO THE STRUCTURE OF NUMBERING SCHEMES:

CONCLUSIONS

1. User-friendly numbering is a key to effective telecommunications on a national and European level
2. Logical and structured numbering schemes are a prerequisite of user-friendly numbering both on a national and European level
3. The stability of national schemes can only be guaranteed if these schemes, in addition to the national needs, also take into account the needs of Europe

RECOMMENDATIONS

1. National numbering schemes that do not fulfil the present demands of number capacity and open numbering conditions, should be reviewed and modified as soon as possible in a way that guarantees capacity, openness and user-friendly numbering in the long term
2. However, comprehensive numbering changes in national numbering schemes should be delayed, where possible, until the common guidelines on revising numbering schemes and the European numbering strategy has been defined by the end of 97
3. Common guidelines on revising numbering schemes and the European numbering strategy should be defined as soon as possible in order to enable European countries to plan their national schemes and guarantee long term stability of national schemes.

CONCLUSIONS AND RECOMMENDATIONS WITH REGARD TO THE USER-FRIENDLINESS OF INDIVIDUAL NUMBERS

CONCLUSIONS

4. The following numbering principles should be supported:

Numbering logic

- The use of market oriented numbering logic
- The use of tariff oriented numbering logic

The use of Service Access Codes (SACs)

- NRAs should reserve a set of SACs for present and future national use (e.g. freephone, shared cost, shared revenue, personal numbers, spare codes for future services etc.)

Short numbers

- Short numbers waste numbering capacity
- Short numbers should be used very carefully under strict control by NRAs
- 3 and 4 digit short numbers should be used only in very limited cases
- 5 digit short numbers should be used for national "golden" numbers
- NRAs should reserve a set of short numbers for future national use (like already reserved for emergency services, 112)

"Sounding" and "Image" numbers

- Sounding and image numbers are user-friendly numbers
- Subscribers should have some say in selecting numbers in accordance with rules as defined by the NRA

European harmonisation

- European harmonisation should be supported but only with careful consideration of which numbers should be harmonised. Further study is needed

Geographical numbers

- Geographical numbers should be retained as far as possible.

Non-geographical numbers

- Non-geographical numbers should be clearly distinguished from geographical numbers

Number portability

- For geographical numbers number portability should be allowed as long as geographical information defined by the public numbering plan is preserved
- Full portability (geographical, operator) should only be made available with non-geographical numbers

RECOMMENDATIONS

4. When numbering services, market and tariff oriented numbering logic using Service Access Codes should be preferred instead of short numbers

CHAPTER 4 - ALPHANUMERIC DIALLING

4.1 - Demands for alphanumeric dialling

The requirement for alphanumeric dialling is market driven especially for services like freephone, premium rate and personal communications. In alphanumeric dialling the following points of view or perspectives of interested parties exist:

- the user's perspective, reflecting the user demand on an easy access to services
- the service provider's perspective, reflecting the demands of service providers to market, sell and maintain their services
- the network operators' perspective: how to manage the network and how to avoid systems or procedures which cause misdialling and create confusion. Efficient and user-friendly systems make dialling easy and probably generate more traffic, which benefits both the service providers and network operators
- the manufacturers' perspective, reflecting the manufacturing of terminal equipment, applying the standards, making changes to the present keypads
- administrative perspective: reflecting concerns on how to avoid conflicts which may arise when combining telephone numbers which are not trademarks with names which may be registered trademarks

4.1.1 - The user's perspective

Names of organisations or "brands" of products are easier to remember than their telephone numbers (for example 0800-RAILWAYS, corresponds 0800 - 72459297). If letters and names can be mapped to numbers, alphanumeric dialling could facilitate user-friendly dialling.

4.1.2 - The service provider's perspective

Service providers can be divided into two groups: service providers who at the same time are network operators, and service providers who are independent of network operators. Whether they are network operators or independent service providers, they view alphanumeric dialling as important with regard to usability of services.

4.1.3 - The network operator's perspective

Network operators consider alphanumeric dialling an issue related to user-friendliness but regard it as restricted mainly to freephone or premium rate services. There are a variety of different keypads on the market. This is one of the reasons why the application of alphanumeric dialling could cause confusion and misdialling.

The European network operators will provide new pan-European and global services. The use of a universal mapping is a key factor for the success of these services. Therefore, the European network operators have a special interest to promote the implementation of E.161 A mapping on the telecommunication terminal keypads.

4.1.4 - The perspective of the manufacturing industry

The European manufacturing industry supports the initiatives to harmonise telephone keypad characters. The use of alpha-numeric keypads will help users remember and dial telephone numbers. According to ECTEL¹³ the most preferred single standard for the alpha-numeric telephone keypad allocation is ITU-T E.161 Option A which has also been adopted by ISO and ETSI.

ECTEL states that the only practical way of converting existing terminals is through the use of keypad overlays or stickers. Once the standard is agreed, stickers with the alphanumeric characters could be distributed by the PTOs with the telecom bills issued to customers. The distribution of overlays is more difficult since the keypad size is not uniform.

According to ECTEL the manufacturing issues associated with the keypad are:

- benefits of a single common design
- period over which old designs have to be provided
- conversion of existing product - mechanical (keypad overlay, stickers, button replacement)
- costs of conversion to and manufacture of the new design
- change to the assignment of letters decoded within the terminal, if any (e.g. name/number lists, function control)
- market impact of a keypad design change

Furthermore, ECTEL points out that any change in the allocation of characters to the respective keyset does not only involve mechanical adaptation but also creates substantial conversion costs in systems, especially in PBXs, which make use of the character encoding scheme in the centralised control software.

ECTEL insists that a keypad standard shall not become a mandatory regulation and that existing equipment should maintain its right on the market, e.g. for extensions. ECTEL also suggests that compatibility could only be achieved if the basic operational functions were also standardised.

- 31. ECTEL supports the harmonisation of keypads in accordance with E.161Option A
- 32. Standard should remain voluntary not mandatory
- 33. Existing equipment should maintain its right to be on the market

4.2 - Standards

4.2.1 - ITU-T

ITU-T has published Recommendation E.161, "Arrangement of digits, letters and symbols on telephones and other devices that can be used for gaining access to a telephone network" (Melbourne 1988).

According to this recommendation, "for the automatic **international** service, it is preferable that the national numbering plan should **not** involve the use of letters (associated with figures)".

Furthermore: "In view of the fact that purely numerical numbering plans are now recommended and that the association of letters to digits is not the same in different countries, it is not desirable to standardise letter symbols for the push buttons corresponding to each of the digits. In cases where a mixed letter-

¹³ ECTEL Numbering Group: Keypad characters; 7 November 95

and-digit dialling system is still in use in a country, the letters associated with the figures in the dialling system of the country concerned may, of course, be included on the corresponding push buttons of this country's telephone sets (see Figure 2/E.161)", see figure 4.1.

1	2 ABC	3 DEF
4 GHI	5 JKL	6 MN
7 PRS	8 TUV	9 WXY
	0 OQ	

Figure 4.1. Layout of keypad according to CCITT Rec E.161 (Melbourne 1988)

ITU-T revised the Recommendation E.161 (Helsinki 1993). According to the revised version "For the automatic **international** service, it is preferable that the national numbering plan should not involve the routine use of letters e.g. to designate local exchanges (associated with digits). However, letters may be used to designate the names of particular services, facilities, organisations or individual subscribers. The allocation of such mnemonics (and their equivalent national numbers) is a national matter."

According to the revised Recommendation E.161 (Helsinki 1993) "Where letters as well as digits appear on a dial or its surround, the recommended relationship between the letters and the digits are as shown in the two options that follow: "

OPTION A			OPTION B		
1	2 ABC	3 DEF	1 QZ	2 ABC	3 DEF
4 GHI	5 JKL	6 MNO	4 GHI	5 JKL	6 MNO
7 PQRS	8 TUV	9 WXYZ	7 PRS	8 TUV	9 WXY
	0			0	

Figure 4.2. Relations between letters and digits according to the revised Recommendation E.161 (Helsinki 1993)

Option B is not preferred for countries which are introducing a standard on alphanumeric keypads. It is to be phased out, in international service, where practicable, in countries using this option, preferably 1 April 1996 (provisional date- for further study)

4.2.2 - ETSI

The ETSI TCR-TR 023 ¹⁴ report reviews the background of the global attempt to standardise the assignment of alphanumeric letters to digits on keypads in the ITU-T, to review the status in Europe and to provide consequential recommendations

The ETSI TC-HF report supports the ITU-T Recommendation E.161, Option A. TC-HF shall not at present, nor for a considerable time to come, recommend any telecommunication services that presume a single rule for the assignment of letters to digits. Consequently, the use of letters together with numeric keyboards should be regarded solely as an individual "aide-memoires" matter.

¹⁴ ETSI TCR-TR 023: "Human Factors (HF); Assignment of alphanumeric letters to digits on push button dialling keypads."

4.2.3 - ISO / IEC

ISO / IEC have issued a standard¹⁵ for the allocation of letters to the keys of numeric keyboards. The 26 letters of the Latin alphabet are associated with the digits in compliance to that recommended in the ITU-T recommendation E.161, option A.

4.3 - Present situation in the market place

Today there are a variety of different alphanumeric keypads on the market. It seems that most of these keypads differ from the standard. The format of alphanumeric keypads may vary even in different equipment produced by the same manufacturer.

The new standard (ITU-T E.161 Option A) seems to be rapidly implemented. It appears that many operators have standardised on this layout for all their new telephones. This means that alphanumeric dialling may become more realistic in carefully selected market sectors much sooner than might have previously been predicted. In the UK, for example, the widespread adoption of ITU-T E.161 seems to be happening very rapidly without any pressure being applied to manufacturers or network operators. The remaining problem is thus, one of existing non-standard telephones and the speed with which they will diminish within Europe. This is difficult to predict.

In the US, no uniform key pad standard exists regarding the association of letters and numbers. The older, and still most prevalent arrangement is the following: The "1" and "0" keys have no letters on them. The rest of keys (from "2" to "9") have 3 letters each, in alphabetical order. The "Q" and "Z" letters are not mapped. This remains the most prevalent combination.

However, new sets coming out from telecommunications vendors, particularly all AT&T manufactured sets, have added the "Q" to the "7" key and the "Z" to the "9" key, in compliance with the E.161, Option A. It is believed that this will be the dominant configuration of the future in the US, but it is not currently a standard.

It should be noted that E.161 addresses the Latin alphabet only. There are many languages within Europe, that have other characters. This should be acknowledged. However, this is not a problem of telecommunications only. Presenting letters and names in a format which is clearly understandable by all users world-wide is a more general problem (for example æ, ø å, Cyrillic alphabet etc.). Furthermore, telecommunications services are becoming global and the mapping problem is a global problem rather than European only.

4.4 - Conclusions

There are three issues related to the use of alphanumeric dialling: 1) Market demand 2) The present market situation 3) Standardisation and harmonisation

Market demand

When interviewing service providers and service subscribers there seems to be a clear market demand for alphanumeric dialling in freephone services. The demand for other services is not clear but it may be asked how other services, like premium rate services, would differ from freephone services with regard to user-friendly dialling. However, it seems that the demand for alphanumeric dialling is focused on service numbers rather than on normal subscriber numbers.

¹⁵ ISO /IEC 9995-8 "Information technology - Keyboard layouts for text and office systems - Part 8: Allocation of letters to the keys of a numeric keyboard". First edition 15 August 1994

CONCLUSION 5:

There is a clear market demand for alphanumeric dialling

Market situation

In the existing standard, alphanumeric dialling is avoided rather than encouraged. This is understandable in view of the different character sets used in different countries and the variety of existing keypads on the market. In these circumstances alphanumeric dialling would cause confusion and misdialling rather than make dialling more user-friendly and reliable.

CONCLUSION 6:

At the moment, use of alphanumeric dialling causes confusion and misdialling.
It should not be recommended at present.

In the market place there is a great variety of different types of terminal equipment and different types of keypads. Changing the keypads of this equipment is a very difficult and very costly task, whichever the changing procedure. Furthermore, it cannot be guaranteed that all the equipment will be changed. Equipment with old keypads will always remain. This old equipment will inevitably cause confusion and misdialling. There seems to be no reason to change existing keypads.

CONCLUSION 7:

The changing of existing keypads is not advisable at this point of time.

Standardisation / harmonisation

In the future, the telecommunications market will be a global market. The first global service, the International Freephone Service (IFS) using Universal International Freephone Number (UIFN), will be launched in February 1997. With the globalisation of services, the alphanumeric keypads should be harmonised on a global level.

It is evident that we have a clear standard for alphanumeric dialling. International standardisation bodies ITU and ISO and the European standardisation body ETSI support the same international standard, E.161 Option A. There is therefore no need for new standardisation.

Standards are not mandatory. Manufacturers, service providers and operators are not obliged to follow the standards. It seems clear that under the present circumstances the utilisation of alphanumeric dialling is very difficult. However, if nothing is done today, we will not be able to utilise alphanumeric dialling in the future. If we start to follow the standard today, the keypads could eventually be harmonised in the

long run. Mechanisms should be created that encourage manufacturers of telecommunication equipment to follow the existing standard E.161, option A.

CONCLUSION 8:

The standard for alphanumeric dialling is ITU-T Rec. E.161, option A.
There is no need for any new standard. The use of E.161 Option A should be highly encouraged and it should be applied globally.

4.6 - Regulatory aspects

The use of different mapping between letters and digits on keypads must be avoided in the future. The harmonisation of the keypads based on E.161 Option A is desirable for the success of future pan-European and global services.

As pointed out before, it seems that there are so many different keypads in use on the market that the utilisation of alphanumeric dialling is not available in the short term. However, if from now on all new keypads produced followed the same standard, after a period in which the old terminals would be replaced with the new ones, the alphanumeric dialling would be applicable in the telephone network.

Harmonising the manufacturing of keypads is not a question of missing standards - a standard already exists for it on a global level. The implementation of the existing standard E.161, Option A should be highly encouraged. The problem is how to encourage the utilisation of the existing standard? Standards are not mandatory. How can the manufacturing industry be influenced and all the market participants be made to apply the standard?

Three different, parallel approaches were found:

1. Actions needed to be taken by the CEU and NRAs
2. Actions needed to be taken by the European manufacturing industry
3. Actions needed to be taken by the sellers of the telecommunications equipment

To accelerate keypad harmonisation, the implementation the standard E.161 Option A must be encouraged by CEU and NRAs. CEU should consider the possibility of recommending in the future directive on telecommunication terminals, to uniquely implement, on a voluntary basis, the E.161 Option A mapping on the keypads of telecommunication terminals.

The European manufacturing industry should be contacted by the CEU and ECTRA to discuss and agree upon, on a voluntary basis, the implementation of E.161 Option A. NRAs should do the same at a national level.

Across Europe the network operators are the main telecommunication terminal sellers. They should be encouraged to only sell telecommunication terminals with the E.161 Option A mappings. The European network operators should be contacted by the CEU and ECTRA to discuss and agree on this issue.

NRAs should do the same at a national level. Alphanumeric dialling should also be standardised at a national level.

RECOMMENDATION 5

Mechanisms should be created to support the implementation of ITU-T Rec. E.161 Option A.

These mechanisms could be:

1. Direct contacts from CEU and ECTRA to European manufacturing industry
2. Direct contacts from NRAs to national manufacturing industry
3. Direct contacts from CEU and ECTRA to European equipment resellers to procure only E.161 Option A compatible terminal equipment
4. Direct contacts from NRAs to national resellers to procure only E.161 Option A compatible terminal equipment
5. Standardisation of alphanumeric dialling at a national level

CHAPTER 5 - CODE ALLOCATION AND NUMBERING OF CALLING LINE IDENTIFICATION (CLI)

5.1 - Calling Line Identification as a concept

Calling Line Identification (CLI) is related to Identification Services. CLI is used within the network to identify callers for charging, routing and administrative purposes. CLI, when introduced into the public domain, has a number of benefits for both residential and business users. At the same time, some problems related to issues such as privacy and data protection emerge. Some technical issues have also to be solved e.g. which numbers should be presented as CLI numbers and what would be the most user-friendly mechanism to activate the service at both ends of the connection.

Two main functions of the CLI are the Calling Line Identification Presentation (CLIP) and the Calling Line Identification Restriction (CLIR).

CLIP gives the called party the possibility to recognise where the call is originating from. The telephone number of the calling party will be displayed to the called party before the call is answered (if such a display is available on the terminal equipment). Transfer of CLI is a normal internal function of modern telephone networks. CLI, where available, is always transferred within the network. CLI is usually used at a national level. It is not necessarily transferred across national borders. The introduction of CLIP and CLIR services is a national matter and has to be made in accordance with data protection and privacy regulations applicable in the country.

This study focuses on numbering issues related to the presentation of the CLI and the possible use of a harmonised CLIR code from the users point of view. Issues related to privacy and data protection as well as issues related to which numbers will be presented as a CLI number are out of the scope of this study.

5.2 - The use of Identification Services

CLI services are used for different purposes and could be seen as facilitators of future telecommunications markets. CLI may facilitate for example call-back services, customer billing and identification of subscriber location (for emergency services). CLI can be used to facilitate IN-based services and Computer Integrated Telephony. Some not comprehensive examples may pinpoint the possible use of CLI:

- The called party with the appropriate equipment could automatically screen incoming calls before answering the call. He/she could use the received CLI to route the call within the private network or within an intelligent PABX.
- A customer of local operator A is using operator B's long distance network; CLI is used to identify the calling party and to check if he/she is operator B's customer. If so, he/she is allowed to use operator B as a long distance carrier.
- CLI could be used in emergency centres or customer call centres to identify the calling party's location automatically. In this case, it would be possible to obtain the name and the address of the calling party before the call is answered.
- CLI could also be used to provide a call-back service, where the number of the last call (answered or not) would be stored in order to make a new call later by using this number.

5.3 - A definition of Identification services

The utilisation of a comprehensive set of Identification Services is possible only with a new network technology such as ISDN. In this study we refer to the service definitions of ISDN networks. During the cause of the work ETSI service descriptions¹⁶ regarding CLIP and CLIR in PSTN networks were under public enquiry.

The following four main supplementary services¹⁷ are defined in ISDN.

1. Calling Line Identification Presentation (CLIP)¹⁸
The Calling Line Identification Presentation (CLIP) provides the called party with the possibility of receiving identification of the calling party.
2. Calling Line Identification Restriction (CLIR)¹⁹
The Calling Line Identification Restriction (CLIR) enables the calling party to prevent presentation of its ISDN number to the called party.
3. Connected Line Identification Presentation (COLP)²⁰
The Connected Line Identification Presentation (COLP) provides the calling party with the possibility to receive identification of the connected party.
4. Connected Line Identification Restriction (COLR)²¹
The Connected Line Identification Restriction (COLR) enables the connected party to prevent presentation of its ISDN number to the calling party.

In addition to these ISDN supplementary services two other services are defined for name identification:

5. Calling Name Identification Presentation (CNIP)²²
Calling Name Identification Presentation (CNIP) is a terminating service that provides either the name associated with the calling party number or an indication of privacy or unavailability to the called party.
6. Calling Name Identification Restriction (CNIR)²³
Calling Name Identification Restriction (CNIR) is an originating service that allows a user to alter the network stored or subscribed privacy status associated with the users calling name.

The main difference of CLIP/CLIR and COLP/COLR services is the direction in which they transfer information. CLIP/CLIR refers to the identification information transferred from the calling party to the called party, COLP/COLR refers to the identification information transferred from the connected party to the calling party. The transfer of COLR is made only after answering the call.

This study focuses on CLIP/CLIR and COLP/COLR procedures (1-4) which cover the demands set by the European Union for the implementation of CLI. These two service groups may also need call-by-call access and consequently an accessing mechanism which utilises numbering resources either from outside or inside national numbering plans. The other services mentioned above (5,6) are considered as services which are applied according to subscription. No numbering solution is needed.

¹⁶ ETSI prETS 300 648 Public Switched Telephone Network (PSTN); Calling Line Identification Presentation (CLIP) supplementary service; service description and ETSI prETS 300 649 Public Switched Telephone Network (PSTN); Calling Line Identification Restriction (CLIR) supplementary service; Service description February 1996

¹⁷ ETSI NA1 (94) 06 Comprehensive List of supplementary services. Date: 2 March 1995

¹⁸ ETSI ETS 300 089, January 1992

¹⁹ ETSI ETS 300 090, January 1992

²⁰ ETSI ETS 300 094, January 1992

²¹ ETSI ETS 300 095, January 1992

²² ITU-T I.251.9 COM 1-R 43, p.3

²³ ITU-T I.251.10, COM 1-R 43, p.9

5.3.1 - Calling Line Identification Presentation (CLIP)

The Calling Line Identification Presentation (CLIP) provides the called party with the possibility of receiving identification of the calling party. If CLIP is prevented by the calling party, the call will be delivered correctly without the presentation of the CLI.

Activation/deactivation of CLIP

ETSI standard²⁴ states that the service is to be activated and deactivated by the service provider. The ETSI Draft prETS on "Minimum man-machine interface for access and control of supplementary services"²⁵ has reserved service code 30 for the activation/deactivation of CLIP. However, it seems that the code has not been used in the network so far.

Number format of CLIP

As regards the number format for CLI number supplied to the called party, three alternatives exist, depending on where the call originates from.

1. The **international** format is used if the call is originating from abroad. The full international number with the international prefix is displayed to the terminal of the called party. This allows the number to be used for direct calling back.
2. The **national** format is used if the call originates from the same country. The national number along with the national prefix (if needed) is displayed for calling back purposes.
3. The **local** numbering format is presented, if the call is a local call in the same numbering area.

Prefixes

Prefixes are not transferred through networks; they have to be inserted by the called party's exchange. In a competitive environment with several long distance and international carriers some problems may exist in inserting the appropriate prefix.

Table 5.1 shows the three CLIP formats combined with the three possible call types.

Call Type→ CLIP number format↓	local call*	national call	international call
local number*	yes	not applicable**	not applicable**
national number	restrictions	yes	not applicable**
international number	restrictions	restrictions	yes

* not possible in countries with closed numbering scheme

** only a part of the necessary number can be displayed

Table 5.1 Number format for CLIP under different call procedures

As indicated in the table, the CLIP for a local call could also be a national or international number. Does this make sense, or is it better to have different presentations for each type of call? In order to be able to

²⁴ ETSI ETS 300 089, January 1992

²⁵ Draft prETS 300 738: Human Factors (HF): Minimum man-machine interface (MMI) to public network based supplementary services June 1996

make a call by using the number presented, an indication of what type of call is involved it might be useful to users. In the signalling system, a field is used to indicate if it is a national or an international call. This means that all the presentations are possible in ISDN networks, but are all formats user-friendly? If the call is originating in the local area why use the national or international format? The user might be confused about the price of the call.

The present networks do not necessarily allow the national or international format for local calls. For example the dialling of national or international numbers for a local call may be prohibited and correspondingly, the dialling of an international number for a national call may be prohibited.

What number has to be presented as a CLI number?

Normally, CLI identifies the telephone number of the calling line. This number is usually the network address of the calling subscriber. With IN technology, the telephone number of a subscriber can be a personal number, different to that of the network address. The number required for call-back services is not necessarily the same as the number required for unambiguous identification which is needed for example in the case of subscriber billing or for emergency services. In practice, several unsolved problems exist with regard to the transfer of CLI, due to differences in exchange systems, PBXs, PBX numbers, call-forwarded numbers, personal numbers etc. These problems are not dealt with in this study.

Examples of CLI problem areas:

An employee working away from his main office may prefer to direct incoming calls to his main office rather than to his home number.

When calling patients from home, doctors might not wish to reveal their home number. They could opt to use their surgery's telephone number.

A company which is making telephone sales business may want to have a Premium Rate Number displayed to the called party.

5.3.2 - Calling Line Identification Restriction (CLIR)

The Calling Line Identification Restriction (CLIR) enables the calling party to prevent presentation of its ISDN number to the called party. ETSI has reserved service code 31 for the purpose of CLIR. Two alternatives for CLIR are identified:

1. On a permanent basis. In this case the caller may ask the telephone operator not to present a number on a permanent basis on all his/her calls.
2. On a call-by-call basis. In this case the caller may restrict the presentation of his/her CLI on a call-by-call basis by dialling a specific prefix before dialling the telephone number.

The alternative of restricting CLI on a permanent basis would appear to be easy to implement - no major technical problems have been found. However, according to the proposal of the European Union, the called party may have the right "to reject incoming calls where the presentation of the calling line identification has been eliminated by the calling user or subscriber". This procedure is also known as block blocking. In this case no connection will be established. The implementation of block blocking involves some technical problems. A clear distinction needs to be made between calls where CLI is restricted by the caller and calls where it is technically impossible to obtain CLI, e.g. in the case of a call originating from a network which is not capable of sending CLI.

Problems of CLIR are mainly related to administrative issues and to the launch of the service. The following questions have been asked: Should the subscriber line be defined as permanently restricted when launching the service? How to handle secret numbers? Should they automatically be defined as permanently restricted? Answers to these questions are out of scope of this study.

5.3.3 - Connected Line Identification Presentation (COLP)

The Connected Line Identification Presentation (COLP) provides the calling party with the possibility to receive identification of the connected party. COLP is a similar service to CLIP, the only difference is that while in CLIP the identification information is transferred from the calling party to called party, in COLP the information is transferred from the connected party to calling party. ETSI has reserved the service code 76 for Connected Line Identification Presentation.

5.3.4 - Connected Line Identification Restriction (COLR)

The Connected Line Identification Restriction (COLR) enables the connected party to prevent presentation of its ISDN number to the calling party. When the call is transferred, the identification information related to the transferred call is not necessarily the same as the information used by the caller to establish a call. The called party has the possibility to activate/deactivate COLR. This mechanism may not be based on call-by-call activation/deactivation because when a call has been received, activation/deactivation is too late. The activation/deactivation may be based on a permanent subscription or on user actions utilising supplementary services of the network. ETSI has reserved the service code 77 for Connected Line Identification Restriction.

5.4 - Standardisation of Identification Services in ETSI and ITU-T

The following recommendations and standards exist for Information Services:

- CEPT:** A CEPT Recommendation T/SF 2 (T/CAC 02) (Subscriber control procedures for supplementary services in modern telecommunications system, 1991) and T/CAC S 10 (Services and facilities aspects of an integrated Services Digital Network (ISDN)) are dealing with CLI issues.
- ETSI:** Standards for ISDN supplementary services could be found in the ETSI ETS 300 xxx series.
- ITU-T:** ITU-T Recommendations I.251.x cover ISDN supplementary services on a global level.

5.5 - Which environment supports Identification Services?

The technical problems involved in introducing CLI into the network relate on the one hand to network technology and on the other hand to terminal equipment technology. How CLI is supported by fixed and mobile networks and terminal equipment is dealt with in more detail in the following.

5.5.1 - Fixed networks

The European fixed telephone networks are based on

- 1) ISDN technology supporting CLI,
- 2) non-ISDN technology (digital and analogue) with supporting CLI and
- 3) non-ISDN technology which does not support CLI.

The development of current networks and services towards ISDN networks is based on the use of digital SPC technology. The degree of digitalisation of networks varies from country to country. At the end of 1994 in western Europe the digitalisation degree of local exchange was 65.2% and lines with direct international dialling 100 % while in Central and Eastern Europe the degree of digitalisation was 17.4 % and lines with direct international dialling 75.8 %. In the former Soviet Union the digitalisation degree

was 11.3 %²⁶. In western Europe, ISDN penetration in 1995 was less than 1%. However, all new exchanges to be purchased today are based on digital technology. The digitalisation degree of telephone networks will grow rapidly when the old technology is replaced by the new one. At the same time ISDN capability is growing yearly by approximately 40%.

²⁶ Communications Week International: Alcatel statistics 95

The following conclusions can be made:

1. The majority of European exchanges support CLI. Approximately 30% of European subscriber lines are not able to obtain CLI. The number of exchanges not supporting CLI decreases rapidly when the old technology is replaced with the new one
2. There are still a great number of technical problems related to the practical implementation of CLI
3. CLI is defined in ETSI standards
4. For non-ISDN networks supporting CLI, national standards are applied in some European countries. These standards are based to a large degree on CEPT recommendations.

5.5.2 - Mobile networks

Mobile networks differ from fixed networks in many ways. Mobile networks are usually numbered by utilising full national numbers - for this reason it is easier to define the CLIP number format for these networks than for fixed networks. Mobile networks are based on SPC technology and * and # are usable both in the networks and terminal equipment. CLI definitions are included in GSM standards. In NMT (Nordic Mobile Telephone) networks CLIP/CLIR are only possible in the direction from mobile network to other networks and not for incoming NMT calls. In NMT networks CLI information cannot be transferred to NMT terminal equipment.

Mobile networks are closely connected to fixed networks and the rules and procedures defined for CLIP/CLIR and COLP/COLR in fixed networks should also be applicable to mobile networks.

5.5.3 - Terminal equipment

Due to the old terminal equipment technology, it can be estimated that about 2/3 of terminals in CEPT countries cannot utilise * and # DTMF signalling. Although there is a growing market for additional display equipment, a very small amount of new terminal equipment is equipped with displays able to show CLI numbers.

5.6 - Situation in European countries

Annex 6 shows examples of CLI implementation in some European countries. Some countries are using standardised service codes from outside of the national numbering plan according to ETSI standards, some only codes form national numbering resources, some both ETSI standards and national resources.

CLI Presentation

As regards the number format of CLIP, In Germany, the UK, and Sweden only the national format is used adding the national prefix in front of the number. In Finland the international format is also specified.

In NMT networks CLI is in use but the network is unable to send CLI to the NMT terminal.

CLI Restriction

Fixed networks:

As regards the **permanent suppressing** of CLI, the procedures in the countries studied seem to be unified. In Germany, the UK, Sweden, Finland and Denmark suppression is made by subscription.

As regards a **per-call suppression**, dialling procedures *31#, #31# and *31* and codes from numbering resources are used to activate CLIR. In Germany CLIR is not possible on a call-by-call basis. In the UK a prefix 141 is used for CLIR. In Sweden and Finland *31# and in Denmark *31* is used in ISDN and non-ISDN SPC networks. Denmark uses also prefix 1831 for CLIR in addition to *31* when no * and # are available in the terminal equipment. In the Netherlands CLI

service is not yet available, but *31* (or 131) has been reserved to activate CLIR on a call by call basis and #31* (or 132) has been reserved for the deactivation of an per line CLIR service.

In some countries, operators have applied the service for the fixed network in the following way:

1. If the presentation of the CLI is allowed on a permanent basis, CLIR can be activated on a per-call basis by dialling the code *31# in front of the number.
2. If the presentation of the CLI is permanently suppressed, CLIR can be deactivated on a per-call basis by dialling the same code *31#.

This procedure may cause confusion if the user does not know whether the presentation of CLI is permanently suppressed or not.

Mobile networks:

In NMT networks the caller can restrict the presentation of the CLI by dialling *31*# in front of the number.

In GSM networks three different CLIR cases have to be distinguished:

1. Permanent CLIR: The presentation of the CLI is permanently restricted (per line). A presentation on a per call basis is not possible.
2. Temporary restricted: The presentation of the CLI is always restricted (per line), except when dialling *31# in front of the number (call by call).
3. Temporary allowed: The CLI will be always presented (per line), except when dialling #31# (call by call) in front of the number.

In spite of that the fact that a standard exists on CLIR activation, it seems that the selected *and # procedures are different in different countries and in different fixed and mobile networks. They are not harmonised which might involve user confusion and might be the reason for the extremely low use of supplementary service. A question may be asked as to whether the standard for the CLIR is clear enough and free from misinterpretations. ETSI should study reasons for the ambiguity in implementations of CLIR standard format and revise the standards if deemed necessary.

34. ETO considers it highly important that * and # dialling procedures for CLI activation/deactivation should be unambiguous and that they are used in the same manner in all public networks, fixed and mobile, in every CEPT country

35. ETSI should study reasons for the ambiguity in implementing CLIR procedures and revise standards if deemed appropriate

5.7 - Current situation with respect to European Union demands

In article 8 of a common position by the Council²⁷ the demand for the "Presentation and restriction of calling and connected line identification" were specified (Annex 8). According to this specification, the following issues should be available:

1. a per-call and per-line elimination of the CLI
2. the possibility for the called subscriber to prevent the presentation of the CLI of incoming

²⁷ Common position by the Council on "Modified proposal for a Directive of the European Parliament and of the Council concerning the processing of personal data and protection of privacy in the telecommunications sector, in particular in the integrated Services Digital Network (ISDN) and in the digital mobile networks (former COM(94) 128 final-COD 288); Brussels, 3 July 1996.

- calls
3. the possibility for the called subscriber to reject incoming calls where the presentation of the calling line identification has been eliminated by the calling user or subscriber
 4. the possibility for the called subscriber to eliminate the presentation of the connected line identification to the calling subscriber

5.8 - Conclusions and Recommendations

Number format of CLIP

Call-back facilities are considered in this study as highly important and user-friendly. To help the called party to call the calling party back, the number supplied to the called party should carry exactly the same format which the called party uses when dialling the number of the calling party. This would guarantee a full functionality of the service. This means that for local calls, numbers should be in the local dialling format, for national calls the number should be in the national dialling and for international calls the number should be in the international dialling format. For calls originating from mobile phones the CLI number should be exactly the same format as that which the called party uses when dialling the number of the mobile subscriber. In order to facilitate user-friendly dialling throughout Europe (easy recognition of the number independent of the country), this principle of CLIP should be applied in every European public network, fixed and mobile.

Recommendation 6

The number format of the CLI displayed to the called party should be exactly the same as the one which the called party uses when calling the calling party

The number presented as a CLI number

As mentioned in point 5.3 there are several problems involved with implementing CLI. Which numbers should be defined as CLI number? Should the user have some say in defining his CLI number? The problems are partly technical, related to different network technology and PBXs, partly a matter of principle, related to the use of the CLI number, particularly in a competitive network environment and IN services.

Further technical studies on this issue are needed before any proposals or guidelines can be given.

Harmonised dialling procedure

Harmonisation of numbers is related to user-friendly numbering. However, benefits of harmonisation have to be in line with harmonisation costs. CLI issues relate to sensitive issues of privacy and data protection. Harmonisation of CLIR activation and deactivation procedures is considered here important and it can be easily achieved by the ETSI standards on CLI. Number changes to present telephone networks or comprehensive investments in the network are not needed. Taking into account the fact that the use of * and # and the DTMF dialling is growing very fast, ETO proposes ETSI standard to be used for harmonised CLIR activation/deactivation throughout Europe.

However, ETSI standards are based on the use of * and # signs and DTMF dialling of terminal equipment. About 2/3 of all European subscribers are unable to utilise these procedures. In order to serve subscribers which have no * and # signs and DTMF dialling in their equipment, an alternative solution using numbering resources should be available. ETO considers the use of numbering resources for CLIR activation/deactivation highly important but only an intermediate step and no harmonisation of these numbers is needed on a European level.

Codes for CLIR activation/deactivation

In order to facilitate effective, reliable, unambiguous and user-friendly procedures for CLIR activation/deactivation, the procedures defined for CLIR should be applicable in all European fixed and mobile networks which enable CLI and the use of * and #.

ETSI has reserved service code 31 for the activation of CLIR combined with * and # as a prefix in front of the dialled number. This service code has already been implemented in some countries and there seem to be no major technical difficulties involved in implementing this code. A standard exists and no new one is required. However, the implemented dialling procedures using * and # differ from country to country and from fixed network to mobile networks. ETSI should urgently study why so many different interpretations of the standard exist and revise the standard if deemed appropriate.

ETO makes the following recommendations:

Recommendation 7

ETSI standard ETS 300738 (not adopted yet) using * and # dialling procedures should be applied for harmonised CLIR activation/deactivation in all CEPT countries in all public networks enabling the CLI and the use of * and # dialling procedure

Recommendation 8

For networks and terminal equipment which cannot utilise * and # dialling, an alternative solution using national numbering resources for CLIR activation/deactivation should parallelly be implemented in all CEPT countries. The decision to reserve and use these codes in national networks should be a national matter. There is no need for European harmonisation of these codes.

Recommendation 9

Codes for activating and deactivating CLIR (whether reserved from national resources or using ETSI standard procedures with * and #) should be unambiguous and mean the same function in all networks, fixed and mobile and in all circumstances.

Recommendation 10

ETSI should urgently study reasons for different usage of * and # procedures for CLI activation/deactivation and revise the standard if deemed appropriate.

Harmonisation of COLP/COLR within Europe

Connected Line Identification Presentation can be applied in accordance with the ETSI Standard ETS 300 094. As regards the activation of Connected Line Identification Restriction, it can be activated the subscription of the called party in accordance with the ETSI standard ETS 300 095.

CHAPTER 6 - SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

6.1 - User-friendliness in numbering

CONCLUSIONS AND RECOMMENDATIONS WITH REGARD TO THE STRUCTURE OF NUMBERING SCHEMES:

CONCLUSIONS

1. User-friendly numbering is a key to effective telecommunications on a national and European level
2. Logical and structured numbering schemes are a prerequisite of user-friendly numbering both on a national and European level
3. The stability of national schemes can only be guaranteed if these schemes, in addition to the national needs, also take into account the needs of Europe

RECOMMENDATIONS

1. National numbering schemes that do not fulfil the present demands of number capacity and open numbering conditions, should be reviewed and modified as soon as possible in a way that guarantees capacity, openness and user-friendly numbering in the long term
2. However, comprehensive numbering changes in national numbering schemes should be delayed, where possible, until the common guidelines on revising numbering schemes and the European numbering strategy has been defined by the end of 97
3. Common guidelines on revising numbering schemes and the European numbering strategy should be defined as soon as possible in order to enable European countries to plan their national schemes and guarantee long term stability of national schemes.

CONCLUSIONS AND RECOMMENDATIONS WITH REGARD TO THE USER-FRIENDLINESS OF INDIVIDUAL NUMBERS

CONCLUSIONS

4. The following numbering principles should be supported:

Numbering logic

- The use of market oriented numbering logic
- The use of tariff oriented numbering logic

The use of Service Access Codes (SACs)

- NRAs should reserve a set of SACs for present and future national use (e.g. freephone, shared cost, shared revenue, personal numbers, spare codes for future services etc.)

Short numbers

- Short numbers waste numbering capacity
- Short numbers should be used very carefully under strict control by NRAs
- 3 and 4 digit short numbers should be used only in very limited cases
- 5 digit short numbers should be used for national "golden" numbers
- NRAs should reserve a set of short numbers for future national use (like already reserved for emergency services, 112)

"Sounding" and "Image" numbers

- Sounding and image numbers are user-friendly numbers
- Subscribers should have some say in selecting numbers in accordance with rules as defined by the NRA

European harmonisation

- European harmonisation should be supported but only with careful consideration of which numbers should be harmonised. Further study is needed

Geographical numbers

- Geographical numbers should be retained as far as possible.

Non-geographical numbers

- Non-geographical numbers should be clearly distinguished from geographical numbers

Number portability

- For geographical numbers number portability should be allowed as long as geographical information defined by the public numbering plan is preserved
- Full portability (geographical, operator) should only be made available with non-geographical numbers

RECOMMENDATIONS

4. When numbering services, market and tariff oriented numbering logic using Service Access Codes should be preferred instead of short numbers

6.2 - Alphanumeric dialling

CONCLUSIONS

5. There is a clear market demand for alphanumeric dialling
6. At the moment, use of alphanumeric dialling causes confusion and misdialling. It should not be recommended at present.
7. The changing of existing keypads is not advisable at this point of time.
8. The standard for alphanumeric dialling is ITU-T Rec. E.161, option A. There is no need for any new standard. The use of E.161 Option A should highly encouraged and it should be applied globally.

RECOMMENDATIONS

5. Mechanisms should be created to support the implementation of ITU-T Rec. E.161 Option A. These mechanisms could be:
 1. Direct contacts from CEU and ECTRA to European manufacturing industry
 2. Direct contacts from NRAs to national manufacturing industry
 3. Direct contacts from CEU and ECTRA to European equipment resellers to procure only E.161 Option A compatible terminal equipment
 4. Direct contacts from NRAs to national resellers to procure only E.161 Option A compatible terminal equipment
 5. standardisation of alphanumeric dialling at a national level

6.3 - Code allocation and numbering of Calling Line Identification (CLI)

RECOMMENDATIONS

6. The number format of the CLI displayed to the called party should be exactly the same as the one which the called party uses when calling the calling party
7. ETSI standard ETS 300738 (not adopted yet) using * and # dialling procedures should be applied for harmonised CLIR activation/deactivation in all CEPT countries in all public networks enabling the CLI and the use of * and # dialling procedure
8. For networks and terminal equipment which cannot utilise * and # dialling, an alternative solution using national numbering resources for CLIR activation/deactivation should be parallelly implemented in all CEPT countries. The decision to reserve and use these codes in national networks should be a national matter. There is no need for European harmonisation of these codes.
9. Codes for activating and deactivating CLIR (whether reserved from national resources or using ETSI standard procedures with * and #) should be unambiguous and mean the same function in all networks, fixed and mobile and in all circumstances.
10. ETSI should urgently study reasons for different usage of * and # procedures for CLI activation/deactivation and revise the standard if deemed appropriate.

ANNEXES

Annex 1 - Work requirement

ANNEX 1
Work Requirement No.

1. Subject: Numbering related to the topic of user-friendliness

2. Purpose

The work order covers the work that the European Telecommunications Office (ETO) will conduct on behalf of the European Commission in the important area of numbering of telecommunications services. This Annex focuses on the topic of user-friendliness of dialling and access arrangements

3. Justification

The issue of numbering at the European level was addressed in the "Council Resolution on the promotion of Europe-wide co-operation on numbering of telecommunications services" (92/C 318/02; 19 November 1992)

The Council of Ministers adopted on the 22 July 1993 a Council Resolution on the review of the situation in the Telecommunications sector. The Council Resolution sets the future agenda for the further liberalisation of public voice telephony.

User-friendly numbering for access to other users or to services is important to subscribers. Moreover, user-friendly numbering is also important to operators and to service providers to ensure usage of the network and services.

To ensure that complexity of numbering and dialling arrangements does not hinder the take-up of services and use of the network, investigation is required into how user-friendly numbering can be maintained and promoted in a dynamic environment.

4. Work requirement

(1) to examine aspects of user-friendliness and its effects to numbering. To make proposals how user-friendliness of numbering schemes can be promoted for example by dialling arrangements, memorability, stability of numbering schemes, harmonisation of service codes, use of short codes, market, sector or tariff orientation of numbering logic and portability of numbers.

(2) to examine the issue of alphanumeric dialling and opportunities for keypad harmonisation and to make proposals for keypad harmonisation if found appropriate

(3) to examine code allocations and numbering arrangements arising by the implementation of Calling Line Identification (CLI) facilities into the network. To make proposals for harmonisation of CLI numbering procedures and codes

5. Execution

The work on these issues shall be made in close co-operation with the CEC, the ECTRA PT on Numbering and the European Numbering Forum (ENF). The final report shall be delivered to the CEC not later than 1 September 1996.

6. Deliverables

Two interim reports and one final report shall be delivered.

The first interim report shall be delivered during the course of the work, containing the different aspects of 1) user friendliness, 2) issues concerning alphanumeric dialling and 3) numbering aspects of Calling Line Identification. The first interim report will be delivered approximately 1 June 1995.

The second interim report shall contain findings and proposals and it shall be delivered approximately 1 January 1996. The report shall be submitted to CEPT/ECTRA for information and comments.

The final report shall contain the findings and proposals, as approved by CEPT/ECTRA and will include any comments individual CEPT/ECTRA members have on these issues in their respective national regimes. The final report shall be delivered to the CEC not later than 1 September 1996.

All reports shall be made available in draft form one month before a liaison meeting between the CEC and the ETO discusses the results and approval can be given for their release.

The Commission shall receive three copies of the interim reports, while the approved final report shall be made available in 15 bound copies, one unbound copy and one copy on floppy disk in Word for Windows V2.0 format. Graphics shall be made available on separate hard copies.

7. Manpower

It is expected that this work can be accomplished in 6 manmonths of effort at expert level including subcontracting.

8. Subcontracting

Subcontracts may be given to external experts for the execution of the parts of this contract, representing 1 manmonth

Annex 2 - List of abbreviations

CC	Country Code
CEPT	European Conference of Postal and Telecommunications Administrations
CERP	European Committee on Postal Regulation
CEU	Commission of the European Union
CLI	Calling Line Identification
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CN	Corporate Network
CNIP	Calling Name Identification Presentation
CNIR	Calling Name Identification Restriction
COLP	Connected Line Identification Presentation
COLR	Connected Line Identification Restriction
CTM	Cordless Terminal Mobility
DCS 1800	Digital Communications System, 1800 MHz
DTMF	Dual Tone Multi Frequency
ECMA	Standardizing Information and Communication Systems
ECTEL	The European Telecommunications and Professional Electronic Industry
ECTRA	European Committee for Telecommunications Regulatory Affairs
ECTRA PTN	ECTRA Project Team on Numbering
ECTUA	European Council of Telecommunications Users Association
EIG	European Interest Group
EIIA	European Information Industry Association
ENF	European Numbering Forum
ERC	European Radiocommunications Committee
ERO	European Radiocommunications Office
ETNO	European Public Telecommunications Network Operators' Association
ETNS	European Telephony Numbering Space
ETO	European Telecommunications Office
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
ETSI STC NA2	ETSI Sub Technical Committee Network Aspects 2
EU	European Union
FPLMTS	Future Public Land Mobile Telecommunications System
GSM	Global System for Mobile Communications
IEC	The International Electrotechnical Commission
IN	Intelligent Network
INTUG	International Telecommunications Users Group
ISDN	Integrated Services Digital Network
ISO	The International Organisation for Standardization
ITU	International Telecommunication Union
ITU-T	Telecommunication Standardization Sector of ITU
MoU	Memorandum of Understanding
NANP	North American Numbering Plan

NDC	National Destination Code
NMT	Nordic MobileTelephone
NRA	National Regulatory Authority
N(S)N	National (Significant) Number
OFTEL	Office of Telecommunications (UK)
SAC	Service Access Code
SN	Subscriber Number
SPC	Stored Program Control
UMTS	Universal Mobile Telecommunications System
UPT	Universal Personal Telecommunications
VPN	Virtual Private Network

Annex 3 - Dialling examples of existing short numbers

Using N(S)N (NDC+SN) field:

Germany:	01144	Telekom service
	01188	National Directory Service
	00118	International Directory Service
Denmark:	113	International Directory
(no trunk prefix)	152	Sport news
	155	Speaking clock

Using SN field:

In several countries:	112	European Emergency Number
	118	Number for directory services
In Belgium:	1229	Operator Assistance nat., Dutch
	1329	Operator Assistance nat., French
	1429	Operator Assistance nat., German
	1224	Operator Assistance int., Dutch
	1324	Operator Assistance int., French
	1424	Operator Assistance int., German
In Czech Republic:	112	recorded time
	116	weather forecast
In the UK:	100	Assistance Operator
	123	Speaking Clock
	153	International Directory
	155	International Assistance
	192	National Directory
In Finland:	10022	Police emergency number
In Hungary	04	Ambulance
(trunk prefix 06)	05	Fire
	07	Police
In France	12	National Directory Service
	15	Public medical services
	17	Police number
	18	Fire alarm number
	36XX	Short numbers
	52XX	Short numbers

Example of dialling of
an international "long/short"
number :

00 670 1755

00 = international prefix
670 = Country Code of Northern
Mariana Islands
1755 = Service number

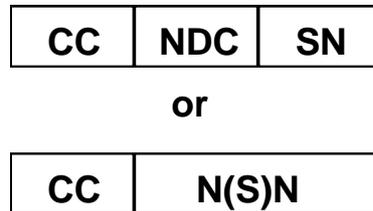
Annex 4 - Number format and number capacity

1 - Number structure and available number capacity

Before studying the implications that user-friendly numbering may have on numbering schemes, we should study the structure of a number and its available capacity in more detail.

1.1 - Number structure

The format of the international telephone number (E.164) is presented in figure 1.1.



where

CC = Country Code;

NDC = National Destination Code;

SN = Subscriber Number

N(S)N = National (Significant) Number (=NDC+SN)

Figure 1.1. Format of the international telephone number

On a national level numbers can be used for services in two ways:

- Using National (Significant) Number for services

To access the service nationally, a subscriber usually has to dial the trunk prefix and full national number. Service numbers are unambiguous throughout the country.

- Using a local subscriber number SN for services

To access the service from the same numbering area, a subscriber has only to dial the Subscriber Number of that service. To access this service from another numbering area, the subscriber has to dial the trunk prefix, the national destination code and the Subscriber Number SN. The Subscriber Number is not necessarily unambiguous in different numbering areas.

However, an SN could be used nationally for the same service (refer to emergency number 112) if the Subscriber Number of that service is harmonised within the country to denote the same service in all of the numbering areas.

These alternatives differ from the capacity point of view and they are studied here in more detail. This study is based on the maximum 12 digit length of an international number, well known that it will be expanded to 15 digits at the beginning of 1997.

This study is based on the maximum 12 digit length of an international number.

1.2 - Number capacity using National (Significant) Numbers for services

A National (Significant) Number is used to number subscribers and services within a country, figure 1.2.

CC	N(S)N	
CC	NDC	SN

Figure 1.2. Using National (Significant) Numbers to number services

An N(S)N usually consists of an NDC (National Destination Code) and a Subscriber Number (SN). In countries with several numbering areas, the NDC usually addresses the geographical or non-geographical numbering area. In addition to numbering geographical or non-geographical subscribers, the NDC can also be used to address national or international services. Within the country, the trunk prefix²⁸ is used to address an NDC. In the national dialling plan the first digit of the NDC (following the trunk prefix) is used as follows:

- Digit 0 usually used as an international prefix to access international networks
- Digit 1 to 9 used for numbering of National Destination Codes

An N(S)N can be used for the numbering of services of national or international nature. The N(S)N is an unambiguous number within the country. Total theoretical numbering capacity of N(S)N depends on the length of the Country Code. In countries with a 2 digit CC the maximum theoretical capacity is 10 000 million individual numbers and in countries with a 3 digit CC 1000 million numbers. It should be noted that only a portion of the N(S)N capacity can be used for service numbering, the main part of the capacity will be used for subscriber numbering.. Possible international prefix (0) takes already 10% of the total capacity

In countries of 2 or 3 digit CC, the total theoretical number capacity of N(S)N resources are between 1000 million and 10 000 million individual numbers. The N(S)N is an unambiguous number within the country.

1.3 - Number capacity using Subscriber Number (SN) for services

SNs are used to number both subscribers and services within an NDC (figure 1.3):

CC	NDC	SN
-----------	------------	-----------

Figure 1.3. The use of SNs for service numbering

In the dialling plan the first dialled digit of the SN is used as follows:

²⁸ Some countries e.g. Denmark and Norway use only one numbering area and the trunk prefix is not used

Digit 0	usually used as a trunk prefix ²⁹ for accessing other numbering areas
Digit 1 to 9	usually used as a first digit of local subscriber number or service number

A trunk prefix is not necessarily needed in local calls within the numbering area (within NDC). The Subscriber Number dialled directly accesses the subscriber or service.

The service may be a local one. In this case the service can only be accessed from the local area by dialling the Subscriber Number only. The service can also be accessed from other numbering areas by dialling the trunk prefix, NDC and the SN. The service number is not necessarily unambiguous in every geographical numbering area.

The service can also be a national service or an international one . In this case dialling the Subscriber Number will route the call to the service. The service may not necessarily be reached by dialling the trunk prefix, NDC and SN. When a number is used for national or international services, the number must be unambiguous in every geographical numbering area within the country and must route the call to the same service, whether it be a national or international one.

Example: the European emergency call number 112 has to be routed in all numbering areas to emergency service centres. In one numbering area several emergency centres may exist. One specific service centre in one numbering area cannot necessarily be individually reached from other numbering areas by dialling the area code and then 112.

The total numbering capacity of an SN field depends on the length of the subscriber number. If the maximum subscriber number length is 9 digits, the maximum theoretical capacity is then 1000 million individual numbers in every numbering area. It should be noted that only a portion of the SN capacity can be used for services, the main part is used for subscriber numbering.

The total theoretical maximum number capacity for an SN is 1000 million individual numbers, usually less than that. SN is not necessarily an unambiguous number.

1.4 - Implications of short numbers / service access codes in numbering schemes

As defined in this study a short number is defined as a number which, when dialled, directly accesses a specific service. The length of a short number is defined as a number with a maximum of 5 dialled digits, not including the possible trunk prefix.

In this study Service Access Code is defined as a code indicating the type of service involved. The actual service number includes the Service Access Code in front of the number, followed by the digits indicating the individual service. The Service Access Code only identifies the type of involved service, and not the individual service itself.

SAC	XXXXX...X
------------	------------------

SAC = denotes the Service Access Code, identifying the service type (e.g. premium rate, for example 0900)
 XXXXX...X = denotes the individual service number

²⁹ Some countries e.g. Denmark and Norway use only one numbering area and the trunk prefix is not used

Figure 1.4. The Service Access Code as a part of the service number

1.4.1 - Short numbers / access codes and number capacity

Short numbers "waste" a much larger number capacity than long numbers. This is due to the fact that the individual numbers behind a short number cannot be used for other purposes. For example the use of the European emergency call number 112 implies that numbers behind 112 (112 XX XXX; up to 0.1 million individual numbers) are unusable in every NDC, presuming a number length of 8 digits.

The demand for short numbers will probably increase in the future. To avoid exhausting number capacity, the use of short numbers should be limited in one way or another. This implies the following questions:

- what is the minimum length of a short number?
- what services should be allocated for short numbers?
 - * non-commercial services?
 - * commercial services?
 - * services of public importance only?
 - * services concerning the operation of telecommunications infrastructure and services that are common to all competitive operators?
- what are the criteria for short number allocation?
 - * density of calls?
 - * importance for the community?

An example of a non-commercial service of public importance is the European emergency call number 112. It will be implemented in all EU countries by the end of 1996 at the very latest. From the competition point of view there does not seem to have been any major difficulties involved in allocating the code. The emergency services are usually public in nature and managed by public organisations. The service is usually financed by public resources.

What happens if the numbers, and the services behind the numbers gain some commercial value and enter into free competition?

- is it possible to allocate short numbers to competitors?
- what is the appropriate length of a short number?
- if short numbers are allocated to different competitors, will capacity eventually be exhausted?

Short numbers/codes could be allocated for commercial and non-commercial use. For example short numbers/codes with 3,4 or even 5 digits could be allocated for non-commercial use in the first place. Other short codes (like 0800 for freephone) could be for commercial use. The assignment criteria for short numbers may be a complicated matter. To non-commercial use (like emergency services) could apply criteria like societal importance and number of calls to the service. To commercial use criteria could apply like number of calls to the service and price to be paid for the number.

It seems clear that short numbers are a scarce resource and some regulatory measures are needed in allocation of this resource. In the following we try to find answers presented above by analysing the resource related to short numbers.

1.4.1.1 - Short numbers / access codes using National (Significant) Number

If an N(S)N is used for short numbers/codes, the length of a short number/code can be specified as being between 1 digit and several digits. The amount of 1) available short numbers/codes and 2) unusable capacity of individual numbers behind each short number and 3) capacity of individual numbers behind each service access codes is presented in table 1.5 in relation to the length of a Country Code.

length of the short number/ service access code	number of available short numbers/SACs		unusable capacity of individual numbers behind each short number/number capacity behind each service access code		
	total amount	if 10% for services	CC 1 digit	CC 2 digits	CC 3 digits
trunk prefix + 1 digit	9 ³⁰	1	10 000 000 000	1 000 000 000	100 000 000
trunk prefix + 2 digits	90	9	1 000 000 000	100 000 000	10 000 000
trunk prefix + 3 digits	900	90	100 000 000	10 000 000	1 000 000
trunk prefix + 4 digits	9 000	900	10 000 000	1 000 000	100 000
trunk prefix + 5 digits	90 000	9000	1 000 000	100 000	10 000
trunk prefix + 6 digits	900 000	90 000	100 000	10 000	1 000
trunk prefix + 7 digits	9 000 000	900 000	10 000	1 000	100
trunk prefix + 8 digits	90 000 000	9 000 000	1 000	100	10
trunk prefix + 9 digits	900 000 000	90 000 000	100	10	

Table 1.5 Number capacity using National (Significant) Number for services

Note:

- 1) The numbers in the shadowed area are not considered as short numbers.
- 2) As regards the amount of available short numbers/codes, only part of the total capacity can be allocated to services. If this part is 10%, the available capacity of blocks for service numbers is then 10% of the total capacity. The available amount of a short number of trunk prefix and 2 digits is then only 9, trunk prefix and 3 digits only 90, etc.

The issues related to the use of short numbers/codes can be evaluated under the following view points:

- 1) the length of a short number/code
- 2) number of available short numbers/codes
- 3) capacity of individual numbers that short numbers "waste" or make unusable within the national numbering scheme
- 4) capacity of individual service numbers behind the SAC

As regards "wasted" number capacity, using a trunk prefix and 1 digit short number, the capacity of unusable numbers is 100 million to 10 billion numbers per short number, depending on the length of the country code. Even with a trunk prefix and 4 digit short numbers, the capacity of unusable individual numbers is 100.000 to 10 million.

As regards capacity of individual service numbers behind each SAC, using a trunk prefix and 1 digit code, the maximum capacity for individual service numbers is 100 million to 10 billion numbers per one access code, depending on the length of the CC. Even a trunk prefix and 4 digit access code enables the capacity of 100.000 to 10 million individual numbers.

Assessment of the implications of short number/code length

1) The use of trunk prefix

The use of NDC+SN precludes the use of a trunk prefix in national calls. It automatically lengthens the number/code by one digit.

³⁰ digits from 1 to 9. Digit 0 is reserved for an international prefix.

2) Trunk Prefix + 1 digit number

Two dialled digits waste between 100 million and 10 billion individual Subscriber Numbers, depending on the length of the Country Code.

The amount of individual short numbers/codes is extremely limited. The total amount of available short numbers/codes is only 9, only a small portion of which can be allocated to services. The rest may remain for the numbering of subscribers.

Preferable use:

- for numbering of NDCs to be used for geographical numbers, non-geographical numbers, personal numbers, etc.

Not recommended:

- for numbering of individual commercial (e.g. freephone, premium rate type services) or non-commercial services (e.g. 112 type services)

3) Trunk Prefix + 2 digit number

Three dialled digits waste 10-1000 million individual Subscriber Numbers, depending on the length of the Country Code.

The amount of individual short numbers is very limited. The total amount of available short numbers is 90, only a small portion of which can be allocated to services. The rest may remain for the numbering of subscribers.

Preferable use:

- for numbering of NDCs to be used for geographical numbers, non-geographical numbers, personal numbers, etc.

Not recommended:

- for numbering of individual commercial or non-commercial services

4) Trunk Prefix + 3 digit number

Four dialled digits waste 1-100 million individual Subscriber Number, depending on the length of the Country Code.

The amount of individual short numbers is very limited. The total amount of available short numbers is 900, only a small part of which can be allocated to services. The rest may remain for the numbering of subscribers.

Preferable use:

- for numbering NDCs to be used for geographical numbers, non-geographical numbers, personal numbers, as access codes for commercial services, etc.
- for numbering of very limited number of individual non-commercial services as defined by the NRA

Not recommended:

- for numbering of individual commercial services

5) Trunk Prefix + 4 digit number

Five dialled digits waste 0,1-10 million individual Subscriber Numbers, depending on the length of the Country Code.

The amount of individual short numbers is limited. The total amount of available short numbers is 9000, only a small part of which can be allocated to services. The rest may

remain for numbering of subscribers. If 10% of the capacity is allocated for services it implies 900 short numbers for services

Preferable use:

- for numbering of NDCs to be used as access codes for commercial services
- for numbering of individual, non-commercial services

Not recommended:

- for numbering of individual commercial services

6) Trunk Prefix and 5 digit number

Six dialled digits do not involve any significant wastage of numbering capacity.

Depending on the maximum length of the Subscriber Number, each short number wastes 0.01-1 million individual Subscriber Numbers.

The total amount of available short numbers is 90 000 only a small part of which can be allocated to services. The rest may remain for the numbering of subscribers. If 10% of capacity is allocated to services it implies 9000 short numbers for services.

The use of the trunk prefix and five digit short numbers may offer a potential for national and international services. Some portion of the numbers could be offered for the numbering of competitive services.

Preferable use:

- for numbering of individual commercial services with rules defined by NRA.
These rules should limit the demand of numbers

Not recommended:

- for numbering of individual commercial services without any limitations

The assessment is summarised in the table below:

The length of the number	Wasted capacity	The total amount of short numbers / codes	Usability for services	
			Preferable use for numbering of	Not recommended for numbering of
TP + 1 digit	0,1 - 10 billion	9	- NDCs for geographical, non-geographical numbers, personal numbers, etc.	- individual commercial and non-commercial services
TP + 2 digits	10 - 1000 million	90	- NDCs for geographical, non-geographical numbers, personal numbers, etc.	- individual commercial and non-commercial services not to be used
TP + 3 digits	1-100 million	900	- NDCs for geographical, non-geographical numbers, personal numbers, access codes for commercial services etc.	- individual commercial and non-commercial services
TP + 4 digits	0,1-10 million	9 000	- NDCs for geographical, non-geographical numbers, access codes for commercial services, etc. - individual non-commercial services with rules defined by the NRA	- individual commercial services
TP + 5 digits	0,01-1 million	90 000	- individual commercial services with rules defined by the NRA	- individual commercial services without any rules

Table 1.6. Assessment of alternatives

Summary:

1. Short numbers waste number capacity very efficiently and they should be used very carefully. For numbering of services, instead of using short numbers, the use of access codes and individual numbers behind each access code should be preferred
2. Short numbers should not be used without any limitations for numbering of individual commercial services
3. First digits of N(S)N resources should be used for numbering of geographical or non-geographical NDCs in the country, including NDCs for personal numbers and access codes for national services.
4. Three first digits could be used for access codes for commercial services (e.g. 0800) as defined by the NRA
5. Four first digits could be used for numbering of individual non-commercial services as defined by the NRA (e.g. 0ABCD, where 0 is the trunk prefix and ABCD an individual non-commercial service)
6. The five first digits of an N(S)N could be used for numbering of limited amount of individual commercial services as defined by the NRA (e.g. 0BCDEF), with rules which limit the demand of such numbers (e.g. pricing etc.).

1.4.1.2 - Short numbers/codes using Subscriber Number (SN) for services

The analysis of SN resources is similar to that of NDC resources. However, some minor differences exist and that is why we repeat the analysis here.

If an SN is used as a short number/code, the length of a short number/code can be specified as being between 1 digit and several digits. The amount of 1) available short numbers/codes and 2) unusable capacity of individual numbers behind each short number and 3) capacity of individual numbers behind each service access code is presented in table 1.7 in relation to the length of a Subscriber Number (SN).

length of the short number / SAC	number of available short numbers /SACs in each NDC		unusable capacity of individual numbers behind each short number / capacity behind each SAC			
			SN 6 digits	SN 7 digits	SN 8 digits	SN 9 digits
1 digit	9 ³¹	1	100 000	1 000 000	10 000 000	100 000 000
2 digits	90	9	10 000	100 000	1 000 000	10 000 000
3 digits	900	90	1 000	10 000	100 000	1 000 000
4 digits	9 000	900	100	1 000	10 000	100 000
5 digits	90 000	9 000	10	100	1 000	10 000
6 digits	900 000	90 000		10	100	1 000
7 digits	9 000 000	900 000			10	100
8 digits	90 000 000	9 000 000				10
9 digits	900 000 000	90 000 000				

Table 1.7 Number capacity using local numbers for services

Note:

- 1) The numbers in the shadowed area are not considered as short numbers/codes.
- 2) As regards the amount of available short numbers/codes, only part of the total capacity can be allocated to services. If this part is 10%, the available capacity of service numbers is then 10% of the total capacity. According to table 1.7 the maximum amount of 1 digit short numbers/codes is 1, of 2 digit short numbers/codes only 9, the amount of

³¹ digits from 1 to 9. Digit 0 is reserved for a national prefix.

3 digit short numbers/codes is only 90 and the amount of 4 digit short numbers/codes is only 900 etc.

The issues related to short numbers can be evaluated under the following areas:

- 1) the length of a short number
- 2) number of available short numbers
- 3) capacity of individual numbers that short numbers "waste" or make unusable within the national numbering scheme
- 4) capacity of individual service numbers behind each SAC

As regards "wasted" number capacity, using 1 digit short numbers wastes between 0.10 and 100 million, 2 digit short numbers wastes between 0.01 and 10 million, 3 digit short numbers between 0.001 and 1 million and 4 digit short numbers between 0.1 and 100 thousand individual numbers depending of the length of the SN

As regards capacity of individual service numbers behind each SAC, 1 digit code enables the maximum capacity of 0.1 to 100 million individual numbers per one access code, depending on the length of the SN. A 4 digit access code enables the capacity of 100 to 100.000 individual numbers.

Assessment of implications of the length of a short number

1) A short number/code of 1 digit

The use of 1 digit short numbers wastes 0.1-100 million individual Subscriber Numbers, depending on the actual length of the Subscriber Number.

The amount of individual short numbers/codes is extremely limited. The total amount of available short numbers/codes is only 9, only a small part of which can be allocated to services. The rest may remain for the numbering of subscribers.

Preferable use:

- to identify from the first digit 1) subscriber numbers of different local operators,
- 2) trunk prefix and 3) access codes to services

Not recommended:

- for numbering of individual commercial or non-commercial services

2) A short number/code of 2 digits

The use of 2 digit short numbers wastes 0,01-10 million individual Subscriber Numbers, depending on the actual length of the Subscriber Number.

The number of individual short numbers is very limited. The total amount of available short numbers is only 90, only a small part of which can be allocated to services. The rest may remain for the numbering of subscribers.

Preferable use:

- to identify from the first two digits 1) subscriber numbers of different local operators or 2) access code to services

Not recommended:

- for numbering of individual commercial or non-commercial services

3) A short number/code of 3 digits

Three digit short numbers wastes 0,001-1 million individual Subscriber Number, depending the actual length of the Subscriber Number.

The number of individual short numbers/codes is limited. The total amount of available short numbers/codes is 900, only a small part of which can be allocated to services. The rest may remain for numbering of subscribers.

The use of 3 digit short numbers could be used to a limited amount of individual non-commercial services and access codes for commercial services. They should not be used for numbering of individual commercial services.

Preferable use:

- to identify from the first three digits 1) subscriber numbers of different local operators or 2) access codes for commercial services
- for numbering of very restricted number of individual, non-commercial services as defined by the NRA

Not recommended:

- for numbering of individual commercial services

4) A short number of 4 digits

Four digit short numbers waste 100-100.000 individual Subscriber Numbers, depending on the actual length of the Subscriber Number.

The amount of individual short numbers/codes is limited. The total amount of available short numbers/codes is 9000, only small a part of which can be allocated to services. The rest may remain for the numbering of subscribers. If 10% of the capacity is allocated for services it implies 900 short numbers/codes.

Four digit short numbers may offer some potential for numbering of services. However some concern exists about how these short numbers may be allocated for individual competitive services.

Preferable use:

- to identify from the first four digits 1) subscriber numbers of different local operators or 2) access codes for commercial services
- for numbering of individual, non-commercial services as defined by the NRA

Not recommended:

- for numbering of individual commercial

5) A short number of 5 digits

Five digit short numbers does not significantly waste numbering capacity. Depending on the length of the actual Subscriber Number, each 5 digit short number wastes 10-10.000 individual Subscriber Numbers.

The total amount of available short numbers/codes is 90 000, only a small part of which can be allocated to services. The rest may remain for the numbering of subscribers. If 10% of the capacity is allocated for services it implies 9000 short numbers/codes.

Five digit numbers may offer some potential for the numbering of different services. Some part of these numbers could be offered for competitive services. However some concern exists about how these short numbers may be allocated for a wide range of competitive services.

Preferable use:

- for numbering of individual commercial services as defined by the NRA

Not recommended:

- for numbering of individual commercial services without any limitations

The assessment is summarised in the table below:

The length of the number/SAC	Wasted capacity of a short number Number capacity behind each SAC	The total amount of short numbers / codes	Usability for services	
			Preferable use for numbering of	Not recommended for numbering of
1 digit	10 - 100 million	9	- to identify from the first number 1) subscribers of different local operators 2) trunk prefix 3) access codes for services	- individual commercial or non-commercial services
2 digits	1 - 10 million	90	- to identify from the first number 1) subscribers of different local operators 2) access codes for services	- individual commercial or non-commercial services
3 digits	0,1-1 million	900	- to identify from the first number 1) subscribers of different local operators 2) access codes for services - restricted number of individual non-commercial services	- individual commercial services
4 digits	10-100 thousand	9 000	- to identify from the first number 1) subscribers of different local operators 2) access codes services - individual non-commercial services	- individual commercial services
5 digits	1-10 thousand	90 000	- access codes for commercial services - individual, commercial services under the rules defined by the NRA	- individual commercial services without any rules

Table 1.8 Assessment of alternatives

Summary:

1. SN resources should be used mainly for numbering of local subscribers and local services. The first digits of a subscriber number (up to 4 digits) could denote subscriber blocks of different local operators.
2. Three digit subscriber numbers should be used only for very a limited number of non-commercial services as defined by the NRA (like 112). Three digit codes could be used for access codes for commercial services.
3. Four digit subscriber numbers could be used for individual non-commercial services as defined by the NRA.
4. Five digit subscriber numbers could be used for numbering of individual commercial services as defined by the NRA with rules which limit the demand of such numbers (e.g. pricing etc.).

Annex 5 - CLI capabilities in the fixed telephone networks

1. ISDN networks

The ISDN network is capable of transferring calling or connected line identification. In ISDN networks CLI is defined as a supplementary service. ETSI has defined Identification Services for ISDN networks and preliminary reserved codes for CLIP/CLIR and COLP/COLR. The access mechanism utilises * and # on the keypad of DTMF devices. ISDN networks are also capable of utilising access mechanisms other than those with * and #, for example using national numbering resources.

Within ISDN networks ETSI standards are applicable by using * and # and codes reserved for CLIP/CLIR and COLP/COLR. No new standards are needed. The use of * and # has no impact on national numbering plan. If services are accessed by numbers only without * and #, a number has to be reserved from the national numbering plan of each country.

2. Non-ISDN networks supporting CLI

In Non-ISDN networks which support CLI, CLI is based on national standards. These standards are usually based on CEPT recommendations which are applied to respond to national requirements. In some cases * and # can be used to address CLI for non-ISDN networks responding to the access mechanism of ISDN networks, because of the SPC functionality of their switches. Access mechanisms other than * and # can also be used, as in the case of ISDN networks.

Within non-ISDN networks supporting CLI, ETSI standards may be applicable in most cases by using * and # and codes reserved for CLIP/CLIR and COLP/COLR. No new standards are needed. The use of * and # have no impact on national numbering plan. If access to services is gained by using numbers without * and #, the numbers have to be reserved from the national numbering plan, as is the case of ISDN networks.

3. Non-ISDN networks which do not support CLI

Analogue networks without SPC functionalities do not support the transfer of identification services. Subscribers of these networks can not be identified by CLI.

The table below summarises the different CLI approaches in ISDN and non-ISDN networks

Network	Applicable standards	Access code	harmonised code on a European level?
ISDN networks	ETSI	Outside the numbering plan	yes
	National	Inside the numbering plan	no
Non-ISDN networks capable for CLI	ETSI	Outside the numbering plan	yes
	National	Inside the numbering plan	no
Analogue non-SPC networks	Not applicable	Not applicable	Not applicable

Networks, access codes and standardisation in relation to CLI

Annex 6 - Present and planned CLI implementation in some European countries

Block Blocking: rejecting of incoming calls where presentation of CLI has been eliminated; Block blocking gives the called party the opportunity to reject calls automatically, if CLI is suppressed by the calling party.

Country	CLIR 1) call by call 2) on a permanent basis	CLIP number presentation	Block Blocking
Belgium	1) special button on the keypad, depending on the internal manufacture standard 2) as part of the subscription in the local exchange with small extra fee	the national/international number without prefixes. The presented number cannot be used directly for call back purposes	
Denmark	1) ISDN networks: *31*; Rotary dialling 1831 2) as part of the subscription in the local exchange		
Finland	1) ISDN network: *31# non-ISDN networks: *31* NMT network: *31*# 2) on a permanent basis stored in the local exchange	national format incl. prefix (full diallable number) no international format	not possible today, under consideration
France (Service is not in operation, only tests are set up Procedures could be subject of change)	1) - ISDN terminal CLIR is activated by using a special button on the terminal - DTMF terminals *31* - other terminals prefix 3651 to activate CLIR on a per call basis 2) presentation of CLI normally allowed - DTMF terminals: CLIR permanently activated by *31# and deactivated by #31# and interrogated by *#31# - other terminals: 36521111 to activate CLIR 36522222 to deactivate CLIR 36523333 to interrogate CLIR	on analogue line: 0 NDC SN national format 00 CC NDC SN international ISDN line NDC SN national CC NDC SN international	Not yet supported
Germany	1) switching CLIR on and off is not possible 2) as part of the subscription in the local exchange	in an ISDN end to end connection: only national format incl. prefix (full diallable number) no international format	no standard today; problems in distinguishing suppressed CLI from normal analogue calling lines and calling lines from abroad

Country	CLIR 1) call by call 2) on a permanent basis	CLIP number presentation	Block Blocking
Sweden	1) ISDN: *31# or #31# PSTN: #31# for lines connected to SPC exchanges (Service will start beginning of 1996); interim solution for PSTN network to suppress CLI is IN based: call a national Freephone number, wait for second dialling tone, dial number 2) on a permanent basis stored in the local exchange	national format incl. prefix (full diallable number, if terminal equipment supports this function, otherwise only the full national number without any prefix) no international format	not introduced, because this seems to be a terminal service not a network service. Exchange manufacture will develop a network based solution for 1997/98.
The Netherlands	CLI will not be introduced in PSTN and ISDN before earliest 2. Quarter. 97, because of policy and privacy reasons 1) Prefix *31* (or 131, when DTMF is not available) to activate CLIR on a call by call basis; 2) CLIR is permanently restricted as part of the subscription in the local exchange; Prefix #31* (or 132, when DTMF is not available) to deactivate unblock CLIR on a call by call basis		more a terminal feature than a network feature, issue under study
UK ³²	1) Call blocking: prefix 141 should be used to activate CLIR 2) Line blocking: as part of the subscription in the local exchange	national format incl. prefix (full diallable number) no international format	The CLI service must distinguish between calls where the CLI is "withheld" (i.e. positively blocked by the caller) and where it is "unavailable", and that this distinction must be available at the called customers line (network terminating point). Service is not implemented; under study today

³² OFTEL Policy Paper, The Introduction of Calling Line Identification July 1994

Annex 7 - Availability of DTMF capabilities in different European countries

Country	% of terminals that have DTMF	% of switches with DTMF capability	DTMF terminals planned for the future	Switches with DTMF capability in the future
Bulgaria	<1	<1	7% in 2000	1% in 2000
Croatia	?	~50	50% in 2000	>80% in 2000
Cyprus	~60	>70		
Czech Republic	8-10	16-20		
Denmark	>80	100		
Estonia	<13	0.7		
Finland	~90	~90		
France	>75	100		
Hungary	?	60		
Ireland	97% of all lines	>90		
Latvia	10-15	14	65% in 2003	100% in 2003
The Netherlands	>50	100	100	
Norway	>75	>80		
Poland	20	?		40% in 2000
Portugal	>10	64		
Romania	5	20	100% in 2005	100% in 2005
Slovakia	~32	~24		100% in 2000
Slovenia	<45	>55		
Switzerland	85-95	60		
UK	?	>80		

Annex 8 - European Union demands

The present view in the EU on the presentation and restriction of calling and connected line identification is as follows³³:

1. Where presentation of calling-line identification is offered, the calling user must have the possibility via a simple means, free of charge, to eliminate the presentation of the calling-line identification on a per-call basis. The calling subscriber must have this possibility on a per-line basis.
2. Where presentation of calling-line identification is offered, the called subscriber must have the possibility via a simple means, free of charge for reasonable use of this function, to prevent the presentation of the calling line identification of incoming calls.
- 2bis. Where presentation of calling line identification is offered and where the calling line identification is presented prior to the call being established, the called subscriber must have the possibility via a simple means, to reject incoming calls where the presentation of the calling line identification has been eliminated by the calling user or subscriber.
3. Where presentation of calling line identification is offered, the called subscriber must have the possibility via a simple means, free of charge, to eliminate the presentation of the connected line identification to the calling user.
4. The provision set out in paragraphs 1 shall also apply with regard to calls to third countries originating in the Community; the provision set out in paragraphs 2 and 3 shall also apply to incoming calls originating in third countries.
5. Member States shall ensure that where presentation of calling and/or connected line identification is offered, the providers of publicly available telecommunications services inform public thereof and of the possibilities set out in paragraphs 1, 2 and 3.”

³³ Common position by the Council on “Modified proposal for a Directive of the European Parliament and of the Council concerning the processing of personal data and protection of privacy in the telecommunications sector, in particular in the integrated Services Digital Network (ISDN) and in the digital mobile networks (former COM(94) 128 final-COD 288); Brussels, 3 July 1996.

Annex 9 - List of references

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Annex 10 - Comments of individual ECTRA countries