

FINAL REPORT

ON

NON-DISCRIMINATORY ACCESS TO NUMBERING RESOURCES



15 July 1996

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This report has been prepared by Jukka Kanervisto and Gerd Wiedenhaupt from the ETO with the kind assistance of the experts of the ECTRA Project Team on Numbering, ECMA, ETNO, ECTEL, EIIA, ECTUA, ETSI and GSM MoU 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 "Non-discriminatory access to numbering resources" has been prepared by ETO on behalf of ECTRA for the Commission of the European Union.

Numbering capacity is a potentially competitive resource. It is therefore necessary to ensure that developments in telecommunications networks and services are not constrained on numbering grounds. This challenge needs to be addressed by careful management of overall numbering schemes, at global, European and national levels.

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 and the need for further development in that market. This Resolution sets the future agenda for further liberalisation of public voice telephony. Non-discriminatory access to numbering resources is an important issue in this context.

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

- 1) to examine and make proposals for common guidelines on number ownership and tradability of numbers and on access to customers
- 2) to examine and make proposals for common guidelines on harmonised/competitive access to directory enquiry services in telecommunication networks and
- 3) to examine the DNIC and DCC allocation procedures and use of pan-European DNICs, to propose guidelines on pricing of DNICs and on criteria for allocation of DNICs and to propose procedures for allocation of European DNICs.

ETO has prepared this study in close operation with the ECTRA Project Team on Numbering and the parties represented in the European Numbering Forum (ENF). ETO subcontracted Moquet Borde Dieux Geens & Associes from France to study the issue of number ownership from the legal point of view. The Final Report contains findings and proposals as approved by CEPT/ECTRA and also contains comments individual CEPT/ECTRA members have on these issues in relation to their respective national regimes.

Results and findings

The results and findings of the study have been divided into four areas, for each of which separate conclusions and proposals have been made.

Number ownership and tradability of numbers

In today's competitive environment, numbers are continually increasing in commercial value. As a result of this the issues of number ownership and tradability of numbers have also grown in importance. Questions such as "who owns numbers?", "can numbers be traded?" and "can numbers be priced?" are now being asked.

If subscribers were to possess ownership rights to the telephone numbers allocated to them, they would be entitled to keep their respective numbers under all circumstances and dispose of them as they deemed fit. An international telephone number is subject to changes. Exhausted numbering capacity or some other occurrence may lead to demands to change global or national numbering schemes. Because of this, subscribers cannot be granted "real" ownership rights to their telephone numbers. Consequently, numbers are regarded as a public resource to be administered for the common good by the State or the regulatory authority. In order to be able to accommodate future developments in the telephone network no commitments should be made which prevent numbering schemes from being changed for the benefit of all telecommunications users. Numbers are considered as non-proprietary data to which no particular organisation, institution or individual can claim any ownership. No one should be able to register a telephone number as a trademark.

In this report ETO makes the following conclusions and proposals:

1. Since no-one can have any ownership rights to numbers, instead of dealing with the term "number ownership", the term Rights of Use (RoU) of numbers should be defined for all parties involved: users, service providers and network operators. These RoU should be defined at a national level for national numbers and on a European level for pan-European numbers.
2. The term "trading of numbers" may be misunderstood as the transfer of ownership rights from one owner to another. Since no-one can own numbers, ownership rights cannot be traded. Instead of dealing with the trading of numbers, terms for granting the RoU and transferring RoU should be defined on a national level for national numbers and on a European level for pan-European numbers.
3. Today some European countries price numbers and some are considering pricing them. ETO considers number pricing advisable as it is a means of covering the cost of number administration as well as a way of regulating the use of scarce resources, particularly short numbers. However, number pricing should be left for the respective community to decide upon; at a national level by NRAs and at a European level by ECTRA.

Based on the above, the key issue involved is the creation of Numbering Conventions including the following: Rights of Use of numbers for users, service providers, network operators, a defined set of rules on number allocation procedures, withdrawal of numbers, number changes, transfer of numbers, modification of numbering schemes, reallocation of numbers, the auditing of numbers, surveillance of number resources, publicity and appeal processes involved in allocation.

Numbering Conventions for national numbers should be implemented in every CEPT country. Proposals for such conventions should be prepared by ETO with the assistance of the ECTRA PTN and ENF. ECTRA should make a Decision on these Conventions and on their implementation.

Numbering Conventions for pan-European numbers should be prepared by ETO with the assistance of the ECTRA PTN and the ENF. ECTRA should make a Decision on these Conventions and on their implementation.

(Preparation of these conventions has already been agreed upon between ETO and the Commission of the European Union)

Access to customers

Access to customers is defined in this study as an issue related to customer relations, number portability and billing. The main focus of this study has been number portability. Issues related to customer relations and customer billing are not numbering issues and have therefore not been studied here in detail. However, some problems related to these fields have emerged during the study, particularly with regard to customer billing. Customer billing is considered in this study as being related to interconnection. Further studies on this issue are needed.

As regards number portability, it is recognised that difficulties involved in implementing number portability are closely related to existing network technology. Several studies show the importance of number portability in the local loop and demonstrate that when using digital exchange technology and modern signalling systems the benefits of number portability in the local loop clearly outweigh the costs. In a competitive environment, operator number portability between fixed network operators is a key issue.

In its report ETO makes the following conclusions and proposals:

1. ETO considers that operator portability in the local loops of fixed networks should be implemented in EU and EEA countries as soon as possible and in other CEPT countries in accordance with a time-schedule consistent with the introduction of competition in local networks.
2. Operator portability in mobile services is considered as being of clear benefit to competition. Further studies are urgently needed on technical alternatives to operator portability, which should include analyses of their benefits and costs.

3. Today, it is not possible to have operator portability in IN-based services in Europe. However, operator portability in these services would have a clear positive impact on service competition. Moreover, common access codes for services would save number capacity and would be user-friendly. Further studies on technical and administrative alternatives to and economical impacts of operator portability in IN-based services are urgently needed. In addition to the current ETSI study on number portability for pan-European services, ETSI should be mandated to study operator portability in IN-based services at a national level. This study, together with the current ETSI study on number portability for pan-European services should result in a common model for operator portability of IN-based services to be applied in a consistent way both at a national and pan-European level
4. Implementation of number portability in the present telephone network without IN-technology is seen as an important but only intermediate solution. Developmental work on number portability should focus on an IN-solution, which is regarded as a natural platform to number portability.
5. When discussing geographical number portability, the question of whether current geographical numbers should be made geographically portable or not has been raised. Geographical numbers have always been geographically portable within a restricted geographical area (e.g. exchange area). If geographical numbers were made geographically portable without any restrictions, geographical numbers would no longer exist. All numbers would be non-geographical in nature. ETO considers geographical numbers to be user-friendly numbers and as such believes that the principle of geographical numbering should be maintained. However, the area in which geographical numbers can be made geographically portable should be defined.

Directory Enquiry Services

Directory enquiry services are considered as one of the most important basic services of telecommunications networks. This is also emphasised in the Communication from the Commission of the European Union to the European Parliament, where “white pages” of telephone directories are defined as part of the universal service. Easy access to directory services is considered essential for the efficient use of directory services both at a national and European level. Directory services are considered highly competitive services.

Harmonised access numbers for directory services makes it easier for users to access these services. However, harmonisation of access numbers is in direct contradiction with service competition. The aim of this study has been to find a solution which enables directory access numbers to be harmonised but which allows at the same time allow competition in directory services. Other important issues such as data protection and privacy, the defining and pricing of “universal” services and issues related to “yellow pages” etc. are not covered in this study.

Although harmonisation of access numbers is considered an important facilitator of directory services, harmonisation is a difficult and time-consuming task because of the need to change numbers in those countries where the harmonised number will be used. Number range 11x seems to be the easiest range to adopt for harmonisation since work in this range has already begun with the harmonisation of the European emergency number 112. Furthermore, 11x numbers have been recommended by CEPT for service use since 1976.

ETO has made the following conclusions and proposals:

1. ETO recommends that access numbers for directory services be harmonised throughout CEPT countries and that all directory services be numbered behind access code 118, without any prefix in front of the code.
2. In order to facilitate competition between different directory service providers but at the same time allow for user-friendly numbering through the use of harmonised access codes, ETO proposes that each network operator should be able to preselect a directory service provider for national and international directories. At the same time service providers should be able to apply for individual service numbers for call-by-call selection to be used by the user in addition to common access numbers for preselection.

3. In order to harmonise directory service numbers throughout Europe, an access number 118x should be used for preselected national directory services and an access number 118y for preselected international directory services. Individual numbers for directory service providers should be numbered behind the access code 118z. Further studies are needed to define numbers x, y and z above. These studies should take into account future aspects of cross-border access, human factor aspects and possible evolution towards the one common access number 118 while still retaining the possibility for individual call-by-call access with numbers 118z.
4. Finally, in order to facilitate cross-border access for directory services, it should be recommended that operators' Country Direct service be allowed access to all directory services in the home country.

DCC/DNIC Allocation Procedures in Europe

Current numbering of data networks is based on ITU-T Recommendation X.121. According to this recommendation, Data Country Codes (DCCs) and Data Network Identification Codes (DNICs) are used to identify data networks. The following problems are related to the use of DNICs: restricted capacity of available codes, the reservation of several country-based codes for a single international service provider/operator and variations in national criteria for allocating and pricing DNICs.

The problem of exhausted capacity is not only a European but also a global problem. This problem has been identified by the ITU-T which has taken actions to safeguard global DCC/DNIC resources. In order to prevent international service providers from obtaining one DNIC from every country in which they provide their services, the present ITU-T Recommendations allow service providers to use one single DNIC to identify their network also in other countries. In addition to this, capacity problems may be avoided by sharing DNICs with several service providers.

DNIC pricing also affects DNIC resources. Arbitrary pricing may lead to a situation where international service providers choose the "free of charge" DNICs of one country rather than the "high priced" DNICs of others. This option could lead to the DNIC resources of the country providing "free of charge" DNICs being exhausted.

In order to avoid problems of exhausted DNIC capacity, ETO considers it essential that NRAs should reserve capacity for shared DNICs. Furthermore, NRAs should have the right to refuse to allocate DNICs to applicants in cases where other reasonable alternatives exist and where there are no clear technical or economical benefits to be derived from using the DNICs to be allocated by the NRA. At the same time NRAs should be obliged to allow into their country service providers who have DNICs allocated from other countries or from global resources to use these DNICs according to the rules of the NRA.

So far DNIC pricing has been a matter of national regulation. As regards DNIC pricing, no real need for harmonisation has so far been found. The allocation procedures proposed above would help to solve problems of exhausted capacity caused by pricing. DNIC pricing should, therefore, be left for NRAs to decide upon.

DNIC allocation should be carried out in a fair, impartial, transparent and non-discriminatory manner. Similar to the proposal to prepare Numbering Conventions for telephone networks, such Conventions should also be created for the numbering of data networks. These Data Network Numbering Conventions should define criteria for allocating DNICs, sharing DNICs, the validity of an assignment, withdrawing DNICs and reassigning DNICs. Furthermore, the terms under which NRAs can refuse applications for DNICs should be based on the criteria specified in Data Network Numbering Conventions.

Data Network Numbering Conventions should be prepared by ETO with the assistance of the ECTRA PTN and ENF. ECTRA should make a Decision on these conventions and on their implementation in all CEPT countries.

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 countries² and out of these countries, 15 countries³ also signed the arrangement on the One-Stop-Shopping on licensing.

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. So far ETO has signed five work orders concerning numbering issues.

1.2 - Presentation of the work requirement

Numbering capacity is a potentially competitive resource. It is therefore necessary to ensure that developments in telecommunications networks and services are not constrained on the grounds of numbering. This challenge needs to be addressed by careful management of overall numbering schemes, at global, European and national levels.

Clearly defined guidelines are necessary prerequisites for the harmonisation of the regulatory regime in Europe, the overall aim of which is to ensure equal access to the market for all market participants. The work requirements addressed to ETO are as follows:

- 1) to examine issues of customer ownership, number ownership and tradability of numbers. To make proposals for common guidelines.
- 2) to examine harmonised / competitive directory enquiry service facilities in telecommunication networks, taking into account the competitive and user-friendliness implications and access to directory services across national borders. To make proposals for common guidelines.
- 3) to examine DNIC and DCC allocation procedures and the use of pan-European DNICs. To propose guidelines on the pricing of DNICs and on criteria for the allocation of DNICs. To propose procedures for the allocation of European DCCs.

1.3 - Schedule and methodology

This study was 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)

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, the 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

⁴ The European Numbering Forum (ENF) was established as a Forum for the exchange of information and expertise, for coordination and consultation, discussion and common studies on European numbering, addressing and related issues, in accordance with the European Union Council Resolution 92/C318/02 on the promotion of Europe-wide co-operation on numbering of telecommunication services

- ECTUA (European Council of Telecommunications Users Association)
- EIIA (European Information Industry Association)
- ETNO (European Public Telecommunications Network Operators' Association)
- ETSI (European Telecommunications Standards Institute)
- GSM MoU EIG (GSM MoU European Interest Group)

The first interim report, containing different aspects of 1) customer and number ownership and trading of numbers, 2) directory services and 3) DCC / DNIC allocation procedures, 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 April 1995.

The second interim report, containing ETO's findings and proposals, was delivered to ECTRA, the ECTRA Project Team on Numbering and the ENF for their comments. It was delivered to the Commission in November 1995.

The draft final report was sent to ECTRA in May 1996 in order to obtain their approval and to receive comments from countries wanting to stress their view on specific points of the report.

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

CHAPTER 2 - BACKGROUND AND DEFINITION OF STUDY ITEMS

Non-discriminatory access to numbering resources is a concept which has a very wide scope. The study items specified in this work requirement cover important parts of that scope. The items are not necessarily linked to each other and in this study they are dealt with separately.

2.1 - Number ownership and tradability of numbers

In the competitive environment telephone numbers are becoming more and more part of services and as a result of this, their commercial value is increasing.

Questions regarding number ownership and number trading have arisen for many reasons: Certain numbers have a unique character and therefore represent an economic value (e.g. an 800 number with an extension of digits corresponding to the letter sequence, for example "PIZZA"). Holders of numbers do not want their number changed when changing location or network operator. They want to keep their number unchanged, to own their number and when possible, even to trade it.

In general terms ownership means the legal right of possession, the "owning" of an exclusive right or title to something. Exclusive right generally means a right in which no-one else has a share. Applied to the ownership of numbers, this term might mean the owner's legal right to a number once allocated to him, to which no others have a share.

A telephone number is not an independent number. It may identify its holder but at the same time it may also identify many other subjects: an address in the network, a service type or the tariff of the service offered, a route in the network. Furthermore, a telephone number is used to control switches. Its format is internationally specified and it may be subject to changes due to different factors which are independent of the holder of the number and even of the entity allocating the number. A telephone number is today - and will continue to be so well into the future - a number in which others also have a share.

Number ownership and number trading are issues closely related to number portability. Without number portability, numbers may be owned and traded, but use of the number may be restricted to only the single exchange area or to the single network operator. The full benefits of number ownership appear only with full number portability.

The allocation, ownership and free tradability of numbers between customers or between customers and operators is deemed highly important by the telecommunications industry. The aim of this study is to identify the problems of number ownership and number trading, to identify areas where regulation is needed and to suggest common guidelines on the subject. Number ownership and number trading are dealt with in chapter 3.

2.2 - Access to customers

The strong link which incumbent operators have had with their customers is closely related to the monopoly situation of network operators. Incumbent operators have created relations with their customers, constructed local loops to the premises of subscribers; they have given subscribers numbers, compiled subscriber directories, established billing arrangements and channels for delivering information. It can generally be said that previously, incumbent operators had 100% market share. Even now they have such a strong hold over their customers that it is as if they almost owned the customer.

Service providers offering value added services are customers of network operators. The network operator that has assigned a number to a service provider may argue that the customer is his and that he is entitled to bill the customer and not the service provider providing the service. Settlement rates between network operators and service providers is becoming a key commercial issue, a situation which is already found in the US market today.

The introduction of competition into telecommunication networks and services has cut the mandatory link between customer and network operator. Despite of this, incumbent operators still have a strong position in the market and are making efforts to maintain their position in whatever way possible. From a regulatory point of view the key issues are impartiality, equal access, fairness and issues of cross-subsidy. The aim of this study is to highlight the problems of users and service providers in relation to network competition, to point out the areas where regulatory actions are needed and to propose guidelines for national regulatory authorities on this issue. As regards customer access, one of the main issues in a competitive environment is number portability. Number portability is dealt with in Chapter 4 in more detail.

2.3 - Directory Enquiry Services

The introduction of competition into telecommunication networks and services has given rise to many new questions about directory services. These questions relate to the co-ordinating and combining of the subscriber data of different network operators, to the procedures for publishing directories, to how and in which directories portable or non-geographical numbers may be shown, to data protection, and to the numbering of directory enquiry services.

Directory enquiry services are very important for users of telecommunications services. Numbering arrangements for directory services should ensure that users have easy and efficient access to these services. Furthermore, in an environment where the competitive provision of directory enquiry services exists, numbering arrangements should ensure non-discrimination between alternative service providers.

From the user's point of view, easy access to directory enquiry services is a prerequisite for the efficient use of services in different countries. If different codes are to be allocated for various providers of directory services, this should be done on demonstrably equal terms.

From the service provider's perspective, easy access to directory enquiry services along with fair and impartial allocation of service numbers, within different countries and also across national borders, seem to be the most crucial issues.

The aim of this study is to highlight the numbering problems of directory services at a European level and in a competitive environment, in order to find solutions for selecting alternative directory enquiry service facilities, taking into account competitive and user-friendliness implications of various scenarios. In order to understand the background and scope of directory services, reference will be made in this study to present and future directory standards, including X.500 services and work to be carried out by the European Directory Forum.

The intention of this study is

- 1) to study the need for harmonised access to directory services,
- 2) to analyse the numbering problems of and find alternatives for accessing directory services,
- 3) to assess the need for the regulatory actions and
- 4) to make proposals for numbering of directory services.

Access to directory services is a key element in facilitating the efficient use of services. This study focuses on the numbering of directory services only; other important issues as service provision itself, charging, billing, interconnection agreements, dataprotection and privacy issues etc. are not covered in this report. Numbering of directory enquiry services are dealt with in more detail in Chapter 5.

2.4 - DNIC / DCC allocation

Data Network Identification Codes (DNICs) are used to identify data networks. The following issues explain why it is necessary to study the problems of DNICs in more detail: the restricted capacity of available codes, the reservation of several country-based codes for a single international service provider/operator, the use of codes on a regional basis covering several countries and the pricing of codes.

At present a Data Network Identification Code (DNIC) is composed of a Data Country Code (DCC) followed by a single digit network identifier. The DCC element in the DNIC closely aligns the use of the DNIC with the country identified by the DCC. Routing is however carried out on the DNIC rather than DCC, cancelling out the need to restrict the use of the DNIC to any one country. Work needs to be conducted to investigate the possibility of lifting restrictions on DNIC use specific to each country and encouraging the use of a single DNIC throughout Member States.

Variations in national criteria for DNIC allocation and arbitrary pricing policies could lead to potential geographical distortions in the number of applications for pan-European DNICs. Companies wishing to operate on a pan-European basis would apply for DNICs in the country offering the lowest price and they would then automatically operate in other Member States, where they otherwise might not meet all the criteria necessary to be awarded a DNIC. Certain countries with relaxed criteria and a slack pricing policy would quickly run out of codes. Guidelines on the pricing of DNICs and on the minimum criteria necessary for allocation are required.

Issues of DCC/DNIC are dealt with in Chapter 6 of this study.

CHAPTER 3 - NUMBER OWNERSHIP AND TRADABILITY OF NUMBERS

Today numbers play an increasingly important role in services and are acquiring more and more commercial value. The commercial value of a number is due to the following:

- 1) Entities providing different services may invest a lot of effort and money to make the service known to the public. Numbers are essential facilitators of services. They may form a part of the intangible assets or trademark of the service. Even the re-allocation of such numbers may be difficult.
- 2) A numbering fee may be used as a means of financing the costs of the administration of numbering and/or as a means of allocating scarce resources. When a number has a real commercial value at the highest administrative level, it may easily lead to demands for pricing and trading mechanisms at a lower level.

Issues such as number allocation, ownership and tradability of numbers are all deemed highly important. In the following section the current situation in some European countries and in some countries outside Europe is presented. This analysis has been carried out in co-operation with ETO and Moquet Borde Dieux Geens & Associates from France, an ETO subcontractor. This consultancy company has also studied the question of customer ownership from a legal perspective.

3.1 - Present situation in European countries

3.1.1 - Value of a number

For residential users

The value of a number varies depending on the party involved. For residential users numbers are a means of communication. Their value is related to their memorability and to their user-friendliness.

For Service providers⁵ / Service subscribers⁶

For Service providers and Service subscribers numbers also have values other than those related to communication only. These entities may want to "brand" their services. They may use numbers for making their services known and for facilitating the memorability of their services. If their service numbers are easily recognisable, easy to remember and easy to use, this may generate more traffic, more contacts and more business than that of numbers which are longer, more difficult to remember and more difficult to use.

Example of a Service Provider:

A freephone service provider is a holder and administrator of a freephone database which is connected to the public telephone network. A freephone service provider may be a network operator or an independent entity.

Example of a Service Subscriber:

A national bank uses the name "Direct Line 2580" as a business name for all its banking services. The name comes from the dial pad of the telephone set, where digits 2580 form a direct line. The number 2580 is used whenever possible: in freephone services 0800-2580, even in the bank's DDI switchboard number in areas where the subscriber number 2580 XXX(X) has been made available. The bank has invested a lot of effort and money in making the service well-known nation-wide.

For business users and Corporate Networks

The value of a number for business users and Corporate Networks may be equated with the value of a number for service providers / service subscribers with regard to the branding or type of business of the company.

⁵ Service Provider: An entity, which has, for the purpose of service provision, telecommunications equipment interconnected to the public telecommunications network

⁶ Service Subscriber: An entity subscribing to the services of the Service Provider

Furthermore, according to ECTEL⁷, for Corporate Networks, the value of a number is associated with the size of the area in which a business can be reached by its customers under a single number (including prefix), e.g. a number, through which a single terminal in a CN can be reached from all over Europe, is more valuable than a number, through which this terminal can be reached from inside only one country.

For Network Operators

Numbers also have some extra value for network operators. Operators, in particular incumbent operators, may be at the same time both network operators and service providers. They want to have attractive number blocks so that they may offer attractive numbers for their own services and for their subscribers or users connected to their network. Attractive numbers - whether service numbers or network access codes - which are easy to remember and easy to dial, generate more traffic and better business. Operators also want to brand their services.

Example of an operator branding:

In Sweden the second international operator applied for and obtained the code "007" to provide access to outgoing international calls. 007 is familiar to most people from other connections, and makes it easy for people to remember the service.

3.1.2 - Numbering administration

The National Number Space (NNS) is commonly accepted as a national resource, which is administrated by the National Regulatory Authorities (NRAs). This is a direct result of the introduction of competition into the telecommunications network and services. In principal, administrative and operational functions are separated in most European countries. This is in accordance with Directive 90/388/EEC⁸. National administrations are the organisations responsible for numbering issues. However, in most European countries the practical work of allocation is still carried out by the dominant national network operator. This is due to the fact that liberalisation of the telecom markets is still very limited. Moreover, NRAs often lack the expertise and resources for numbering. The implementation of new numbering schemes may be seen as an opportunity to transfer total responsibility and administrative tasks of numbering from dominant operators to NRAs.

1. NRAs are responsible for national numbering arrangements in most CEPT countries.
2. The practical work of allocation is still being carried out by the dominant network operator in many countries.
3. Major changes to be made on national numbering schemes offer an opportunity to transfer overall numbering responsibility, including administrative work and allocation tasks, from the dominant operator to the NRA.

3.1.3 - Allocation of numbers

Primary allocation

In the UK, Sweden, Norway and Finland, NRAs have already clearly taken over the responsibility of national numbering schemes and play an active role in the administration of numbering. They allocate number blocks to network operators and service providers under specific rules. In the UK, Oftel has the authority to manage the UK numbering scheme in accordance with the rules set out in the Numbering Conventions. These Numbering Conventions are considered to guarantee equitable, transparent and non-discriminatory access to numbering resources. In the above mentioned countries, subscriber numbers are allocated in blocks of 3-4 significant digits, responding to the capacity of approximately 10.000 - 1.000.000 individual numbers per block within one numbering area. Ultimate capacity is dependent on the maximum number length available.

In some countries NRAs request that operators report the penetration ratio of used/unused numbers as well as any major changes in the numbering plan within a specific time period (for example six months).

⁷ ECTEL comments on Non-Discriminatory Access to Numbering Resources, 29 February 1996

⁸ Commission Directive of 29 June 1990 on competition in the markets for telecommunications services (90/388/EEC)

Secondary allocation

The operators to whom numbers are allocated sublet the numbers to their subscribers, service providers and users. Detailed regulation on secondary allocation is currently under consideration in Norway; however, for the time being the secondary allocation of numbers is carried out according to the policy of individual network operators/service providers.

Subscribers may have some say in the selection of numbers, but only within the limits stated by the operator/service provider. In some cases operators are authorised to charge special fees for popular numbers.

Tertiary allocation

In some countries, (e.g. the Netherlands for GSM) secondary allocation is carried out by operators to service providers and tertiary allocation by service providers to end users. It should be noted that the word "end user" is used here rather than "subscriber", because in some cases numbers are allocated to users without any subscription (for example paging buzzer).

4. In countries where competition has been introduced, numbers are allocated to competing network operators by NRAs in blocks of 3-4 significant digits, in response to the capacity of approximately 10.000 - 1.000.000 individual numbers per block.
5. Operators allocate numbers to subscribers according to their own policy.
6. Subscribers have the restricted possibility of selecting their number.

3.1.4 - Reallocation of numbers

No legal statements have been issued on the reallocation of numbers. Reallocation procedures usually differ according to the type of allocation involved (primary, secondary, tertiary).

In the UK, blocks of numbers recuperated from operators by OFTEL are only reallocated after between one and two years of their recuperation. The corresponding reallocation period for subscriber numbers is between 3 and 6 months.

In France and Germany, no minimum period or contractual rules exist on this issue. Reallocation procedures depend on the policy of network operators. In France the reallocation period of operators is between two months and two years; in Germany, according to Deutsche Telekom, recuperated numbers are normally held for 3 months before being reallocated. Residential and business numbers may have different reallocation periods.

In Norway, a three-month delay is imposed for fixed service numbers before reallocation. This period is 2 months for mobile numbers in the Telenor Mobil system and 12 months in the NetCom GSM system. In Switzerland the period is from 6 to 12 months.

Opposition to reallocation

In the UK it is rare for subscribers to be able to oppose the reallocation of their former numbers. However, this issue falls within the power of each operator, and, as such, is subject to individual commercial policy and operator/subscriber arrangements. In France no particular regulation or internal rules of operators allow subscribers to oppose the reallocation of their former numbers.

In Norway subscribers cannot contest the reallocation of their numbers unless special arrangements have been made with the service provider, for which the subscriber must pay an additional fee as consideration for the reserved number resource. At present, commercial/competition factors are not considered before reallocating a number, but this could be considered as a useful principle for the future.

In Switzerland, subscribers' rights to oppose the reallocation of their number exist only for the purpose of preventing misdialling and may be overruled by the Swiss PTT for reasons of necessity.

7. No legal statements exist on the reallocation of numbers.
8. The reallocation procedure is different for different types of allocation.
9. Reallocation of secondary allocated numbers is usually carried out according to the policy of the network operator.
10. The reallocation period for secondary allocated numbers varies from 3 - 12 months.
11. Reallocation periods may be different for subscriber and business numbers.
12. No rules exist which allow a user to oppose the reallocation of his former number.

3.1.5 - Modification of numbers by the allocator

In the UK, Oftel may withdraw a number allocation if it is not being used in accordance with the Numbering Conventions or if its withdrawal is in the national interest. When doing so, the interested parties must be consulted beforehand and no less than 3 months notice must be given following consultation and before modification.

In Germany, there are currently no regulatory provisions for the modification of numbers.

In Norway documented and approved need for change is necessary before any modification occurs and the subscribers concerned must be notified at least two years prior to the effective date of modification.

In Switzerland, OFCOM may withdraw a number allocation if the correspondent numbers are not used in accordance with the relevant ordinances or if a numbering plan modification requires it.

In Finland, the user must be notified at least 6 months in advance of the number change.

13. Few written rules exist which clarify the rights and responsibilities of the administrator when carrying out changes on numbering schemes.

3.1.6 - Trading of numbers

Vertical and horizontal trading

When dealing with numbers two different types of trading have to be distinguished between: 1) trading related to allocation principles i.e. trading from administrations to operators or trading from operators to subscribers, referred to in this study as “**vertical trading**” and 2) trading between operators, between service operators, between subscribers etc., referred to here as “**horizontal trading**”.

Horizontal trading

No rules or common policy exist for number trading in Europe. In the UK, Oftel has clearly stated that numbers are national resources which must not be traded. In Finland there have been some discussions on number trading, but the regulator has not yet made any decisions on this subject. In some countries, specific cases exist where subscribers have traded numbers amongst themselves.

The extent of the coverage of a number has some impact on horizontal trading. Geographical numbers can be portable only in one exchange area, usually within an area of a diameter of up to some tens of kilometres. Non-portability, i.e. dependency on the geographic area or network, restricts the horizontal trading of numbers - numbers can only be traded within the same exchange area. It is unclear what the demand for number trading is in such restricted areas.

Portable numbers are often referred to as non-geographical numbers which may also be portable between operators. Non-geographical numbers of a numbering area are non-geographical within numbering area only, but not necessarily between numbering areas. National non-geographical numbers may be portable within a country, but may not be carried across countries. National portable numbers are always national numbers and the "market area" of these numbers is restricted to the country in question. Correspondingly, the market area for global numbers, for example global freephone numbers, is world wide.

It is not clear what the demand for horizontal number trading in national or global service numbers is, but it seems obvious that the value of a number and consequently the demand for horizontal trading is in direct proportion to the coverage of the number. In this respect, full portability supports horizontal number trading.

Vertical trading and pricing of numbers

The pricing of numbers is closely related to vertical trading. When incumbent operators (former administrators) administrated "their own" numbering schemes, no charge was allocated to numbering. Numbering administration costs were included in the overall fixed costs of the organisation. The question of charging arose when operational and administrative tasks were separated and when the administration of numbering was transferred to a separate entity.

The issue of number pricing is under discussion for at least two reasons: Firstly, the administration of numbering generates costs. How can these costs be covered? From the State budget, by collecting a numbering fee or in some other way? Secondly, attractive numbers are a scarce resource. The availability of these numbers is far less than the demand for them. This is especially the case with short numbers. How should one allocate scarce resources? Through pricing mechanisms, lottery, auction or in some other way?

Whatever the allocation mechanism, the scarce resource may be of remarkable value to the recipient to whom the scarce resource has been allocated. The question generally asked is: should pricing be allowed or not? If pricing is allowed, the following questions arise:

- Is there a need to price all numbers on an equal basis or only some special numbers (service numbers, short numbers etc.)?
- Who should pay for numbers and under which criteria?

Today in Europe only a few countries price their telephone numbers, other countries are planning to do so in the near future. In some countries (e.g. in Sweden) current legislation does not support number charges. In Finland, the TAC has priced and charged operators and service operators for numbers. In Belgium a network operator charges end-users for numbers: e.g. MSN numbers, and 800 & 900 numbers. Moreover, in some countries (e.g. Finland and Belgium) local operators have collected an extra charge for Direct Dial In (DDI) subscriptions and have explained this charge as the lost or inefficiently used numbering capacity after the DDI access number. Many European countries are considering number pricing and vertical trading.

An example of the pricing of numbers is given in Annex 3.

14. No common rules on number trading exist.
15. Two different methods of trading have to be distinguished between: vertical trading and horizontal trading.
16. Number trading is easier in the circumstances of full number portability.
17. In some countries, horizontal number trading is clearly prohibited.
18. Pricing (and vertical trading) is used in some European countries and many countries are considering it today.

3.2 - The European Telephony Numbering Space (ETNS)

The European Telephony Numbering Space (ETNS), which is intended to be implemented by 1998 at the latest, will provide CEPT-countries with a virtual numbering space to be used for pan-European services. Before any number allocations for pan-European services can be made, it is first necessary to define essential issues such as the administration of this numbering resource, number structure, allocation principles etc.

In order to ensure non-discriminatory and equal access to European numbering resources and transparency in the decisions taken, numbering resources should be administrated by a body which is independent from the potential users of these resources. At the same time, the allocation principles chosen as well as the availability of resources should be published in order to meet the requirements of transparency. For pan-European numbers, this could be carried out in accordance with rules adopted by ECTRA.

With regard to numbering administration, the European Telecommunications Office could be designated as the administrative body because of its independence from the potential users of the number resources.

19. The ETNS for pan-European numbers is a virtual CEPT resource. It should be administrated by a European body in accordance with the rules adopted by ECTRA.
20. ETO could be the European numbering administrator.

3.3 - The situation outside Europe

Moquet Borde Dieux & Associates have studied the issues of numbering administration, allocation, reallocation, modifications and trading of numbers in countries outside Europe where competition has been introduced into the telecommunications sector, i.e. USA, Australia and Japan. A more detailed description of their study is given in Annex 4.

Numbering administration

In Australia and Japan the regulatory function is clearly separated from operational functions. This is also the case in the US but there the administrator of the North American Numbering Plan (NANP) is responsible for the allocation of numbers, pursuant to an application procedures on the part of operators, which is based on "industry consensus procedures". These procedures are demonstrated by the role of inter-industry groups such as the Industry Numbering Committee and the Future of Numbering Forum, in determining numbering policy. The ultimate regulatory authority for US telephone numbers is the Federal Communications Committee (FCC).

Allocation of numbers

In Australia, Japan and the US, primary number allocation from national resources to network operators and service providers is carried out by the numbering administrator, and secondary allocation to subscribers by network operators and service providers. In Australia, numbers may be allocated to subscribers by individuals or organisations having received them through secondary level allocation.

Reallocation of numbers

In Australia there is generally a minimum period of six months between the returning and reallocation of a number. The period may be shorter in certain exceptions. In some instances, the number may be immediately reallocated to a new customer who, from that moment on, holds the rights of use to the number. In Japan, numbers are generally not reallocated to subscribers by the NTT until at least six months after their deactivation.

Opposition to reallocation

In Australia, subscribers must approve the reallocation of a number before the end of the six-month period after its return. In Japan, service providers are not required to allow previous subscribers to oppose the reallocation of their deactivated number(s) and the NTT has issued no specific policy on this issue.

Modification of numbers by the allocator

In Australia, allocators (including AUSTEL, operators and service providers) may only withdraw numbers which they have allocated for specific and limited reasons.

When operators and service providers change or withdraw numbers from subscribers, they are required to give a notice period which must be at least equivalent to the length of time the subscriber has used the number, but not necessarily longer than one year. Shorter notice periods may be provided in specific circumstances. Operators and service providers are required to provide the subscriber with a transition period in which he/she shall have access to both the old and new numbers while the number is being modified, except in case where the modification has been requested by the subscriber or where such access would involve unreasonable technical or financial cost.

In Japan, modifications of numbers allocated to operators must be decided upon by the MTP and operators acting together. A notice period prior to number modification is set at between one and half and three years.

Trading of numbers

In Australia, the concept of tradability was addressed in a call for public comments; however, no regulations on this issue were proposed in the final draft of the national numbering policy. It is recommended that where the transfer of a number between organisations or individuals is planned, the organisations or individuals concerned should obtain prior advice from the relevant operator or service provider implementing the transfer; transferability is possible according to the policies of operators and service providers, but it is not an automatic right of the subscriber.

According to present US legislation, number trading is illegal in the US.

In Japan, since numbers are universally considered as "common property" the trading of numbers does not exist.

3.4 - Aspects of number ownership

3.4.1 - Legal aspects

Ownership Rights and Subscribers

The question arises as to whether subscribers, simply by entering into a telephone subscription contract, possess ownership rights to the telephone numbers allocated to them. If subscribers were to possess ownership rights to their telephone numbers, they would be entitled to keep their respective numbers under all circumstances and dispose of them as they deemed fit.

Moquet Borde Dieux Geens & Associes has conducted a study for ETO concerning the legal issues of number ownership. The situation in a number of countries (Australia, France, Germany, Japan, Norway, Switzerland, the United Kingdom, United States of America) was studied. According to this study, none of the countries studied regards a telephone number as property which can be appropriated and disposed of by the subscriber as he deems fit. The status of numbers is in fact similar to the names of individuals; they are non-proprietary data which no particular organisation or institution can claim any ownership to.

Indeed, in most countries, subscribers can have their telephone number changed and cannot claim to keep their telephone number. Thus, even if a telephone number is of unquestionable commercial value to a subscriber, particularly when the subscriber is a merchant, the subscriber has no economic rights to the telephone number allocated. Even if the operator, as a goodwill gesture and to the extent technically practicable, reallocates the same number to a subscriber at his request, this does not grant the subscriber any ownership rights to the telephone number.

Ownership rights and Regulatory Authority

The only body possessing rights comparable to ownership rights is the regulatory authority that has control over the national numbering systems and allocates numbers to various operators on the market. These rights consist of the right to allocate lists of numbers to operators, and the right to supervise the use of the numbers allocated.

These rights are not, however, true ownership rights, for in none of the countries studied does the regulatory authority in charge of allocating numbers have the power to penalise an operator by withdrawing its right to use a number previously allocated to it. The only possibility of withdrawing allocated numbers would seem to relate to technical requirements, in particular following a change in the numbering system.

Therefore, a telephone number is generally regarded as a public resource to be administrated by the State or the regulatory authority for the common good.

21. From the legal point of view, there can be no real ownership rights for numbers. Numbers are regarded as a public resource to be administrated for the common good by the State or the regulatory authority.

Rights of use

While no one is considered as having ownership rights to a number and regulatory authorities have a certain administrative role, those using the number must have a certain level of certainty with regard to the conditions of use of numbers is needed in order for the market sector to work both efficiently and persistently. In the context of numbering, therefore, both network operators, service providers and subscribers may be considered as having Rights of Use of numbers (RoU).

While operators' Rights of Use are important from a macroeconomics and competitive perspective and should be the object of clear and unambiguous rules, it is the individual subscribers' Rights of Use which are more likely to require the intervention of regulatory authorities, both in relation to the confirmation and definition of these rights and in relation to their subsequent enforcement.

22. In the context of numbering, both operators, service providers and subscribers may be considered as having Rights of Use of numbers.

Intellectual property rights

Intellectual property rights are based on the concept of protecting ideas through the original organisation of information and the original contribution made by the owner from data which is sometimes non-proprietary. In most western countries, intellectual property rights have permitted the acknowledgement of ownership rights to telephone directories, to the benefit of the publishers of these directories. These ownership rights are often based on the arrangement, presentation and layout of the particulars and telephone numbers of subscribers.

The characteristics of intellectual property rights make it clear that these rights would not be applicable to a list of telephone numbers if the list reflected no intellectual effort in terms of arrangement, structuring and presentation.

Having said this, the numbering plan to function efficiently, one can foresee the provision of several "non-rights" of subscribers and operators. One such concept would be the absolute prohibition of subscribers (or others) to claim special rights over telephone numbers by means of intellectual property protection laws. This means, for example, that no one should be able to register a telephone number as a trademark and then block the use or publication of the "protected" number under infringement actions should the number be allocated to a third party for legitimate reasons pursuant to the numbering policy.

23. No one should be able to register a telephone number as a trademark.

Consumer protection

Today, it is generally accepted that regulatory action is often necessary to prevent abuses of market power and, thereby, to maintain a balanced, efficient market. The same philosophy of consumer protection regulation, as practised in virtually every other contemporary market, applies equally well to the telecommunications services market. Since consumer subscribers will almost invariably receive their allocated numbers via secondary allocation carried out by a bargaining power other than subscribers, i.e. telephone operators, the subscriber is disadvantaged if certain conditions affecting his rights of use over a number are left at a contractual level, given the vast difference in bargaining power between subscribers and operators.

It is unrealistic to believe that operators, if left totally unrestrained, will systematically offer and/or adopt contractual terms governing the use of telephone numbers that they find disadvantageous to themselves, regardless of the consumer benefit of such clauses, and even in the face of arguments related to market efficiency.

In matters of consumer protection, rights which are frequently conferred have an insignificant effect if the consumers in question are unaware of their rights. As such, and in the spirit of transparency, subscribers should be informed as to precisely what Rights of Use are connected to their telephone number.

24. Rather than leave Rights of Use of numbers entirely at a contractual level between operator and subscriber, regulatory action is preferred to prevent possible abuses caused by the vast difference in bargaining power between subscribers and operators.
25. Subscribers should be informed as to precisely what rights of use are connected to their telephone number.

3.4.2 - Practical aspects

If users were granted ownership rights to numbers, many practical questions would still remain open: ownership of numbers is only conceivable in the context of full number portability being implemented. This is very limited today. Furthermore, no one can guarantee that a given telephone number will never be changed. This issue itself is in contradiction to true ownership rights. In addition to the “owner” of the number, some others externalities also have a share in his number. Taking into account these legal and practical difficulties of number ownership, it seems that the easiest and most logical solution would be to consider numbers as a public resource and to define precise terms and conditions for Rights of Use of numbers. This definition of numbers as a public resource and the allocation of rights of use, which are precarious and revocable, match the particular characteristics of numbers:

- the intrinsic nature of numbers, and in particular the fact that numbers may be considered as a limited resource,
- the externalities associated with numbers, according to which telephone numbers are also inclined to changes of different factors which are independent of the final user of the number.

According to ETNO⁹, the debate on number ownership is probably not so much a legal debate but rather a regulatory one. If numbering schemes can be based on different legal systems, it will be important to establish administrative and management rules that provide all market players with a level playing field and enable competition to develop. In this context, countries will have an important role to play:

- they will have to give the responsibility of numbering and the administration and management of numbering plans to an independent body,
- provide an appeal procedure in case of complaints.

Furthermore, according to ETNO, non-discriminatory allocation of numbers should be the responsibility of NRAs for primary allocation of numbers and the responsibility of operators and service providers, under the supervision of NRAs, for secondary allocation of numbers.

26. The easiest and most logical solution is to consider numbers as a public resource and to define precise terms and conditions for rights of use of numbers.
27. An appeal procedure in case of complaints should be devised.

⁹ ETNO comments on the first interim report of “Non-discriminatory access to numbering resources”, 13 September 1995

3.5 - Aspects of number trading

With regard to **horizontal trading**, two conflicting points of view and controversial opinions emerged during the study:

Those in favour of horizontal trading

Some see telephone numbers as essential facilitators of services. They may form a part of the intangible assets or trademark of services, even if the numbers themselves cannot be registered as trademarks. Even the re-allocation of such numbers may be difficult. According to this view, numbers should be tradable and the reallocation of such numbers should be regulated.

Those against horizontal trading

Others see telephone numbers as common, scarce resources belonging to the community. The process of reviewing these resources will never cease. No real ownership rights can be addressed to any number. Numbers are subject to changes due to the ongoing development of numbering schemes. In consequence, numbering schemes should be free from any restraints that prevent them being modified in the best interests of all concerned. Any real assets should not be addressed to numbers and numbers should not be traded.

Because ownership rights for numbers do not exist, no trading of ownership rights is possible. Instead of horizontal trading, rights to transfer Rights of Use of numbers should be defined.

As regards **vertical trading** and number pricing, some countries have already started to use pricing mechanisms when allocating numbers. Number pricing can be justified by the costs involved in administrating of numbers and also by providing a mechanisms to limit the usage of a scarce resource. There has been no major opposition to the implementation of vertical trading and pricing of numbers.

Legally, the concept of trading is closely related to ownership rights. If no ownership rights exist, no trading, in legal terms, is possible. As previously stated, no one can possess any ownership rights to telephone numbers. Consequently, telephone numbers, in legal terms cannot be traded. Trading of numbers, therefore, may simply be interpreted as 1) the granting of Rights of Use of numbers (RoU) (vertical trading) and 2) the transferring of Rights of Use of numbers (horizontal trading). Instead of defining the terms of number trading, the terms for transfer of RoU should be defined.

28. Instead of defining the terms of trading of numbers, the terms for granting RoU and for transferring of RoU should be defined.

3.6 - Regulatory aspects - Recommendations

Number ownership

In the long run, changes in technology, developments in services, increases in the number of subscribers (especially in developing countries), interworking with other telecommunications networks and other issues may exert such pressure that numbering schemes will have to be changed. This may take a long time - perhaps even decades - but it will eventually become a reality. For this reason, out-dated numbering schemes are currently being reviewed at national and global levels. This reviewing process is a continuous one.

Bearing this in mind, numbering schemes - at global, European and national levels - should be free from any restraints that prevent them from being modified in the best interests of all concerned. This means that no user, service provider or network operator should be given any exclusive rights to a number.

Recommendation 1

National, European and global numbering schemes should be clearly stated as free from any restraints that prevent them from being modified in the interests of all concerned.

As mentioned earlier, if subscribers were to possess ownership rights to their telephone numbers, they would theoretically be entitled to keep their respective numbers in all circumstances and dispose of them as they deemed fit. In practice, this is not the case due to the links between numbers and telecommunications networks. Exclusive rights to numbers cannot be guaranteed because other parties also have a share in telephone numbers. Numbers are considered non-proprietary data to which no register a telephone number as a trademark.

Recommendation 2

Numbers should be considered non-proprietary data to which no particular organisation, institution or individual can claim any ownership. No-one should be able to register a telephone number as a trademark.

Even the rights of the regulatory authority are not true ownership rights. Telephone numbers should, therefore, be regarded as a public resource to be administered for the common good by the State or the regulatory authority.

Recommendation 3

Numbers should be regarded as a public resource to be administered for the common good by the State or the regulatory authority.

Rights of use

Instead of dealing with the term "number ownership", we should deal only with the term Rights of Use (RoU) of numbers. The Rights of Use of numbers should be defined for all parties involved: users, service providers and network operators. The responsibility, rights and obligations of the regulator should also be defined. This should be defined both on a national level for national numbers and on a European level for pan-European numbers.

Recommendation 4

Instead of number ownership, the user's, service provider's and operator's Rights of Use (RoU) of numbers as well as the regulator's obligations and responsibilities with regard to numbers should be defined both on a national and European level.

Trading of numbers

The term "trading of numbers" may be misunderstood as the transfer of ownership rights of numbers from one owner to another. Because no-one can own numbers, ownership rights cannot be traded. Instead of defining terms of trading of numbers, terms of granting RoU and transferring of RoU should be defined.

Recommendation 5

Instead of defining rules for the trading of numbers, rules for the granting of Rights of Use of numbers should be defined. Correspondingly the rights of users, service providers and operators to transfer the RoU should be defined both on a national level for national numbers and on a European level for pan-European numbers.

Vertical trading and number pricing are related to the procedures for allocating numbers. A harmonised procedure for the pricing of numbers throughout Europe should treat European players equally; the problem up to now, however, has been that national conditions and number administrations differ from country to country - this has made it very difficult to propose common pricing procedure throughout Europe.

However, the principle of number pricing should be recommended in order not only to cover the costs of number administration but also to regulate a scarce resource. The pricing procedure should for the time being be left for the respective community to decide upon; i.e. on a national level by NRAs and by ECTRA at the European level. Some harmonisation of number pricing or limits in number charges may be required in the future.

Recommendation 6

Number pricing in relation to the allocation of numbers is recommended in order to cover the cost of number administration and to regulate the use of scarce resources, in particular short numbers. However, the pricing of numbers should be left for the respective community to decide upon; at the national level by NRAs, at the European level by ECTRA.

3.7 - Proposals for common guidelines

In order to facilitate non-discriminatory and transparent access to numbering resources, a set of rules on numbering principles should be defined. This set of rules, referred to here as Numbering Conventions, should define in addition to Rights of Use of numbers at least the following terms: number allocation procedures, withdrawal of numbers, number changes, modification of numbering schemes, reallocation of numbers, rules on audit of numbers, surveillance of number resources, publicity and appeal processes for allocating of numbers. These Numbering Conventions should be defined both at a national level for national numbers and at a European level for pan-European numbers. In order to guarantee harmonised conditions for pan-European competitors throughout Europe, Numbering Conventions should be prepared in a harmonised way by ETO with the assistance of the ECTRA PTN and the ENF. ECTRA should make a Decision on their implementation in CEPT countries.

Proposal 1

Numbering Conventions for national numbers should be implemented in every CEPT country. A proposal for such Conventions should be prepared by ETO¹⁰ with the assistance of the ECTRA Project Team on Numbering and the ENF. ECTRA should make a Decision on these Conventions and on their implementation.

Proposal 2

Numbering Conventions for pan-European numbers should be prepared by ETO¹¹ with the assistance of the ECTRA Project Team on Numbering and the ENF. ECTRA should make a Decision on these Conventions and on their implementation.

¹⁰ A work order for the study on Numbering Conventions has been agreed in principle between ETO and the CEU

¹¹ A work order for the study on Management of an ETNS has been agreed in principle between ETO and the CEU. ETNS Numbering Conventions are considered as a part of this work order

CHAPTER 4 - ACCESS TO CUSTOMERS

“Access to customers” is understood here as a connection between a customer and a network operator. In addition to technical issues such as local loops, which network operators have constructed to the premises of their customers and numbers they have allocated to their subscribers, access to customers may also materialise, for instance, in the commercial relations telecommunications operators have developed with their customers.

In the past, incumbent operators had a monopoly and 100% share of the market. This gave them a strong hold over their customers. This dominant position and strong link with their customers still exists and has its roots a long way in the past. This strong hold may create a barrier for new market entrants.

Access to customers is related to the issues of customer relations, number portability and billing. In this study the main focus is on number portability although some other problem areas have been identified and proposals for new study items will be made.

4.1 - Customer relations

As regards customer relations, it is unclear as to whether telecommunication services differ in principle from any other services or products offered to a customer. In general, in a transparent, competitive environment, regulation should ensure equal circumstances for all players of the telecommunications sector giving them the same chance to enter the market and to obtain impartial and non-discriminatory access to resources. When monopoly sector is being liberalised, the fixed and former customer relations of the incumbent operators may form a barrier for new operators which they will have to overcome. As regards customer relations, however, it is unclear whether there is any need for regulatory intervention.

Example of the importance of customer interface:

In Finland private telephone companies cover 73% of Finnish subscribers while the remaining 27% are connected to the local network of Telecom Finland. Before 1993 the local areas of the telcos did not overlap and each local telco was in a monopoly position in its own concession area. Long distance traffic was Telecom Finland's monopoly area.

When competition was launched in 1993 for long distance calls, the long distance operator Kaukoverkko Ysi Oy (owned by the private companies) was allowed to compete with Telecom Finland. Local private companies (owners of the Kaukoverkko Ysi Oy), using their existing customer relations, succeeded in marketing the services of their new long distance company to their local customers so well that Telecom Finland lost more than 50% of the long distance market in a few months.

29. It is unclear whether telecommunications services differ from any other services or products offered to a customer.

30. The fixed and old customer relations of the incumbent operators may form a barrier for new operators entering the market.

31. It is unclear whether there is a need for regulatory intervention with regard to customer relations.

4.2 - Number portability

Number portability in general and operator portability in particular are important to users because it means that they do not need to be confronted with changes in subscriber numbers and it lowers the threshold level for subscribers to change operator. It is a direct benefit to subscribers who change operator while keeping their number(s) and to users who call those subscribers. It may also prove an indirect benefit to all users because of its stimulating effect on lower tariffs and better service quality because of increased competition.

Portable numbers are important to service providers because through them they can offer services with a unique number that covers the whole market area. These numbers should be independent of the location of the service provision. Operator number portability would also benefit service providers if they could make network operators compete with each other without being forced to change their telephone number.

The following types of portability have to be distinguished between: 1) geographical number portability, 2) portability between operators and 3) portability between services. Portability between services is understood here as number portability between different network services, for example between analogue and digital mobile networks. This study does not consider number portability between different value added services, for example freephone services, shared revenue services etc.

Number portability may also be a combination of these different types of portability.

4.2.1 - Geographic number portability

With geographic number portability the end user retains the same telephone number when moving from one location to another.

Geographic number portability has some clear benefits to users because they are not confronted with number changes when changing their location. However, its direct impact on competition is not very clear. Geographic number portability may be considered a commercial issue for network operators rather than regulatory issue despite the benefits that geographic number portability may give to customers.

Geographical number portability has some impact on the numbering system itself which may need regulatory intervention. These impacts affect to the type of numbers as follows:

1. **Non-geographical numbers** are recognised as having no geographical identity within the numbering area in question. From the user's point of view, non-geographical numbers are currently clearly distinguished from geographical numbers. Non-geographical numbers can be seen as a natural platform for geographical number portability.
2. **Geographical numbers** are recognised as having a clear geographical identity. If geographical numbers are made geographically portable, geographical numbers will no longer exist. All numbers will become non-geographical numbers. By making geographical numbers geographically portable, we destroy the present familiar and user-friendly numbering logic. Before any decisions on geographical number portability for geographical numbers are made, careful consideration should be given to its impact on call tariffs and user-friendly numbering.

In this study, geographical numbering is considered a facilitator of user-friendly numbering and it is proposed that a certain degree of geographic identity in numbering should be maintained. Some minor geographical portability with geographical numbers has always existed, e.g. within the exchange area. In order to maintain this principle of geographical numbering, the area in which geographical numbers should be entitled to be made geographically portable should be defined.

32. Geographic portability has some clear benefits to users.
33. It is not very clear what the direct impact of geographic portability to competition is.
34. The principle of geographical numbering should be maintained.
35. The area in which geographical numbers should be entitled to be made geographically portable should be defined.

4.2.2 - Operator portability

4.2.2.1 - Portability between fixed network operators

Portability between fixed network operators means that end users retain the same telephone number when changing from one network operator to another.

Operator portability has a direct impact on network competition. Through operator portability new network operators are able to offer their network services to all customers without having to ask them to change their number. Users believe they can make network operators compete and consequently collect the fruits of competition.

36. Operator portability in fixed networks has a direct impact on network competition.

4.2.2.2 - Portability between mobile operators

Portability between mobile operators is understood here as portability by which an end user retains his/her telephone number when changing from one mobile network to another, within the same technology (i.e. within GSM technology) or between different technologies (i.e. from NMT to GSM, from GSM to DCS 1800 etc.).

Within the same technology, for example, GSM networks, all network operators have a non-geographic number space within which they can brand their network services.

As regards barriers in entering the market, the situation in the mobile communications sector is different to that of fixed networks. In mobile networks, new mobile operators are now marketing their network services primarily at new customers who have no existing mobile numbers. In fixed networks, new operators focus their marketing on customers of incumbent operators who already have telephone numbers. If customers have to change their numbers when changing network operator, this forms a barrier preventing competition.

Mobile network operators are not very keen on service number portability at the moment, but when mobile penetration is more developed and mobile operators start to look for growth in subscriptions from the market shares of the existing subscriptions rather than from new "virgin" subscriptions, the demand for number portability may become as important as it is in the fixed network today.

Users are already demanding operator portability between mobile operators. Without mobile operator portability, users cannot make different mobile operators compete because they have to change their number.

It seems clear that within the same technology, mobile operator portability has a strong impact on network competition - a short term advantage for users - a long-term one for mobile operators.

Between different technologies, e.g. NMT/GSM, GSM/DCS 1800 the impact of number portability on network competition, call tariffs and user-friendly numbering is not clear. Users are not necessarily very interested in technology. Users may have some benefits if they are able to change from NMT to GSM or GSM to DCS 1800 without changing their number. However, different tariffs in different networks, different coverage areas, user-friendly numbering logic etc. may all be valid reason for opposing number portability between different technologies.

Portability between mobile operators both within the same and between different technologies usually requires some IN-based solutions. These solutions may be new ones used in parallel, overlapping with present solutions or the migration of different existing IN-solutions. So far, no studies exist on these technical alternatives and their management and economical impact. Portability between mobile operators seems to offer benefits both to users and mobile operators and should therefore be supported. However,

final proposals on portability between mobile operators can only be made after further studies have been carried out.

37. In the mobile communications sector portability between mobile operators has a clear impact on network competition.
38. Further studies are needed on number portability between mobile operators. These studies should focus on technical alternatives for implementing number portability, administrative issues and costs and benefits of mobile portability.

4.2.3 - Portability between fixed and mobile networks

Number portability between fixed and mobile networks is understood here as the ability to use present fixed network numbers as mobile numbers or vice versa.

It is not clear what the real demand for this kind of portability is, what its impact on competition might be or what benefits and costs could be involved. Furthermore, as regards the future development of personal telecommunications, Universal Personal Telecommunications (UPT), as presently defined, will make the UPT number independent of network and location. UPT provides the user with a portable number in all kind of networks.

Before any recommendations or proposals on number portability between fixed and mobile networks can be made, further studies on this issue are needed. These studies should investigate the demands, technical alternatives, administrative issues, costs and benefits.

4.2.4 - Technical aspects

Telephone numbers in the present telephone network

In the existing network, the telephone number is an address of the network. Under present circumstances, the number is used for routing purposes to route the call to the called subscriber's network address. If a subscriber wants to change to another operator or geographical address, corresponding to another network address, he/she has to change the number.

Technical alternatives for number portability

The present solutions of number portability are based on different applications of **call-forward technology**. In traditional call-forwarding, for example, the call to the portable number is firstly routed to the original destination exchange. There the call is re-routed according to the new network address of the subscriber. In this solution the call is always routed to the network of the original operator first. In more advanced solutions the call itself is not transferred to the original destination exchange, the new address of the called subscriber is requested by signalling messages and rerouting is carried out in the exchange of the calling party. This is often called a **call-drop-back-solution**.

Common to all these solutions is the fact that the original operator is always involved in receiving calls or signalling enquiries and re-routing calls to new addresses or maintaining the addresses of the ported customer, even if these subscribers have changed their subscriptions to other operators or geographical addresses several times over. It seems clear that call-forward technology does not give a sophisticated and stable long term solution for number portability. Other solutions for number portability are based on the use of IN-technology and modern signalling systems.

Intelligent Network (IN) technology seems to offer a natural platform to number portability because it offers a solution for separating subscribers' personal numbers from their network addresses. So far IN-capability is at a very low level in public telephone networks. Implementation of number portability with IN-technology today involves separate access codes to portability services. Subscribers have to change their existing numbers to have a portable number. However, IN-facilities are included as a natural part of new exchange technology. In the long run, as old technology is replaced with new, the public network will slowly evolve into an IN network and when every call in the future telephone network is firstly routed to the IN database, number portability may become a natural part of public telephone networks.

Taking into account the technical possibilities available and the evolution of technology, the urgent need for number portability can be answered by applying call-forwarding type technology, including call-drop-back solutions. However, as IN-based solutions seem to offer a natural platform to number portability, call-forwarding type technology for number portability should be seen as an important but only intermediate solution and the main focus for the future development of number portability should be based on IN-technology.

39. Call-forwarding type applications should be seen as an important but only intermediate solution for number portability.

40. When considering how to develop number portability in the future, the main focus should be on IN- based solutions.

4.2.5 - Number portability on a national level

4.2.5.1 - Number portability in local loops

Several countries have carried out or are carrying out studies on number portability in local loops (e.g. the UK, the Netherlands, Denmark, France, Finland). Number portability is also included in ETSI NA2 work programme. Several number portability trials are also being conducted. These trials focus on portability between operators only.

Technical solutions for number portability are dependent on the network technology available. In a fully digitalised network with advanced signalling systems, number portability may be more easily implemented than in non-digitalised networks with old signalling systems. Technical solutions, the amount of customers to whom number portability can be offered, management solutions etc. may vary from country to country.

In the UK, according to OFTEL¹², the experiences of number portability are encouraging:

- The UK experience shows that number portability delivers considerable benefits which far outweigh the costs.
- As well as substantial direct benefits, portability will provide very significant indirect benefits, assist greatly in the creation of genuine competition for all categories of customers, driving down prices, encouraging innovation, and raising quality.
- Number portability is technically straightforward to implement using existing switch architecture, does not lead to a loss of functionality, and does not create significant additional network management problems. Successful trials have been completed in the UK and a service is now ready to be rolled out.
- The UK's Monopolies and Mergers Commission has produced an agreed allocation of the costs of portability, in which incumbent and other operators bear 70% of their own costs and recover the remainder from the operators to whom portability is being provided.

Present studies and trials focus on number portability between operators. This enables a customer to change network operator while remaining at the same address. Number portability which also covers geographical portability is being considered in several countries.

41. Technical solutions for number portability depend on the network technology available.

42. In the UK, operator number portability delivers considerable benefits which far outweigh the costs.

¹² Number Portability: A paper by the Office of Telecommunications of the United Kingdom; OFTEL 4 March 1996

4.2.5.2 - Number portability in IN-based services

In European countries IN-based services (e.g. freephone, shared cost, shared revenue services) are operator-based and do not allow number portability between operators. The IN-solutions used enable geographical number portability without any difficulties.

With regard to users, the direct impact of number portability in IN-based services on competition or on non-discriminatory access to services is somewhat unclear. However, some indirect consequences are obvious. If number portability stimulates more efficient competition in services this also gives competition benefits to end users. In addition to these indirect consequences, the issue of user-friendly numbering is important from the user's point of view. If, for example, it is possible to number national freephone services under the same 800 flag, the single service access number is easy to remember and easy to use.

With regard to service providers, the direct impact of number portability on competition is more clear. This is particularly the case with independent service providers who are not network operators. With operator portable numbers these service providers can make network operators compete in providing connections to the service provider.

With regard to administrations, a common access number to some specific services (e.g. freephone) saves numbering resources for service access codes.

Operator portability of IN-based services has a clear, positive impact on competition. Applying operator portability to IN-based services involves some kind of integration of the operator specific databases. As of yet, no detailed studies on the technical and economical aspects of this issue exist. Integration of or co-operation between operator-based databases is a demanding technological task and technical alternatives and costs and benefits should be studied in more detail before any detailed decision on the implementation of number portability of IN-based services is made.

43. Operator portability of IN-based services has a clear positive impact on service competition. Common national service access codes save numbering capacity and are user-friendly.
44. Further studies are needed on the technical, administrative and economical impacts of operator portability in IN-based services.

4.2.6 - Number portability at a European level

It is estimated that a European Telephony Numbering Space for pan-European services will be implemented by 1998 at the latest. The management of the numbering space, including the services and numbers which will be used, the routing of service calls and number portability for pan-European service numbers are being studied in co-operation with ETSI and ETO. It seems clear that pan-European service numbers are non-geographical in nature, and that operator number portability would give benefits to service providers. Operator portability creates a demand for IN-based solution for pan-European services. Studies on number portability for pan-European services should focus on the utilisation of IN-technology.

45. Studies on number portability for pan-European services should focus on the utilisation of IN-technology.

4.3 - Billing

Billing of the customer is a key issue in a competitive environment. At the same time it is a very complicated issue because there are a lot of issues involved: network technology, technical interconnection and agreements needed between network operators and between network operators and service providers / service subscribers.

Traditionally, local operators billed the customer. Customers received only one bill which included all teleservices - including local, long distance and international calls, initiated from their subscriber lines. The old technology did not offer other alternatives for billing. Today, modern signalling systems and the use of the facility of Calling Line Identification (CLI) give network operators more alternatives for arranging their billing. Technology does not necessarily prevent the competitive operator from billing the customer directly any more.

Several options exist for billing the customer. Several alternatives also exist for charging between operators, service providers and service subscribers. All alternatives need an agreement between the operators, service providers and service subscribers.

It is also important for the user that the billing system and the bill itself is understandable, logical and simple. In order to distinguish between different services in the bill, e.g. local calls, long distance calls, international calls, calls to services - particularly premium rate services - some common rules may be needed. Furthermore, it is not clear whether it is of benefit to the customer to receive bills from many operators or not. The average bill of a residential subscriber is rather small. Dividing this bill into several smaller portions increases the billing cost. Moreover, it obscures the total cost of telephony. At worst, the cost of one call may be divided into two or three separate bills.

Billing is not a numbering issue and it is not the main focus of this study. However, some more details related to billing of local, long distance and international calls can be found in Annex 5. Billing is seen in this study as an interconnection issue and should be studied in more detail in this context with other interconnection issues.

46. Billing is more closely related to interconnection issues and should be studied in more detail in this context.

4.4 - Regulatory aspects - Recommendations

Number portability in the fixed network local loops at a national level

It seems clear that operator number portability is a key element in lowering of the competition barrier. Studies on number portability in local networks are being conducted in the UK, Finland the Netherlands and Denmark. According to OFTEL, in the UK number portability delivers considerable benefits which far outweigh the costs. In view of full competition in EU countries by 1998, operator number portability in the local loop between fixed network operators should be implemented in EU and EEA countries as soon as possible and in other CEPT countries using a time schedule which is consistent with the launching of competition in local networks.

Recommendation 7

Operator number portability in the local loop between fixed network operators should be implemented in EU and EEA countries as soon as possible and in other CEPT countries using a time-schedule consistent with the launching of competition in local networks.

As described earlier, number portability based on call-forwarding type solutions, including call-drop-back solutions, can be seen as necessary and urgent but only intermediate solutions. Intelligent Network technology provides a natural platform to number portability and developmental work on number portability should strongly focus on the use of IN-technology.

Recommendation 8

Intelligent Networks provide a natural platform for number portability. Developmental work on number portability should focus on the use of IN-technology.

During discussions on geographical number portability, the question was raised as to whether current geographical numbers should be made geographically portable or not. Geographical numbers have always been geographically portable within a restricted geographical area (e.g. exchange area). If geographical numbers were made geographically portable without any restrictions, no geographical numbers would no longer exist. All numbers would be non-geographical in nature. However, geographical numbers are considered user-friendly and current numbering logic which is based on geographical numbers should be maintained. The area in which geographical numbers can be made geographically portable should be defined.

Recommendation 9

The principle of geographical numbering should be maintained. However, the area in which geographical numbers can be made geographically portable should be defined.

Number portability in IN-based services at national and European levels

New telecommunications services provided by network operators / service operators are usually based on IN technology which allows for geographical portability but not operator portability. Independent service providers regard operator portability as a key to promoting competition. Operator and geographical portability in IN-based telecommunication services seem to have a strong impact on service competition. This will particularly be the case at the European level after the pan-European numbering space is implemented. ETSI and ETO are currently studying number portability in pan-European services. However, no studies exist on the technical and economical consequences of number portability in IN-based services at a national level. A study on number portability of national IN-based service numbers is urgently required. ETSI should be mandated to study operator portability in IN-based services at a national level. This study, together with ETSI's ongoing study on number portability for pan-European services should result in a common model for operator portability of IN-based services to be applied in a consistent way both on a national and a pan-European level.

Recommendation 10

In addition to the current ETSI study on Number portability for pan-European services, ETSI should be mandated to urgently study operator portability in IN-based services on a national level. This study together with the current ETSI study should result in a common model for operator portability of IN-based services to be applied in a consistent way both on a national and a pan-European level.

Operator portability between mobile services

As stated previously, in the mobile communications sector, operator portability between mobile operators has a clear positive impact on competition. However, further studies are needed on technical alternatives for implementing number portability, administrative issues and costs and benefits of mobile number portability.

Recommendation 11

Operator portability between mobile services has a clear impact on competition. Future studies are needed on technical alternatives for implementing number portability, administrative issues and costs and benefits of mobile number portability.

CHAPTER 5 - NUMBERING OF DIRECTORY ENQUIRY SERVICES

This chapter deals with numbering of directory enquiry services. The aim of this study is to find a mechanism to access directory services via telephone network in a manner which is user-friendly, but at the same time ensures competition in services. Present access mechanisms will be described, demands for public access introduced, technical options presented and evaluated and finally a proposal for an access mechanism and its numbering solution will be made.

5.1 - Introduction

Directory services may be seen as one of the most important basic telecommunications services. This is also emphasised in the communication from the Commission of the European Union to the European Parliament, in which the “white pages” of telephone directories are defined as part of the universal service¹³. Easy access to directory services is generally seen as a key issue in the efficient use of directories at both national and European levels.

Telephone directories are supplied to the public in a variety of forms: they are printed as paper directories, distributed electronically on CD ROMs or users are allowed to access directory services via data- or via telephone network. The directory service may be seen as a combination of two elements:

- 1) the service itself
- 2) access to the service.

Access to directory information services can be divided into three parts:

- 1) public access by electronic means (like Minitel in France or Telekom Online in Germany or Internet),
- 2) public access via the telephone network by dialling a directory services telephone number and
- 3) access between service providers.

Figure 5.1 shows the different elements of directory services. The main focus of this study is the access through the telephone network and not considering other possibilities, e.g. paper directories.

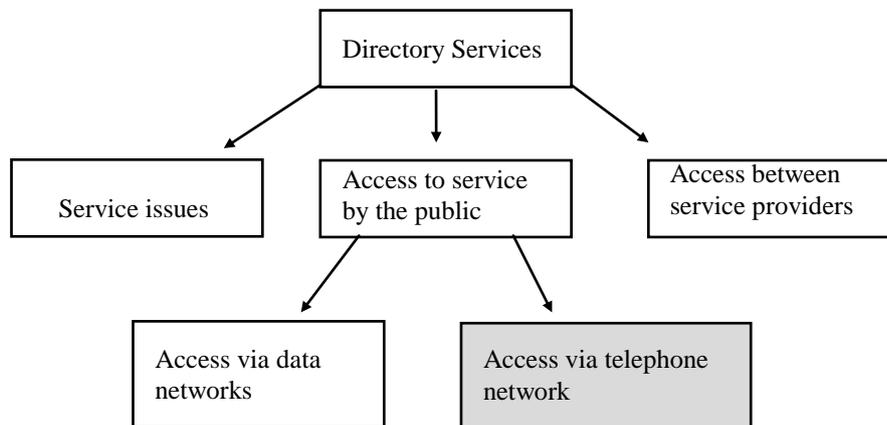


Figure 5.1 Directory Service environment (only the shaded area is covered under this study)

It seems clear that harmonised access to directory services at both national and European levels would facilitate the use of these services. However, directory services are considered competitive services and as such contradict harmonised numbering.

The aim of this study is to find a solution which harmonises access to directory services but maintains the competitive edge of directory services.

¹³ Communication from the Commission to the European Parliament and to the Council: Future development of the market in directories and other telecommunications information services in a competitive environment COM (95) 431 def., 10.10.1995

5.2 - Background of Directory Enquiry Services

Today the directory services of telephone networks are mainly provided by national incumbent operators. Services are based on the use of databases, which are usually national in nature. International co-operation in directory services is based on the exchange of information between national operators of different countries. International co-operation requires directory standards. More detailed information on directory standards and current directory co-operation can be found in Annex 6.

5.3 - Present public access mechanisms for Directory Enquiry Services

Until now, the interface between user and the service providers has been a national matter. CEPT Recommendation T/SF 1¹⁴ deals with a proposal for harmonising access numbers to special services, including the access to national directory enquiries. This Recommendation suggests the use of access number 118 for national directory enquiries "although a master plan still does not exist for national numbering plans". The same Recommendation suggests 112 as a common CEPT emergency number and 115 "as a number for the international operator". The international directory service and any kind of a competitive environment is not explicitly mentioned in CEPT T/SF 1, but the recommendations might be interpreted that international directory services are also covered.

5.3.1 - Situation in Europe

The situation with regard to national and international directory enquiry services in Europe differs from country to country. There is however one common area which applies to all countries: In each country national and international directory services are divided into two different services which can be reached by using different access numbers. In Europe, no single number for both services is currently in use, but one country is at present studying this possibility.

The access numbers used for directory services differ from country to country. The numbers in use derive from tradition, special series for premium rate etc. The use of 118 has not significantly spread throughout Europe - it is used in Finland and Denmark for national services and in Germany in the form 01188.

47. Today, national and international directory services are two separate services.

48. Access number 118 is the only number which is used in more than one country for national directory services.

5.3.1.1 - National Directory Enquiry Services

The access numbers for the national directory enquiry services of different European countries are listed in Annexes 9 and 10. The substantial differences are:

- 1) the access number itself,
- 2) the number length, varying between 2 and 6 digits,
- 3) the service itself; no common service definition exists and each operator has defined his own service and
- 4) the price of the service

In some countries all directory information is stored in one national database. This database can be directly accessed by each national fixed network operator. In mobile networks this is not necessarily the case. Mobile operators have often implemented their own directory services with their own operator specific access numbers. Access from a mobile terminal to common national database with the national access number is not necessarily possible.

In some other countries the subscriber numbers of competing mobile operators are not included in the database of the incumbent fixed network operator. In order to find out the subscriber number of a competing mobile operator it is necessary to dial the directory service number of this operator (if a directory service for mobile operator exists at all). This does not seem to be an appropriate solution for

¹⁴ CEPT Recommendation T/SF 1 (The Hague 1972, revised at Puerto de la Cruz 1974, at Malaga-Torremolinos 1975, at Stockholm 1976 and by correspondence 1990) Long Term Standardisation of National Numbering Plans

users as it may cause confusion since callers do not necessarily know from which directory they may find the numbers in question.

In addition to a common national directory service, which includes all the directory information of all networks, some service providers - mainly mobile - may offer advanced directory enquiry services in their own network for their own subscribers only and usually under a specific short number.

In some countries, like in Sweden and the UK, the obligation of incumbent operators to offer national directory enquiry services is part of the licence of the network operator. In this case all national numbers are included in a national database and this database can also be used by other operators and service providers. These kind of licensing conditions are now being reviewed by the regulatory authorities.

National directory enquiry services are developing from single directory enquiry services to advanced directory enquiry services to meet customer demands. Some of these additional services are:

- call completion / call connect
- special enquiries for business customers
- in addition to information concerning location, also information on fax-, freephone-, mobile- and other subscribers numbers

In some countries involved a “basic service” will be introduced with the price and/or content decided by the regulatory authority.

Based on the data in Annex 9 the following conclusions can be drawn:

49. The access number of national Directory Enquiry Services differs from country to country.
50. The length of the access number for national enquiries varies from 2 to 6 digits.
51. In addition to the common national service with a national access number, some network operators offer advanced Directory Enquiry Services to their own customers with operator-specific access numbers.
52. One directory service provider does not necessarily provide directory data of all network operators.

5.3.1.2 - International Directory Enquiry Services

The same issues discussed above under national directory services also apply for international directory enquiry services.

Based on a study of the more detailed information given in Annex 10, the following conclusions can be drawn:

53. The access number of International Directory Enquiry Services differs from country to country.
54. The length of the access number for international directory enquiries varies from 3 to 6 digits.
55. In most countries today only one operator offers an international Directory Enquiry Service, but some mobile operators are planning to introduce this service in the future.

56. In some countries, in order to distinguish between 1) different countries of destination and/or 2) different languages spoken by the operator, the International Directory Enquiry Service is divided into different parts using different access numbers for different countries/areas of the world.

5.3.1.3 - Cross-border access

With regard to access to directory services, two different cases have to be distinguished between: 1) users wanting to access national or international directory services in their own country and 2) users located in foreign countries wanting to access national or international directory services in their own country through the telephone network.

The first case involves normal access to the directory services of a country. The second case is called “cross-border” access.

Cross-border access using present access codes for national and international directory services is not commonly available in Europe today. This is partly due to constraints caused by selected numbering solutions and partly due to difficulties involved in transferring charging information in international connections. However, some operators have implemented specific solutions for cross-border access to satisfy customers needs.

Example of cross-border access:

Denmark’s national directory enquiry service (national access number 118) can be reached from abroad by dialling +45 1180 0000, where 45 is the country code of Denmark, 118 the national directory service number, followed by 5 zeros to be in line with the Denmark’s 10 digit fixed international numbering format.

“Country direct” services are also used for cross-border access to directory services and allow users located in foreign countries to be connected to operators in their own country. Operators are usually able to connect callers to subscribers and services in their “home country” and often even to subscribers in other countries. This service can only be used if the user has subscribed to the Country direct service or if the called party pays.

ETSI conducted work on cross-border access¹⁵ which was initiated by the European Commission. This work resulted in a report which reached the following conclusions:

1. Home country direct services could be used for cross-border access to directory services.
2. EU member states should make directory enquiry services for national numbers available to users in other member states, who should be able to contact the service by automatic dialling and be charged as for an ordinary international automatic call.
3. A detailed study should be carried out having the scope to determine the requirements for charging cross border calls that are not charged as ordinary automatic international calls.
4. A harmonised numbering plan for service numbers should be introduced to be used for cross-border access to operator/assistance services, directory enquiry services and if appropriate, other telephone services.

5.3.1.4 - Pricing of Directory Enquiry Services

Tariffs for directory enquiry services differ from country to country. In countries where service competition exists, more customer-oriented services and prices have been attained. Tariffs are sometimes not directly related to the service but depend on the access method, e.g. the tariff from the mobile network to a Directory Service Provider (DSP) offered by the fixed network operator is higher than the tariff of the fixed network. In some countries calls to directory enquiry services are free of charge. It should be noted with regard to competition that services provided free of charge impede competing service providers from entering the market if there are no other mechanisms for financing their services.

¹⁵ Draft Technical report DTR/NA-019002 “Intra-community access to operator/assistance services and to directory services”; 9 February 1994

Detailed information regarding tariffs of directory services in certain European countries are listed in Annex 9. Based on this annex, the following conclusions on the pricing of directory enquiry services can be drawn.

- 57. Tariffs vary from "free of charge" to 1 ECU or more per call, depending on the service involved, the service provider, the time of the day and the access means (fixed or mobile).
- 58. Tariffs for access from mobile phones to the fixed networks Directory Enquiry Services are often higher than from fixed network itself.
- 59. Directory services which are free of charge impede service competition.

5.3.2 - Situation outside Europe

Directory services were studied in the USA, Japan and Australia. The directory services of these countries do not differ to a large extent from those in Europe, see Annex 8.

In the US, access number 411 is used for local services (numbers from the Numbering Plan Area, NPA). Services are provided by each local operator through this access number. Directory services of other NPAs can be obtained through the long distance number, NPA 555 1212. International directory services are provided by each long distance carrier using a national freephone number.

In Japan NTT offers national directory enquiry services and operates a national database for this purpose. An international directory enquiry service has not yet officially been offered.

In Australia Telstra (incumbent operator) has been mandated to provide an "overall" national directory service which can be accessed by number 013. The national database includes all PSTN, Mobile and fax numbers. The international directory service can be accessed by number 0101 and each operator is allowed to offer his own service.

5.4 - Demands for public access to Directory Enquiry Services

5.4.1 - General demands

In its communication to the European Parliament and to the Council¹⁶ the Commission of the European Union points out that access to directory information is seen as a key to effective competition. In addition to this, many organisations have stressed the need for a universal telephone directory.

Directory Enquiry services could become a highly competitive market not only for telephone numbers but also for other information like postal addresses, freephone numbers, fax numbers, telex numbers, E-mail or X.400 addresses. In order to give each market player the same opportunities to offer directory services, access to numbering resources should be non-discriminatory in nature.

Easy access to directory services is a prerequisite of efficient use of directories. Easy access in this context may mean a number which is easy to dial and easy to remember. A short number fulfils this requirement.

Today national and international directory services are two separate areas. The possibility of keeping them separate should also be maintained in the future. However, the evolution of separate services into a single one must not be prevented by the numbering solution selected.

¹⁶ Communication from the Commission to the European Parliament and to the Council: Future development of the market in directories and other telecommunications information services in a competitive environment; COM (95) 431 fin; Brussels 10 October 1995

- 60. Easy access to directory services is a key to the efficient use of directories.
- 61. The access number should be short in length and easy to remember.
- 62. Numbering of directory services should allow different access numbers to be used for national and international directory services.
- 63. Numbering systems should allow national and international services to be merged under one single access number if this is deemed appropriate in the future.

5.4.2 - Impact of competition

In a competitive environment, each directory service provider is free to offer directory services, basic or more advanced. With regard to directory services, the European Commission has defined objectives for the provision of a universal service¹⁷. These objectives are: Directories will be seen as part of a universal service, users must have access to at least one complete list of subscribers in each member state, a minimum amount of information is required to compile such a list.

The creation of a “universal” national directory which includes directory information from all network operators, is a demanding technical task and several different alternatives (single or multiple database, distributed database, or combined, sharing of directory information) exist. A single “universal” database may contradict aspects of competition. How can such a database be created? By whom? How can different directory service providers have access to this database? What regulatory actions are needed?

Using one single access number for directory services creates a problem: How can this number be used by several service providers in a competitive environment? Whom will the number be allocated? It may be of the benefit to the user to remember only one universal access number for one complete list of subscribers but it might be better for service providers to have separate access numbers for each operator to allow competition to flourish.

5.4.3 - Demands for harmonised access numbers

The harmonisation of service access numbers is advantageous to users. However, is harmonisation really necessary? The answer depends on the service in question. If a service is well defined, the minimum service features well known to the public, the use of the service is of public interest and the coverage and usage of the service is significantly high, then harmonisation could be considered appropriate.

Do directory enquiry services fulfill these criteria? The service itself and the minimum service features are known to the public i.e. to obtain the telephone number of a subscriber. The Commission of the European Union considers directory services a part of the universal service. Directory services seem to be used in very large extent today. The service usually covers the whole country and is provided in all European countries. New demands exist to also include directory information provided by new operators, both fixed and mobile, in the common national database. Harmonised access numbers for both national and international directory services seem to respond adequately to the criteria at a national level.

Is harmonisation necessary at a European level? As mentioned earlier, directory services are considered essential to facilitating efficient telecommunications. Europe is integrating. “Home market” is changing from a country-market area to pan-European market area. Goods and people are moving freely. It may be seen beneficial to European telecommunications users, wherever their location, to have a common harmonised access number within Europe for such important services as directory services.

Two levels of harmonisation can be distinguished between:

- 1) harmonisation of service access codes. This means that all related services are numbered behind a common code. Harmonisation of access codes helps the user to remember the number range but not necessarily the individual number,

¹⁷ COM (95) 431 def. Communication from the commission to the European Parliament and to the council: Future Development of the market in directories and other telecommunications information services in a competitive environment from 10.10.1995

- 2) harmonisation of numbers themselves. When dialling the harmonised number, the user always gets the same service. Harmonised numbers help users to reach individual services.

The aim of this study is find harmonised numbers for directory services in order to facilitate easy access to services both at a national and European level.

64. Harmonisation of access numbers facilitates the use of the service both at a national and European level.

5.4.4 - Demand for cross-border access

Users usually need access to country-based national or international directory services in their home countries. It is very seldom that users, when located in their own home countries, need direct access to directory services in other countries. It is obvious that the need for cross-border access is not very great for users in their own countries.

The need arises when a user is located in a foreign country. Some examples of the need for cross-border access are shown in Annex 11. For a user located in a foreign country, two alternatives for accessing directory services may exist:

- 1) to access by telephone the national or international directory services provided in the foreign country the user is located in,
- 2) to access by telephone the national or international directory services in his/her own country.

In the first case at least the following problems are identified:

- the access number of the directory services is not familiar to the user
- language problems related to service provision may exist. These problems relate particularly to the spelling of names with characters used only in specific countries, e.g. the Danish letters æ and ø, the German letters ä, ö, ü and ß, the Swedish letter å, the Russian letters, the Greek letters etc.

In the second case, a user could be connected to a service provider in his own country and use his native language. Difficulties mentioned in case 1 can be avoided.

These examples show clearly the demand for cross-border access in directory services. The demand is not quantified. It seems clear that the demand for cross-border access may be on a far lower level, even marginal, to the demand for directory services at a national level. However, it may have a significant importance in the border areas of countries. In general, one can say that the need for cross-border access exist but the need for harmonised numbering procedures is not very clear.

5.5 - Technical alternatives for access mechanisms

It is assumed in this study that the provision of directory services will be completely free for competition. Service providers can be incumbent telephone operators or completely independent entities capable of service provision. The following alternatives were found for accessing directory enquiry services in these circumstances. The abbreviation DSP is used for the term Directory Service Provider.

5.5.1 - Alternative 1: User selects the Directory Service Provider (DSP) on a call-by-call basis

A user selects DSP individually on a call by call basis. In this case the user dials an individual service number of a DSP, for example:

for national services DSP1: abcdef or
 DSP2: bcdefg

for international services DSP1: cdefgh or
 DSP2: defghi

From the user's point of view this alternative provides competition on a call-by-call basis, but provides user-unfriendly numbering because of the lack of number harmonisation.

From the DSP's point of view this alternative provides full competition with the user as the marketing target. It is easy to brand services.

With regard to the telecommunications network, directory services do not differ from other services.

With regard to competition, this alternative provides full and impartial competition.

5.5.2 - Alternative 2: A subscriber preselects a DSP

Subscribers preselect their DSP by informing the network operator of their preselection. In this case subscribers dial a common harmonised service number for directory services, for example

118x for national directory services and
118y for international directory services

The network operator is obliged to route the call to the preselected DSP.

Instead of obtaining preselected DSP, subscribers can of course select the normal service number of any DSP, once these DSPs have subscribed to a normal service number (see alternative 1), for example:

for national services DSP1: abcdef or
 DSP2: bcdefg

for international services DSP1: cdefgh or
 DSP2: defghi

Alternative 2 can be considered as an extension of alternative 1.

From the user's point of view, the subscriber has the freedom to select a competitive DSP, as in alternative 1, through call-by-call selection. In addition to this, this alternative provides the user with the possibility to preselect the DSP. Based on experiences obtained from preselection of competitive Carriers, preselection of services can be considered a confusing and complicated issue for subscribers. Nonetheless, the preselection of DSPs would provide users with a user-friendly and harmonised numbering solution.

From the DSP's point of view this alternative provides competition with some difficulties caused by two different selection mechanisms (preselection with common numbers and call-by-call selection with individual numbers). With this alternative the marketing target is also the subscriber. Preselected services which use number 118x and 118y cannot be branded. Service branding is possible only with individual numbers (call-by-call selection).

With regard to the network, directory services, when preselected, differ from other services. Each call to directory services has to be routed individually depending on subscriber's choice.

With regard to competition, this alternative provides competition both through call-by-call selection and preselection.

5.5.3 - Alternative 3: A network operator preselects a DSP

Under this alternative DSP is preselected by the network operator and not by the subscriber. Access numbers to directory services are harmonised e.g.

118x for national directory services and
118y for international directory services

The network operator routes the call to its preselected DSP.

Instead of obtaining preselected DSPs, the subscriber can of course always select the normal service number of any DSP, once these DSPs are subscribed as normal service numbers (see alternative 1), for example:

for national services DSP1: abcde1 or
 DSP2: bcdef1

for international services DSP1: abcde2 or
 DSP2: bcdef2

Alternative 3 can be seen as an extension of alternative 1.

From the user's point of view preselection by the subscriber is not possible, because it is made by the network operator. However, a subscriber can select DSP on a call-by-call basis. Numbering is user-friendly and harmonised because of preselection.

From the DSP's point of view this alternative provides full competition with some difficulties arising due to two different selection mechanisms (preselection with common numbers, call-by-call selection with individual numbers). The marketing targets of DSPs are the network operators in the case of preselection and the subscribers in the case of selection on a call-by-call basis. The preselected services cannot be branded because of the existence of the common code for directory services (118x and 118y). It may be difficult for an independent DSP to compete for preselection with an incumbent network operator for preselection rights, since the network operator who decides on preselection also in general acts as a DSP.

With regard to the network, directory services do not differ from other services i.e. no individual routing has to be made. Routing is carried out, in principle, in the same manner as with any other services.

With regard to competition, this alternative provides partial competition with restricted competition through preselection but full competition through call-by-call selection.

5.5.4 - Criteria for assessing different alternatives

Before assessing different alternatives, a number of criteria have to be established.

As mentioned before, directory enquiry services are considered as key facilitators of efficient telecommunications. For this reason, easy and harmonised access to these services throughout Europe is of the utmost importance. Easy and harmonised access may involve implementing a number which is structured and short in length.

Directory services are competitive services. When directory services are seen as key facilitators of efficient telecommunications, competition is also a key issue, necessary to allow services to develop and to let services to develop towards cost-based pricing.

Directory services are one group of services amongst a lot of other present and future ones. From the network point of view, directory services should not differ from any other telecommunications services.

The following criteria have been defined:

- 65. The access number to directory services has to be short in length, structured and harmonised (harmonisation).
- 66. Numbering solutions should facilitate an effective competition in the provision of directory services (competition).
- 67. From the network point of view directory services should not differ from other types of telecommunications services (transparency).

5.5.5 - Assessing of different alternatives against the defined criteria

Alternative 1

Alternative 1 provides a competitive environment, it has no special impact on networks but it does not provide any harmonisation for individual numbers. Alternative 1 does not comply with the criterion of harmonisation.

Alternative 2

Alternative 2 provides a competitive environment, as in alternative 1. In addition to this it also provides full harmonisation through preselection. However, implementation of preselection procedure may create problems for subscribers, as has been the case in the preselection of different carriers. Based on 1) the difficulties encountered in implementing preselection in "Carrier selection", 2) the fact that there may be other similar services which might also demand preselection procedures and 3) the complexity of individual routing in present networks, subscriber preselection may involve problems and costs that overweigh its benefits. Alternative 2 complies with the criteria of harmonisation and competition but it does not comply with the criterion of transparency because of the individual preselection of the directory services.

Alternative 3

Alternative 3 provides a competitive environment, as in alternative 1. In addition to this it also provides full harmonisation with preselection. Furthermore, compared with other telecommunications services, no major technical problems exist. It provides partial competition to subscribers through call-by-call selection; competition for DSPs when they can offer services to network operators (preselection) and to subscribers (individual numbers). However, as regards preselection, this alternative does not guarantee the same preselection rights to independent service providers, due to the fact that the bodies in charge of preselection are network operators who are also DSPs. Network operators may prefer their own services over others in preselection procedures. Alternative 3 complies with the criteria for harmonisation and with those of transparent telecommunications services but it only partly complies with the criteria of competition.

Different alternatives and their compliance with the relevant criteria are summed up in the following table:

	Alternative 1 Call-by-Call selection without preselection	Alternative 2 Call-by-Call selection with subscriber preselection	Alternative 3 Call-by-Call selection with network operator preselection
Criteria for harmonisation			
User aspects	no harmonisation possible	full harmonisation possible	full harmonisation possible
Criteria for competition			
User aspects	competition possible with individual numbers no preselection at all	competition possible with individual numbers (as alternative 1) competition possible on preselection	competition possible with individual numbers (as alternative 1) no competition on preselection
DSP aspects	competition possible with individual numbers no preselection at all	competition possible with individual numbers competition possible on preselection	competition possible with individual numbers competition partially possible on preselection, but network operators have some benefits to independent service providers in preselection
Criteria for transparency to other services			
Network aspects	not different to other services	different to other services	not different to other services

When comparing different alternatives, alternative 1 does not comply with the criterion related to harmonisation. Furthermore, the selection procedure for alternative 1 is included in alternatives 2 and 3. We may consider alternatives 2 and 3 as amendments of alternative 1. For this reason we can omit alternative 1 and study alternatives 2 and 3 in more detail.

Alternatives 2 and 3 make harmonisation available through common access numbers, e.g. 118x and 118y. In both alternatives Call-by-Call selection is included and makes competition possible. Differences, however, emerge when one considers preselection. Efficient competition through preselection is possible only with alternative 2 where the subscriber decides on a preselected DSP. In alternative 3 the network operator decides on the preselected DSP. When network operators also act as DSPs, independent DSPs may have some problems enter the preselection market.

Alternatives 2 and 3 differ in relation to other services. Subscriber preselection (alternative 2) forces network operators to route calls individually, depending on the subscriber's decision. Directory services differ from other services due to individual preselection. In alternative 3, preselection is made by the network operator and routing calls do not, in principle, differ from the routing of any other services.

Subscriber preselection may be of interest in carrier selection because it will be used in every long distance call. As regards directory services a user may dial directory service number only few times in a year and implementation of subscriber preselection to such services may be too complicated and costly compared to its benefits.

Because of difficulties mentioned above in individual preselection, alternative 2 may be difficult to implement. These difficulties could be avoided in alternative 3 (network operator preselection) but in this case competition is restricted. Alternative 3 does, however, provide DSPs with the means to offer their services to those network operators who do not have a "universal" directory service of their own. Furthermore, alternative 3 is in compliance with those licensing regimes which oblige incumbent operators to include the directory information of other operators in their database.

68. Alternative 3 seems to be the one which complies best with the selected criteria.

5.6 - Proposal for a model of harmonised access to Directory Enquiry Services

Alternative 3 is chosen as a model for harmonised access to directory enquiry services (Figure 5.2).

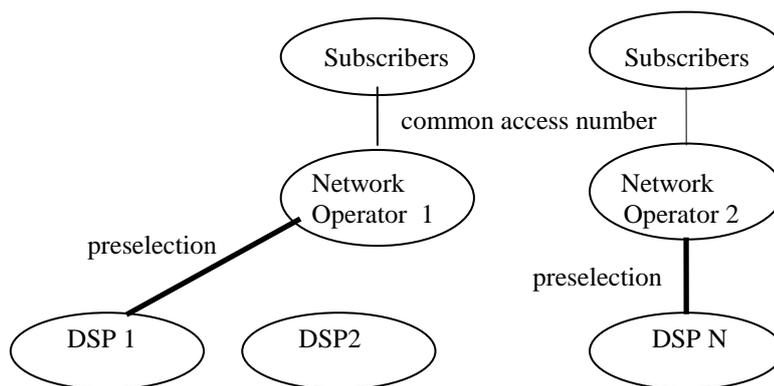


Figure 5.2 Proposed model for harmonised access to directory services using network operator preselection

The subscriber of a network operator selects a common access number (for example 118x or 118y) to directory services. The network operator routes the call to the DSP selected by the network operator. The subscriber cannot preselect the DSP. It is in the operator's interest to provide directory services which fulfill the demands of his customers. In addition to preselection, subscribers in any networks can select their DSP on a call-by-call basis using the normal service number of the selected DSP. All DSPs provide

their service according to their own policy and can arrange interconnection to national "universal" database or shared databases in whichever way they like.

5.7 - Proposal for Access Codes¹⁸ / Access Numbers¹⁹ for Directory Enquiry Services

Two different alternatives exist for the choice of a number range that could be used for accessing directory services within a country. One alternative is the use of a national number space, the other is the use of the pan-European number space ETNS. These two alternatives do not exclude each other.

When using a national number space, two alternatives are possible: the use of an NDC range and the use of a local number range (SN range).

Using an NDC number range

There is no common NDC range which is free in every European country. Before introducing pan-European harmonised access to directory services, it is necessary to make this national number space free in all European countries.

The dialling procedure of an NDC-based access code on a national level is always longer than a number outside a local number range, since the trunk prefix has always to be dialled. From numbering point of view, the use of an NDC number range does not imply any difficulties in accessing the service from abroad.

In countries where a trunk prefix is not in use, the NDC solution could cause some problems with regard to a harmonised dialling procedure.

The task of freeing the same NDC range in every European country is considered a difficult and timely one.

Using local number ranges

Using number ranges from local areas (like 112 for emergency services) could also involve some difficulties for those countries using those access numbers today for other purposes. These countries must also free these number ranges in every numbering area before introducing harmonised access to directory services.

The dialling procedure for local numbers on a national level is shorter than that for the NDC number range because no trunk prefix has to be dialled. As far as numbering is concerned, difficulties arise when using such a local number from abroad. The number does not include any NDC and cannot be dialled from abroad by using the normal international format.

The use of local number ranges does not depend on the trunk prefix and for this reason can be applied in all European countries in the same manner.

Freeing local number ranges in all numbering areas is also a difficult and timely task. However, in connection with the implementation of the European emergency call number 112, in many countries 11x range has also been freed from subscriber use and it is used now for different types of services. Furthermore, based on the CEPT recommendation, access number 118 is used in some countries for national directory services.

Using pan-European number ranges

The European Telephony Number Space (ETNS) has the advantage that when using it, no changes to present national numbers are needed. By using the ETNS number range, the full international dialling format is always required and this implies a longer dialling sequence (for example 003881xx or 003200xx) than that compared to local numbers (for example 118xx).

¹⁸ Access Code: One or more digits at the beginning of a number which identify the type of service. For example in a freephone number 800 123 456, digits 800 form an access code for freephone services

¹⁹ Access Number: A number which, when dialled, provides access to a service. An access number may be shorter than a normal telephone number. For example 112 is considered here as an access number for emergency services.

Conclusions

Based on the following facts:

1. Directory services are considered highly important services essential to telecommunications as a whole
2. The number range 11X has already been freed, in general, from subscriber numbers in EU countries for the implementation of the European emergency number 112
3. The 11X range is used for services in many countries
4. Access number 118 has been recommended by CEPT for directory services and it has already been implemented in some European countries
5. Implementing any other national number ranges - either NDC or SN ranges - would lead to more difficult number changes,
6. The use of a number space from an ETNS for national directory services is considered user-unfriendly because of its lengthy number and international nature

it is recommended that number range 118 be reserved for all directory services in CEPT countries.

69. The number range **118** should be reserved for all directory services in CEPT countries.

5.7.1 - The numbering of national and international directory services on a national level

Based on the selected model for harmonised access to directory services, the following access numbers must be defined: 1) an access number for preselected national directory services, 2) an access number for preselected international directory services and 3) a number range for numbering individual service providers who could be selected on a call-by-call basis.

It was previously proposed that the 118 be reserved for all directory services in CEPT countries. Based on this proposal, the following number structure is proposed:

access number for preselected national directory services:	118x
access number for preselected international directory services:	118y
number range to number individual directory service providers on call-by-call basis:	118zaaa

where 118	= common identifier for all directory services
x	= identifier of national directory services
y	= identifier of international directory services
z	= identifier of competitive service providers
aaa	= a unique identifier to identify the service provider at a national level

The digits x, y and z should be defined, taking into account aspects related to the evolution of service numbering, cross-border access, human factors, general harmonisation of service access codes. It should be noted that when discussing access numbers a service provider might have different levels of services (basic and value added services). These services might be numbered with separate access numbers, e.g. for charging reasons. The structure and length of the aaa identifier is for further study.

5.7.2 - Cross-border access

As was described earlier, the most common use of cross-border access is that of a user in a foreign country who wants to access directory services in his/her own home country. The following alternatives have been discovered:

Using Country Direct Service

The easiest solution is the use of the existing Country Direct Service. In this case, the called operator will connect the calling party to a directory service of his home country. The Country Direct Service is well established and can be used as one way of accessing the home directory services.

Using an international number

Two different methods of using international numbers have been identified: 1) the use of the normal international numbers of a home country and 2) the use of the ETNS.

The use of the normal international number entails the numbering of directory services, in addition to the 118 format proposed earlier, with a normal international number. This is in contradiction with user-friendly numbering, these numbers are difficult to remember and the existence of many different numbers for the same services may cause confusions. Furthermore, international call charges will be used. So far service-related charges cannot be used at international connections.

The use of an ETNS entails numbering directory services, in addition to the 118 format proposed earlier, with an ETNS number. This too in contradiction with user-friendly numbering - numbers are difficult to remember and may cause confusion. However, by using the ETNS a certain degree of harmonisation of access codes could be achieved.

Using 118z numbers

The use of 118z numbers for calls to foreign countries entails the administration of numbers at a European level. In addition to problems of administration, some other problems may emerge (routing, etc.).

As stated earlier, cross-border access is considered important for users. However, the demand for this service has not yet been quantified. This demand may be marginal compared to the demand of directory services in general. Against this background, the Country Direct service, in addition to being of benefit to the user by facilitating the use his "national calling procedures" including the billing of the services on the user's own account, would also be usable for cross-border access of common national directory services. Access to common national directory services should be included in the Country Direct Service.

70. Access to common national directory services should be included in the Country Direct Service.

5.8 - Possible evolution paths

The solution chosen for directory services must allow for the possible evolution from two services (national and international) to one service (covering both national and international services). Possible access from outside Europe has also to be taken into account.

Combining national and international directory services

A possible evolution path is to combine national and international directory services and use only one access number, e.g. 118 for both purposes. Only a few countries are considering such a combination at present. When only one service access number is used for preselection of both national and international directory services, 118x and 118y can be merged into one 118 service without any major problems. However, in addition to having an access number 118 for preselected national and international directory services in parallel with 118z to be used as an access code for individual service providers, some technical arrangements have to be considered in order to distinguish between variable number length (118 and 118zaaa).

Access from outside Europe

Access from outside Europe does not greatly differ to the cross-border access described earlier. Country Direct service, which is widely implemented at a global level could be used to access directory services of the home country. If Country Direct allows for cross-border access within Europe, it should also be usable for calls from outside Europe.

5.9 - Regulatory aspects - Recommendations

Directory services are considered important facilitators of telecommunications. However, before achieving a “universal” directory service, some rules and procedures for establishing and organising a common national database need defining; operators and service providers may be forced to add their directory information data to a common database; the minimum terms of service provision may need to be defined and harmonised within all CEPT countries in order to facilitate the use of common directory service numbers; interconnection arrangements should be negotiated between operators and service providers within Europe; issues such as charging and billing should be studied in more detail.

ETO recommends a model where directory services are divided into two parts: 1) harmonised access to national and international directories using access code/number which is the same in all European countries and 2) access from abroad to directory services in home country by using existing Country Direct services.

This model could provide user-friendly access to “universal” directory services. This model offers also harmonised access to services while still allowing different service providers to compete amongst themselves.

ETO recommends that access numbers for these services be harmonised in all CEPT countries and that all directory services on a national level start with access code 118, without any prefix. This access code should be diallable from all networks, fixed or mobile.

Recommendation 12

It is recommended that access code 118 be reserved for all directory services in all CEPT countries. This access code should be diallable from all networks, fixed or mobile.

In order to allow competition between different directory service providers and to obtain user-friendly numbering with harmonised access codes, it is recommended that each network operator preselect the directory service provider for national and international directories. Directory service providers should be able to reserve an individual access number to be used for call-by-call selection.

Recommendation 13

It is recommended that each network operator preselect a service provider for directory services.

Each directory service provider should be able to reserve an individual access number to be used for call-by-call selection.

In order to harmonise directory service numbers throughout Europe, access number 118x should be used for preselected national directory services and access number 118y for preselected international directory services. At the same time individual access numbers for directory service providers should be numbered behind access code 118z.

Recommendation 14

Access number 118x should be reserved for national directory services in all CEPT countries.

Access number 118y should be reserved for international directory services in all CEPT countries.

Access code 118z should be reserved for the numbering of individual directory service providers.

Further studies are needed to define digits x, y and z in Recommendation 14. These studies should take into account aspects related to the evolution of service numbering, future demands for cross-border access, issues related to human factors, general harmonisation of service access codes, the possible evolution towards one common access number while still retaining the possibility for individual call-by-call access through numbers beginning with 118z.

Recommendation 15

Studies are needed to define which digits should be used behind access code 118 for 1) preselecting national directory services 2) preselecting international directory services and 3) numbering of individual service providers for call-by-call selection.

To facilitate cross-border access, a Country Direct service should allow cross-border access to all the directory services of the home country.

Recommendation 16

For the purpose of cross-border access, the access from abroad to directory services in home country should be included in the Country Direct Service.

CHAPTER 6 - DCC / DNIC ALLOCATION PROCEDURES IN EUROPE

6.1 - Numbering of Data Networks

6.1.1 - Data Country Codes (CCs) and Data Network Identification Codes (DNICs)

Data Country Codes (DCC) and Data Network Identification Codes (DNIC) have been specified at a Global level in ITU-T Recommendation X.121²⁰, Figure 6.1.

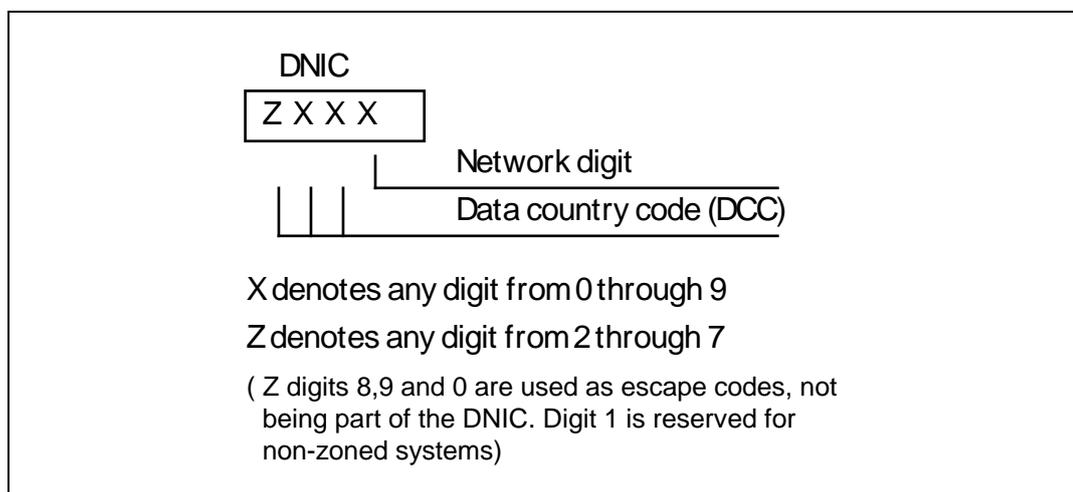


Figure 6.1 Structure of a DNIC as described in Recommendation X.121

The system of Data Network Identification Codes (DNIC) will provide globally for 600 Data Country Codes and will have a theoretical maximum capacity of 6000 DNICs. For Europe, it will provide a maximum of 100 DCCs and 1000 DNICs.

The status of allocated DCCs and DNICs in 95 and 96 are given below²¹:

Status on	DCCs	DNICs
31 January 1995	67	149
15 January 1996	68	162
Growth in 1995	+1	+13
Reserve in 15/1/1996	32	838

Table 5.1. Allocated DCCs and DNICs in Europe in 1995 and 1996

From the table it is seen that on average, only 2.4 DNICs out of a maximum 10 are allocated within a DCC. This means that in general, a large amount of DNIC capacity is available within present DCCs.

6.1.2 - International data number

A data terminal on a public data network when called from another country should be addressed by the international data number assigned to its DTE/DCE (Data Terminal Equipment / Data Circuit Equipment) interface. The international data number should consist of the Data Network Identification Code (DNIC) of the called public data network, followed by the Network Terminal Number (NTN) of the called DTE/DCE interface, or, for example, where an integrated numbering scheme exists within a country, the Data Country Code (DCC) followed by the national number (NN) of the called DTE/DCE interface.

²⁰ CCITT Recommendation X.121, 09/92, ITU 1993

²¹ ITU Operational Bulletins No. 589 - 1.II.1995 and No. 612 - 15.I.1996

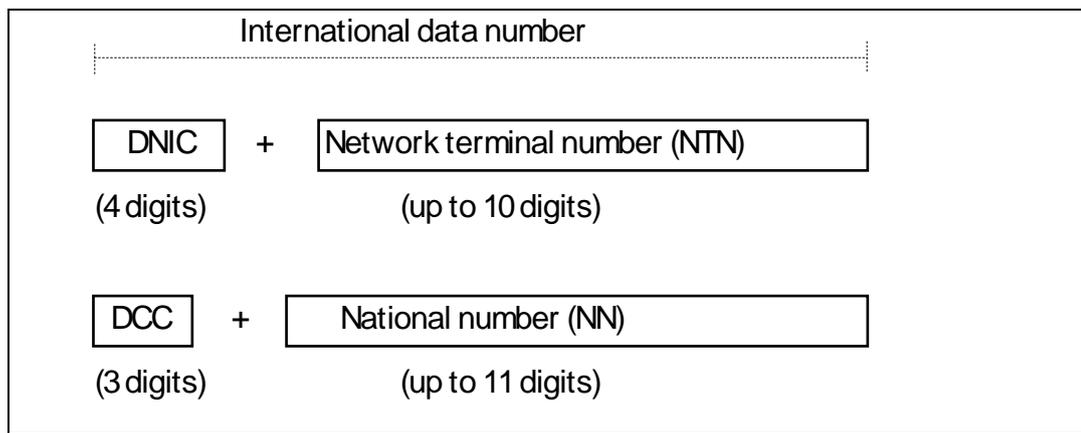


Figure 6.2 Structure of an International data number as described in Recommendation X.121

6.1.3 - Private data Network Identification Codes (PNIC)

A Private data Network Identification Code (PNIC) is assigned to each private data network contained within a group of private data networks identified by a specific DNIC. The Private data Network Identification Code (PNIC)-digits are the first digits of the NTN. A PNIC may also be used to identify a specific public data network within a group of public data networks sharing a common DNIC.

All Private data Network Identification Codes (PNIC) consist of up to six digits. The format for the PNICs is as in Figure 6.3:

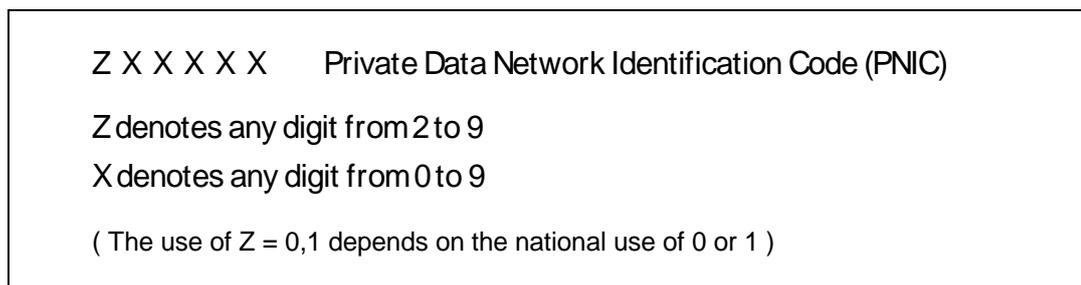


Figure 6.3 Structure of a PNIC as described in Recommendation X.121

6.2 - Administration of DCC / DNIC / PNIC

The assignment of Data Country Codes (DCC) is administrated by the ITU. Network digits will assigned nationally and the ITU-TSB will be notified of all such assignments..

Assignments made by the Director of TSB of the ITU of Data Country Codes (DCC) as well as assignments by countries of the network digits will be published in the Operational Bulletin of the ITU. The DCCs allocated for European countries and the list of allocated DNICs are in Annex 13 (position 30.06.1996).

Private data Network Identification Codes (PNICs) are administrated at a national level.

6.3 - Development of standard X.121

ITU-T Study Group 7²² has amended the Recommendation X.121. The amendments reflect the need to use DCC and DNIC capacity more efficiently and to facilitate the sharing of DNICs. The following points have been agreed within ITU-T:

²² ITU-T SG7 meeting in Geneva, 15-26 April 1996, Com 7-293-E

- Use of Private data Network Identification Codes (PNICs) for the development of network terminal numbers for a group of public data networks or for a group of private data networks connected to public data networks
- Guidelines for the structure of variable length PNICs
- Guidelines on the Numbering of Private Data Networks: Use of PNIC structure for private X.25 networks not attached to the PSPDN
- Recommendations for the Efficient use of DCCs to create DNICs

6.4 - Present situation in Europe

The following analysis is based on information received from different countries (for detailed information see Annex 12). Only a few countries have written procedures for allocating DNICs. Written information was available on the UK, the Netherlands, Germany and Belgium. Norway, Sweden and Switzerland are currently developing procedures. Though only a few written rules for allocation exist, the practical allocation procedures in countries studied do not differ in any substantial way.

6.4.1 - Criteria for allocating DNICs

General terms

Allocation procedures for DNICs are based on ITU-T Recommendation X.121. DNICs are allocated to public data networks. The definition of public data networks differ slightly from country to country but in general it means a service offered to third parties, to any customer, for sale. The applicant shall provide existing or planned national and international interconnection arrangements to other DNICs.

Registered DNICs

All applicants complying with the terms are allocated a registered DNIC. A Registered DNIC is a DNIC registered in the ITU. National authorities inform the ITU-T of DNIC allocations. The ITU-T is publishing a list of allocated DNICs in the ITU Operational Bulletin.

Latent DNICs

In the UK, DNICs are also allocated to networks which do not at present meet the criteria for obtaining registered DNICs but which plan to do so and are likely to become networks which will qualify for registered DNICs in the foreseeable future. These DNICs are registered only in the register of the national authority and not within ITU.

6.4.2 - Sharing of DNICs

Only very few networks are likely to use all or most of the numbering resources of a DNIC.

In the UK, Norway and the Netherlands, the applicant is allocated only part of a DNIC, usually one tenth or several tenths of the DNIC. The remaining space may be assigned to other parties who may then share the DNIC with the first DNIC holder. In these cases the applicant can be addressed with 5 digits. In Denmark the applicant will be allocated a three digit code after the DNIC. In this case the applicant can be addressed with 7 digits.

71. At present, only a few countries have reserved rights to allocate shared DNICs.

6.4.3 - Validity of an assignment

In Ireland, the Netherlands, Switzerland and Norway an assignment is granted for five years. At the end of an allocation period, a DNIC may be reallocated on demand by the applicant, if the application still meets the criteria of DNIC allocation. In most countries there are no time limits on the validity of the allocation.

72. In some countries DNIC assignment is granted for five years. DNICs may be reallocated on demand if the applicant still meets the criteria.

73. In most countries no time limits exist with regard to validity of a DNIC.

6.4.4 - Withdrawing DNICs

In Ireland the regulator reserves the right to recover a DNIC from any Service Provider who ceases to operate a network for which a DNIC has been assigned or who has been found to be in breach of these conditions. In the UK, Ofcom reserves the right to recover a DNIC from any operator who ceases to operate a network for which a DNIC is required. In the Netherlands, the Minister can withdraw a DNIC at the request of the DNIC holder or when the DNIC holder does not comply with the instructions. In Switzerland, OFCOM withdraws the allocation of a DNIC if the applicant ceases to offer data transmission services to third parties.

74. Withdrawal is usually made when:

- requested by the DNIC holder
- the DNIC holder ceases to operate a network for which a DNIC has been assigned
- the DNIC holder does not comply with the given instructions.

6.4.5 - Reassigning DNICs

In Ireland the regulator reserves the right to reassess DNICs or number ranges subject to 12 months notice to the affected Service Provider.

6.4.6 - Publicity

In the Netherlands any assignment of a DNIC or DNIC numbering space is timely published.

6.4.7 - Pricing of DNICs

DNICs are priced only in Denmark and Finland. Norway and Switzerland are likely to price DNICs in the near future. In most of the countries studied, DNICs are allocated free of charge. In the Netherlands, the UK, Belgium and Sweden the pricing of common resources are against the present rule or legislation. Examples of DNIC pricing in a number of European countries are given in Annex 14.

6.4.8 - Problems related to the allocating of DNICs

Capacity problems:

Capacity problems are twofold: Firstly, DNICs are finite resources and a mechanism should be developed to prevent this resource being exhausted. Secondly, allowing an international service provider to use the same DNIC in several countries would safeguard resources, but at the same time it might lead to DNICs being exhausted in some countries if a number of international service providers were to apply for DNICs in the same country.

Pricing problems:

DNIC pricing is a national matter. The question generally asked, however is, should a DNIC be priced or not. If pricing was introduced and some countries still provided DNICs free of charge, international service providers might favour "free-of-charge" DNICs rather than priced DNICs. This could lead to capacity problems such as those described earlier and to shortages in codes in certain countries.

Sharing problems:

The sharing of DNICs may also cause problems. When the capacity of one DNIC is shared between several data networks, one of those networks must be responsible for the entire DNIC and must take charge of issues related to interconnection and interoperability. Service providers having a shared DNIC may not be in an equal position to the holder of a "full" DNIC when billing the customer.

The sharing of DNICs seems to be an issue which requires agreement between the service providers themselves. Nonetheless, some regulatory actions or considerations may be needed.

Other problems:

Under present recommendations, DNICs are allocated to public data networks. It has been questioned whether this is too restrictive or not. Taking into account the fact that

- 1) DNICs are a public, scarce resource,
- 2) the purpose of a DNIC is to facilitate data transmission and interconnection to other datanetworks on a global level,
- 3) private networks can be numbered with PNICs and
- 4) there are no technical restrictions with regard to who can provide datatransmission service and to whom a DNIC can be assigned

no evidence has been found proving that allocation of DNICs for public datanetworks would be restrictive.

6.5 - Situation outside Europe

The situation outside Europe does not greatly differ from that inside Europe. DNICs are used according to X.121 Recommendations.

In zone 3 (North America, Caribbean, Mexico etc.) a total of 36 DCC and 97 DNICs were assigned by the end of 1995²³. The filling rate of DCC was then approximately 2,7 DNICs per one Data Country Code.

In zone 2 (Europe) a total of 68 DCC and 162 DNICs were assigned resulting in a filling rate of approximately 2,4 DNICs per one Data Country Code.

6.6 - Demands for pan-European DNICs

As described earlier, some countries price DNICs whereas in other countries DNICs are free of charge. Service providers throughout Europe, who apply for a DNIC for their network, might prefer to apply for free of charge DNICs to countries where DNICs are not priced. This could lead to problems of exhausted DNIC capacity in those "free of charge" countries.

If, on the other hand, service providers throughout Europe were to apply for one DNIC from every country, this would also lead to a problem of exhausted capacity, because one applicant would be allocated several DNICs - in the worst possible case, tens of DNICs.

At present some service providers have already been assigned DNICs in several countries.

In the ITU-T, a draft proposal for recommendation X.121 defines three scenarios for the numbering of global networks:

Scenario 1.

The global network consists of a number of sub networks, each identified by a DNIC appropriate to the country or geographic region in which the sub network operates.

The DNICs are allocated in accordance with the national laws of the countries or geographical regions in which the networks operate.

Scenario 2.

The global network consists of a number of sub-networks spanning a number of countries or geographic regions. A single DNIC is used to identify the network. The DNIC used is allocated from one of the countries/geographic regions in which the network operates.

Scenario 3.

The global network consists of a number of sub networks spanning a large number of countries or geographic regions. A single DNIC is used to identify the network. The DNIC used is from the

²³ ITU Operational Bulletin No. 611 - 31.12.1995

series specifically allocated to Global Networks according to the eligibility criteria and allocation procedures detailed in Recommendation X.121 Annex F.

Scenarios 1 and 2 present the status quo today. Scenario 3 is a new one and it may be questioned whether it is needed or not. However, the criterion of eligibility, as regards the allocation of Global DNICs, severely restricts the allocation of global resources to only those cases where there is a clear technical benefit in using a single DNIC from the global network series to identify the network and where there are no other reasonable technical alternatives available. Furthermore, it must be possible to demonstrate that the allocating of the code is the most efficient and effective method of identifying the global network.

It would appear that the routing of data-calls is based more on DNICs than on the Data Country Codes. Furthermore, in data networks one country may have several unique country codes. DCCs are losing their country-specific identity and they are used more or less for administrative purposes.

When viewing the capacity of DCCs and DNICs available within Europe at present and the annual growth of DCCs and DNICs, it seems that problems of capacity are over-estimated today. DCC and DNIC resources are scarce but the present actions being taken at a global level within ITU seem to ensure that this resource will not be exhausted. Taking into account the fact that

- 1) the routing of data-calls is based more on DNICs than DCCs,
- 2) DCCs do not carry a country identity such as Country Codes in telephone network and
- 3) the present actions taken in ITU seem to solve the resource problem

it can be concluded that so far the need for DCCs or DNICs specifically for Europe has not been identified.

75. So far, a need for European DCCs and European DNICs has not been identified.

6.7 - Regulatory aspects - Recommendations

In order to avoid problems of exhausted DNIC capacity, NRAs should reserve capacity for shared DNICs.

Recommendation 16

NRAs should reserve capacity for shared DNICs.

The procedure whereby a service provider is allowed to use a DNIC allocated in one country for use in another country, in addition to the right of an NRA to refuse DNIC application when other alternatives exist, would solve the pricing and exhaust problems described previously. For this reason we conclude that NRAs should have the right to refuse allocation of DNICs to applicants in cases where other reasonable alternatives exist and where use of these DNICs would not result in any clear technical or economical benefits.

Recommendation 17

NRAs should have the right to refuse DNICs to applicants unless there is a clear technical benefit in using the national DNIC or no other reasonable technical alternatives exist.

While having the right to refuse an application, NRAs should at the same time be obliged to allow service providers, who have been allocated DNICs from other countries / global resources, to use these DNICs in their countries according to the rules of the NRA.

Recommendation 18

NRAs should be obliged to allow service providers in the country using DNICs allocated from other countries or global resources to use these DNICs according to the rules of the NRA.

Until recently, DNIC pricing has been a matter of national regulation. Any harmonisation of DNIC pricing may have some drawbacks. Proposals for the harmonising prices should be prepared very carefully. As regards DNIC pricing, no real need for harmonisation has so far been found. DNIC pricing should be left for NRAs to decide upon.

Recommendation 19

DNIC pricing should remain a national matter.

In a competitive environment, DNICs may be of some strategic value to service providers. Code allocation should be made in a fair, impartial and non-discriminatory manner. Similar to a proposal for the preparation of Numbering Conventions for telephone network, such Conventions should also be created for the numbering of data networks. These Data Network Numbering Conventions should define criteria for the allocating of DNICs, the sharing of DNICs, the validity of assignments, the withdrawal of DNICs and the reassigning of DNICs. Furthermore, the terms for refusing an application should be based on the criteria specified in Data Network Numbering Conventions.

Recommendation 20

The rules for the allocating of DNICs, rights of use of DNICs as well as the terms for refusing applications should be defined in Data Network Numbering Conventions.

6.8 - Proposals for common guidelines

Based on the recommendations made above, it is proposed that in order to harmonise the procedures within European countries, Data Network Numbering Conventions should be developed by ETO with the assistance of ECTRA PTN and ENF. ECTRA should make a Decision on these Conventions and their implementation in CEPT countries.

Proposal 3

Data Network Numbering Conventions should be prepared by ETO with the assistance of the ECTRA PTN and the ENF. ECTRA should make a Decision on these Conventions and on their implementation in every CEPT country.

Annexes

Annex 1 Work Requirement

1. Subject: Non-discriminatory access to numbering resources

2. Purpose

The work order covers the work that European Telecommunications Office (ETO) will conduct on behalf of the European Commission in the important area of numbering of telecommunication services. This Annex focuses on the topic of non-discriminatory access to numbering resources.

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. Non-discriminatory access to numbering is an important issue in this context.

In view of the increasing competition and in order to achieve harmonisation across Europe, the definition of clear guidelines is deemed a necessary pre-requisite to harmonise the regulatory regime in Europe with an overall aim to ensure equal access to the market for all market participants.

A "best practice" guidance for NRAs on the administration and control of the national numbering schemes needs to be prepared.

4. Work requirement

- (1) to examine issues of customer ownership, number ownership and tradability of numbers. To make proposals for common guidelines.
- (2) to examine harmonised / competitive directory enquiry service facilities in telecommunication networks, taking into account of the competitive and user-friendliness implications and access to directory services across national borders. To make proposals for common guidelines.
- (3) To examine the DNIC and DCC allocation procedures and use of pan-European DNICs. To propose guidelines on pricing of DNICs and on criteria for allocation of DNICs. To propose procedures for allocation of European DCCs.

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 May 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 related to 1) customer and number ownership and trading of numbers, 2) directory enquiry services and 3) DNIC/DCC allocation procedures. The first interim report will be delivered approximately 1 April 1995.

The second interim report shall contain findings and proposals and shall be delivered approximately 1 September 1995. 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 May 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 8 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 2 manmonths

Annex 2 List of abbreviations

AUSTEL	Australian Telecommunications Authority
CC	Country Code
CEPT	European Conference of Postal and Telecommunications Administrations
CERP	European Committee on Postal Regulation
CEU	Commission of the European Union
CN	Corporate Network
DCC	Data Country Code
DES	Directory Enquiry Service
DNIC	Data Network Identification Code
DSP	Directory Service Provider
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
EDF	European Directory Forum
EEA	European Economic Area
EIDQ	European
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
ETSI	European Telecommunications Standards Institute
ETSI STC NA2	ETSI Sub Technical Committee Network Aspects 2
EU	European Union
Eurescom	European Institute for Research and Strategic Studies in Telecommunications
FCC	Federal Communications Commission
GSM	Global System for Mobile Communications
IN	Intelligent Network
ITU	International Telecommunication Union
ITU-T	Telecommunication Standardization Sector of ITU
MoU	Memorandum of Understanding
NANP	North American Numbering Plan
NDC	National Destination Code
NNS	National Numbering Scheme
NRA	National Regulatory Authority
OFTEL	Office of Telecommunications
RoU	Rights of Use
UPT	Universal Personal Telecommunications

Attachment 1 to Annex 3

Annex 4 Numbering administration in Australia, the US and Japan

Australia

Numbering administration

AUSTEL (Australian Telecommunications Authority) is responsible for numbering issues in Australia.

Allocation of numbers

Austel has a legal responsibility to administer number allocation. Telecommunications numbers are regarded as a national resource and are not in any sense owned by any party to whom they are allocated. Operators, service providers and users who receive the numbers through the allocation process are considered as holding rights of use. There are three levels of allocation in Australia: Primary, secondary and tertiary allocation.

Primary allocation

Numbers are first assigned by AUSTEL to individual operators and service providers.

Secondary allocation

Numbers are allocated by operators and service providers to their subscribers from within their own allocated blocks.

Tertiary allocation

Numbers may be allocated to subscribers by individuals or organisations having received them through a secondary level allocation. For example, this would appear to be the case for value added service providers who make advantageous commercial arrangements with the operators that have received numbers by primary allocation. This would most likely interest small businesses that may not be eligible for being allocated blocks of numbers directly from AUSTEL. Some limitations exist regarding the manner in which allocated numbers may be used.

Allocation of numbers to subscribers

Numbers are allocated to subscribers either via secondary or tertiary allocation. Allocation is carried out according to the internal policies of the operators and service providers.

Reallocation of numbers

In Australia there is generally a minimum of six months between the return and reallocation of a number. The period may be shorter in certain exceptions. In some instances, the number may immediately be reallocated to a new customer who, from that moment on, holds the rights of use to the number.

Opposition to reallocation:

Subscribers must approve the reallocation of a number before the end of the six month period after the return of the number.

Modification of numbers by the allocator

Allocators (including AUSTEL, operators and service providers) may only withdraw numbers which they have allocated for specific and limited reasons.

AUSTEL may recover numbers for the following reasons:

- under-utilisation of numbers allocated,
- an allocation of numbers which is inconsistent with the National Numbering Plan,
- a breach of condition of allocation
- the carrier or service provider agrees to AUSTEL's recuperation of previously allocated numbers
- AUSTEL automatically recovers numbers when a service provider or carrier ceases operation

Operators and service providers may only modify a number allocated to a subscriber under the following conditions:

- the National Numbering Plan prescribes a change of number,
- the number modification avoids a problem of costly equipment replacement,

- a number was allocated erroneously and may endanger significant technical or administrative difficulties,
- the subscriber requests a number change,
- the operator or service provider demonstrates to AUSTEL an acceptable justification of the number change

When operators and service providers change or withdraw numbers from subscribers, they are required to give a notice period which is at least equivalent to the length of time the subscriber has used the number, but not necessarily longer than one year. Shorter notice periods may be provided in the following circumstances:

- the number is not in use,
- an erroneous allocation was made,
- the customer requests a number change
- the customer breaches the contractual terms for the use of the number or provision of telecommunication service,
- the operator or service provider ceases to offer the category of service for which the National Numbering Plan prescribes the use of the number,
- the customer does not subscribe within a reasonable period of time to the service for which the number was allocated,
- a temporary allocation was made,
- the operator or service provider demonstrates to AUSTEL that a shorter notice should be offered

Operators and service providers are required to provide the subscriber with a transition period in which he/she shall have access to both the old and new numbers while the number is being modified, except where the modification was requested by the subscriber or where such access would involve unreasonable technical or financial costs.

Trading of numbers

There is currently no formal number trading system in Australia (October 1992)²⁴. AUSTEL's belief is that trading of numbers requires

- Well defined rights of use of numbers
- Clear number portability rules
- A clear understanding of the technical and operational constraints that may exist for use of traded number

Pressure is likely to be strongest in the area of premium/special numbers. However, there may be some demand for the trading of even "ordinary" numbers because of an organisation's or individual's attraction to a certain number.

If trading in numbers is accepted in principle, a number of issues may arise:

- What restrictions, if any, should be imposed on number ranges that can be open to trading
- What administrative support structures need to be implemented to support trading?
- Who should maintain these administrative systems?
- Who should pay for them?

AUSTEL says that to allow trading without an administrative support structure which identifies the rights of use of numbers would lead to chaos. An administrative system could introduce a form of certified title which would ensure that trading activities were not open to fraud.

In Australia the tradability concept was addressed in a call for public comments; however, no regulations were proposed in the final draft of the national numbering policy. It is recommended that where the transfer of a number between organisations or individuals is planned, the affected organisations or individuals should obtain prior advice from the relevant operator or service provider implementing the transfer; transferability is possible according to the policies of operators and service providers, but it is not an automatic right of the subscriber.

²⁴ Austel: Australia's Telephone Number Plan. A discussion paper on numbering administration issues, October 1992

United States of America

Numbering administration

The US presents a slightly different case than that of the other countries referred to in this study. In order to understand the applicable numbering policies, it is useful to examine the development of the current telecommunications system/market. Until the 1980's, ATT held a monopoly on practically all telecommunications services across the country. Under the pressure of actions brought by would-be competitors and the US Justice Department under anti-trust laws, this system was dismantled by the courts. This process remains incomplete and under court supervision.

Under the system which has developed, AT&T services have been broken up into a group of smaller regional companies, the so-called "Baby Bells" or Regional Bell Operating Companies (RBOCs). Under this plan, some services were opened to competition, but the RBOCs were granted monopolies for almost all local fixed point services by State (rather than federal) legislatures and regulatory authorities. The important long distance market, however, was opened to competition and the RBOCs were prohibited from offering such service under the federal judicial divestiture order.

Allocation of numbers

Given this market development, the allocation of numbers to subscribers has continued to be carried out according to the previously existing plan for local services. Long distance services are provided independent of allocated numbers, with out-going calls being either directed to a long distance carrier directly by the relevant RBOC, which is prohibited from providing such service (according to a carrier selection made by the subscriber), or by access codes dialled by subscribers from any location other than from where the subscriber places the call.

Long before the divestiture, AT&T developed and administered the "North American Numbering Plan" (NANP). The NANP telephone numbers are 10 digits in length, and are composed of three parts:

- 3 digit Numbering Plan Area (NPA) code or area code,
- 3 digit central office code
- 4 digit line number

The NANP number format is NXX NXX XXXX, where N is any digit 2-9 and X is any digit 0-9.

The NANP covers 18 nations and administrates not only geographic "area codes" but also service codes ("800", "900", "N11" and carrier access / carrier identification codes). The administrator of NANP is responsible for the allocation of numbers, pursuant to an application procedure on the part of operators, which is based on "industry consensus procedures". These procedures are demonstrated by the role of inter-industry groups such as the Industry Numbering Committee and the Future of Numbering Forum, in determining numbering policy.

Roles of the various groups involved in number administration²⁵

When AT&T introduced the NANP in 1947, they established a two-level administrative structure. AT&T itself administered NPA codes centrally, and the local exchange carriers administered the central office codes and line numbers within their service areas. Coincident with the divestiture of the Bell system in 1984, the Court assigned AT&T's responsibility for central number administration to Bellcore. Bellcore's role includes assignment of NPA codes, carrier identification codes, and other numbering resources that lend themselves to centralised administration. The Bellcore group responsible for central administration is known in the industry as NANPA, short for NANP Administration.

Although seven-digit local telephone numbers are administrated by local exchange carriers, Bellcore's Traffic Routing Administration (TRA) group maintains a database of central office code assignments, and publishes this information in many forms for use in the industry.

NANPA assigns many of the resources under its control using industry-consensus assignment guidelines developed by the Industry Numbering Committee (INC), a standing committee of the Industry Carriers Compatibility Forum.

²⁵ North American Numbering Plan, Numbering Plan Area Codes - 1995 Update; Bellcore letter IL 95/01-018, 31.1.1995

The Federal Communications Commission has asserted plenary jurisdiction in numbering and maintains a strong interest in numbering issues.

As described earlier, as part of the divestiture plan, the administration of the NANP was transferred to Bell Communications Research (Bellcore), an entity wholly owned by the RBOCs. Since 1992, the Federal Communications Commission (FCC) has carried out a public inquiry as to the future of the NANP, since ultimate regulatory authority over US telephone numbers rests in the hands of the FCC. In the meantime, Bellcore has indicated that it no longer wishes to administer the NANP. The FCC has, however, indicated that given the efficiency advantages of the internationally integrated numbering system, it prefers to leave the NANP's administration, to the greatest extent possible, in the hands of a non-governmental entity, avoiding possible conflicts between national regulatory authorities.

Trading of numbers

According to the present legislation, it is not legal to trade numbers in the US. To our knowledge, there are no studies underway on this issue.

JAPAN

Numbering administration

The Ministry of Posts and Telecommunication (MPT) is the regulatory authority which administers Japanese telephone number allocation. Basically all telecommunication markets are open to competition regulated by the Ministry. The largest service provider remains Nippon Telegraph and Telephone (NTT), the former monopoly provider. Telephone numbers are considered as "common property"

Allocation of numbers

Primary allocation

Telephone numbers are divided into several segments, the first one or two of which indicate geographic, carrier and/or service codes. MPT administers the allocation of these codes to operators, who then assign numbers corresponding the final number segment to subscribers. Allocation to service providers is generally based on each service provider's market share. Although NTT indicates that there is, in principle, a notion of transparency in the means of MPT allocation, no law is in force.

Secondary allocation

The allocation of numbers is carried out via secondary allocation by service providers to subscribers. NTT indicates that there is an element of subscriber choice involved in the allocation of numbers to subscribers, in that three various choices are proposed to the subscriber for the final four digits (which indicate the individual subscriber rather than applicable technical codes)

Reallocation of numbers

Generally, numbers are not reallocated to subscribers by NTT until at least six months after their deactivation.

Opposition to reallocation:

Service providers are not required to allow previous subscribers oppose the reallocation of their deactivated number(s) and no relevant policy exists at NTT regarding this issue.

Modification of numbers by the allocator

Modifications of numbers allocated to operators must be decided upon by the MTP and operators acting together. It has been indicated that due to unused numbers and congestion in certain areas, discussions are currently taking place regarding an upcoming numbering system modification. Notice prior to number modification is set at between one and half and three years. This was reported in the "Numbering Study Group Report" (16 May 1995 issued).

Trading of numbers

The trading of numbers does not exist, as numbers are universally considered as "common property"

Annex 5 Aspects of billing

Billing of local, long distance and international calls

It seems that it is in the interest of all operators to bill the customer. This interest seems to be independent of the type of operator, whether local, long distance or international. However, it is not clear whether the billing itself is of interest or only interest on the information concerning customer behaviour, the usage of the services, volume of the traffic etc. This information is automatically available through the billing procedure.

As regards local, long distance and international traffic, there are several technical alternatives for billing, for example:

1. The local operator bills all the calls.
2. Every operator may bill the customer for their own services only
3. The final product will be billed (local call, long distance call, international call)

The local operator is the only one who has up-to-date data on customers. If other operators, in addition to the local operator, are billing the customer, some rules have to be created to enable other operators to obtain up-to-date customer information, CLI and subscriber's billing address.

Bearing in mind that billing is the right of any enterprise, it may be debated whether it should be the right of a long distance or a international operator to bill the subscriber directly or not. In a competitive environment local operators may be considered as customers of long distance and international operators and long distance operators as customers of international operators.

Reference could also be made to other fields of merchandise: the wholesale dealer does not necessarily bill the end user - this is the task of the resale dealer. However, the wholesale dealer needs information on the customer's profile, customer behaviour, etc. If this mechanism was applied to telecommunications, it would be the local operator's privilege to bill the customer. At the same time the local operator would be obliged to provide all the necessary information to long distance operators and international operators concerning the usage of their services.

Billing of services

Billing of services may be even more complicated than that of normal telephone traffic. In addition to network operators, the service operators and possibly service subscribers are also involved in the billing process.

In this context a network operator is understood as a provider of bearer services (switching, transmission, routing), a service operator as an entity providing for example IN-services and a service subscriber a subscribing the service operator. An incumbent telecommunications operator is usually at the same time a network operator and a service operator.

Kiosk billing is often used as a billing mechanism of the service. In kiosk billing, instead of a separate bill, the price of the service is addressed to the telephone bill of the subscriber. Consequently the problems in billing, tariff questions, credit losses, customer complaints, etc. are transferred from the service provider to the network operator.

In a monopoly environment the service subscriber is obliged to offer its services through one service provider/network operator. As regards the contract between the service provider and the network operator, negotiation conditions are not necessarily well balanced. The monopoly operator/service provider may dictate the terms, being at the same one of the competitors on this arena. Network competition with a variety of service providers would provide service subscribers with more alternatives for selecting service providers.

In a competitive environment the service subscriber may ask for offers from other service providers/network operators. However, it is difficult to change network operator/service provider unless the number is portable. Actual, free competition can only be obtained through number portability.

Billing not only concerns network operators and service operators. It concerns also subscribers who pay the bill. The billing system should be understandable, transparent and user-friendly.

Service charges between network operators and service providers/service subscribers

Problems related to the dominant position of incumbent operators are the following:

Firstly, service subscribers and service providers/network operators have to agree amongst themselves on the conditions of the services being offered. For example, an agreement on revenue sharing is necessary for shared revenue services. Where a monopoly exists, the position of the service provider and the service subscriber as far as negotiations are concerned is not equal. The situation will change in a competitive environment where the service subscriber has the possibility of letting service providers compete against one another. The lack of number portability, however, creates some restrictions in competition. In addition to number portability, competition in networks may solve the main problems between the service provider and service subscriber. Instead of establishing some rules for revenue sharing, we should encourage competition in service provision and portability in service numbers.

Secondly, network operators are also usually service providers. In a competitive environment the user who is connected to one network operator may address the call to the services of another network operator or to an independent service provider / service subscriber. In order to guarantee equal and non-discriminatory access to network services and fair competition between different service providers, the need for a clear interconnection point between the service provider and network operator should be studied.

Annex 6 Directory standards and directory co-operation

Directory standards

The need to develop standards for facilitating the interconnection of different directory service systems has been evident for quite some time now. Standardisation work on directories has been carried out at the European level in ETSI TE.6 and EWOS EG DIR and at the global level in ITU-T and ISO.

ITU-T recommendation E.115²⁶ is a standard for communication between national Directory Assistance Systems (DAS). Through the E.115 standard it is possible to reach the databases of at least 17 European countries as well as the US and Australia²⁷.

ITU-T recommendation E.104²⁸ gives an overview of the methods and general principles to be followed when organising an International Telephone Directory Assistance Service. This recommendation forms an umbrella to E.115 as well as the recommendation F.510 (under development). The F.510 will together with an profile description base the service on X.500 technology.

According to E.104, the operator of the originating country dealing with international enquiries should be able to obtain information, depending on the organisation of the enquiry service in each country, through one of the following methods:

- 1) through printed telephone directories;
- 2) through other information systems sent by the country of destination and kept up-to-date (e.g. microfiches);
- 3) by calling the service operator in the destination country to obtain the necessary information;
- 4) by having access to foreign information service computers.

ITU-T Recommendations X.500 - X.521²⁹ have been produced to facilitate the interconnection of information processing systems for providing directory services. The combination of all such systems, together with the directory information which they hold, can be viewed as an integrated whole, called the Directory. The Directory plays a significant role in Open Systems Interconnection, which allows with a minimum degree of technical agreement outside of the interconnection standards themselves, the interconnection of information processing systems of different manufactures, under different management, having different levels of complexity and age.

The existing directory standards of different standardisation bodies are summarised in Attachment 1 to this annex.

The X.500 standard has been developed for the Open System Interconnection (OSI) environment, covering the directory services and protocols associated with a distributed database providing information on subjects such as people and organisations. The information is similar to that of (paper) telephone directories and the yellow pages.

The X.500 standard was introduced in 1988. In Europe several pilot projects for X.500 services exist:

EIDQ-group

The MoU for enhanced International Directory Inquiry Services (EIDQ) is involved in production based on existing technology. The group follows up the inter-working of the current system and engages in service development. It gives feed-back and contributes to the work in standardisation bodies. The group plans for migration to X.500 technology when it is mature and operational. The transition will be carried out in a way that guarantees continuity, a lowest common functionality as well as value-added services. A subgroup TPH500 was set up to study on to study of migration to a X.500 profile and to verify the service in a pilot. Afterwards a new subgroup, the F.DAS-subgroup, was established to continue the work in such a way that EIDQ can contribute to international standardisation.

²⁶ ITU-T Recommendation E.115 "Computerized Information Service for Telephone Subscriber Numbers in Foreign Countries (Directory Assistance), Reserved for Operators" (03/93). New draft revised Recommendation E.115 "Computerized Directory Assistance"

²⁷ Tph 28 - a Well Working Standard for International Directory Inquiry Service. Kent Jansson, Department of Computer and Systems Science, Stockholm University and Royal Institute of Technology, 16 Jan 1995

²⁸ ITU-T Recommendation E.104 "International Telephone Directory Assistance Service and Public Access"

²⁹ CCITT Recommendations X.500 - X.521. Datacommunication networks: Directory. Geneva 1989

Eurescom

The objectives of the Eurescom project are to establish a prototype of the future X.500 directory and to enable users to communicate world-wide. The project is divided into a Feasibility phase (October 1992 - May 1993) and Pilot phase (July 1993 - March 1996). 15 countries are actively participating in the project³⁰.

NameFLOW

The PARADISE project³¹, funded through the EC VALUE programme, has formally been in transition since January 1993 and was formally finished at the end of April 1994. Since then the NameFLOW service has been offered by DANTE³² to its customers, the European national research network organisations. Dante will continue this transition from pilot to self-funded operational service.

Y-NET

The Y-NET project is sponsored by CEC XIII in close collaboration with the three European Computer hardware and software manufactures: Bull, Olivetti and Siemens. Y-NET is managed by the Italian service provider Saritel in Brussels.

Directory co-operation

The first European recommendation T/Tph28 was published in 1978 as a result of the CEPT's study on the "rationalising, by means of computers, of the information available to directory enquiry operators regarding telephone numbers of subscribers situated in another country". The parallel work carried out in the CCITT on the international level resulted in recommendation E.115 which is now a further development of the T/Tph28³³.

Implementation and interconnection according to recommendation T/Tph28 began around 1989. Today, in addition to 17 European databases, US and Australian databases are also available via the T/Tph28, covering in total approximately 300 million subscribers.

After CEPT was reorganised in 1992, it became an organisation for regulatory authorities only. Directory co-operation was re-established within the framework of the MoU established between 18 signatories representing European telecommunications operators.

The subgroup TPH500 of CEPT recognised in its study that the use of X.500 is a viable alternative to T/Tph28. TPH500 provides a migration path from the original T/Tph28 towards an X.500 directory.

Discussions on the establishment of an open forum for directory issues in Europe have already commenced. During discussions in the European Numbering Forum, the question of establishing a similar forum for the co-ordination of and consultation on European Directory Services was raised. The European Directory Forum (EDF) will probably be established in 1996 and will have the aim of providing a framework for the introduction of an enhanced infrastructure for directory services.

³⁰ Eurescom / Mr. Neil Dunnet: Europe wide Directory Services Project. Presentation in the ENF-X.500 meeting in Geneva, 17 January 1995.

³¹ Paradise: International Report: Piloting International Directory Service, May 1994

³² Dante: European Connection, Dante fact sheet

³³ European IDQ Group. X.500 services. Memo 2 November 1994

Annex 7 Directory Enquiry Services in Europe

The following overview shows the different situations in the area of national and international directory services in Europe. A summary of some important figures is shown in table 1 and 2.

The following general comments are valid for all the countries mentioned:

- For callers, numbers of national and international directory services are not reachable from abroad
- in the tariff column only normal daytime tariffs are listed
- many operators/service providers are offering or planning to offer advanced directory services, like Call Completion / Call Connect

Finland

In Finland an independent company was founded to manage the national directory services. The owners of this company are Telecom Finland (30%), Helsinki Telephone Company (HPY) (30%), local operators (30%) and a printing house (10%). This company also prepare, on behalf of operators, a data for printed telephone books

The access code for directory Services is 118 from all networks. Calls are routed from local telephone companies or from Telecom Finland to the nearest service provider. The use of 118 as a national access code for both national and international directory services is planned. In addition to access code 118 Telecom Finland is using its own service numbers for national enquiries (020202) and for international inquiries (020208) in the whole country independently from the network where the call is originated.

For the service of Call completion 5,85 FIM is to be added to the enquiry costs.

Germany

In Germany one fixed network operator (Deutsche Telekom AG) and three mobile operators (DeTeMobil, Mannesmann Mobilfunk and E-Plus) offer public telephone services. The national directory enquiry service is running under number 01188 and the international directory enquiry under 00118 from all networks. The national database is operated by Deutsche Telekom and the mobile operators support the database with their subscriber information.

In addition DeTeMobil, Mannesmann Mobilfunk and E-Plus offer their own advanced national directory service under the short code number 2555 for DeTeMobil, 2288 for Mannesmann Mobilfunk and 1144/1188 for E-Plus. These short codes cannot be reached from the fixed network, neither from the other mobile operator nor from abroad. Although the tariffs are higher than the "standard" directory service, it is seen that a demand for these services exists (several thousand calls per peak hour).

United Kingdom

In the UK, BT provides a national directory service. All other operators support BT on a voluntary basis with the numbers of their customers. The access code for national directory services is 192, for international directory services 153.

Some operators offer their own directory enquiry services in their own networks, like Mercury whose access code 142 is used by Mercury customers wanting more than 2 numbers only.

Switzerland

In Switzerland one national directory enquiry service exists under access number 111, which includes all the fixed and mobile number of Switzerland, and three international directory enquiry services under numbers 191, 192 and 193, all operated by PTT Switzerland. With the number 193, only numbers from France are available, with the number 192 only numbers from Germany and Austria are available. Enquiries for other countries can be made with the number 191. Certain sections of the International directory enquiry service are free of charge, e.g. questions regarding Country Codes, national area Codes and charges. Chargeable areas are those which include questions regarding individual numbers (2 Fr.), for local time (2 Fr.) and for addresses (5 Fr.).

Sweden

In Sweden, Telia's licence for voice telephony includes the operation of a database with all national telephone numbers, also from the three GSM operators (Comviq-GSM, Europolitan and Telia Mobitel). The access code for the national directory service is 07975, and for the international Service 07977.

Europolitan offers a national directory enquiry service under number 118 only through its own network, and is not reachable from outside. The difference in the charge of a Comviq-GSM call to the national directory enquiry is justified in the special customer subscription.

France

In France one fixed network operator (France Telecom) and two GSM operators (France Telecom mobil and SFR) are in operation. France Telecom manages the national database which contains all the subscriber numbers of all three networks. The access code for the national directory enquiry service is 12 and for the international Service 19 ~ 33 12 CC. CC indicates the Country Code of the country from which the information is required.

For MINITEL users, it is possible to access the database directly via Minitel, as well as to obtain numbers and addresses from subscribers in other countries.

Spain

In Spain, Telefonica operates the national directory enquiry service under number 003 and the international service under number 025. Since the beginning of 1995 a second mobile operator (AIRTEL) is in operation; however, no decisions have been made yet about the framework for handling a common directory service.

Italy

The access code for the national directory service is 12. The international directory service is divided into two parts: one for European countries with the access code 176 and the other for countries outside Europe with the access code 1790. A plan to unite these two numbers into one unique number is under study.

A new licence for operators was issued at the end of 1994. Therefore no information about the agreements between operators is available today.

Denmark

The directory service of TeleDanmark only contains TeleDanmark customers from their fixed and mobile networks. The mobile customers of Sonofon are not included in this database. Sonofon has therefore established its own directory service with its own database for its own customers, which has no overlap with the database of TeleDanmark. The access code for reaching this service is 1890. This number is reachable from the fixed and all mobile networks, but is not mentioned in the TeleDanmark Telephone book.

The Netherlands

PTT Telecom Netherland operates the national database for national directory service under number 068008. The international directory enquiry service is reachable under number 060418.

Annex 8 Directory Enquiry Services outside Europe

Directory Services in the U.S.

In the North American Numbering area the access code for the local directory service is 411. Local directory service means all numbers from the Numbering Plan Area (NPA). With this access number the local exchange carrier is addressed and the local operator takes the call. To obtain information from other NPA areas a long distance number has to be dialled. The dialling format of this number is "NPA 555 1212" where NPA identifies the specific numbering plan area. The numbers of all residential customers are included in the databases and by dialling 411 everybody has access from any network to this service.

Normally, mobile customers are not included in the database, because they don't want to make their mobile number public. This is because of the charging procedure. The number of a mobile customer cannot be distinguished from a residential telephone number, because both numbers are taken out of the same number range. When calling a mobile phone the caller only pays the amount he would pay if calling a residential customer. The additional fee for using airtime as a mobile customer has to be paid completely by the called party. Customers therefore avoid charges if they don't publish their mobile number. This does not mean that the mobile customer is not reachable. In most cases a mobile customer also has a residential line in use.

The international directory service is offered by long distance carriers, each of them under a different national freephone number (800 number). The operator then calls the national directory service from that country from where a number was requested. A fee for this service will not be charged. Studies are underway to establish a ways of avoiding this sort of interaction between operators and to have direct access to foreign databases.

Local directory services are usually free of charge depending on local regulatory rulings. For example: In some instances, up to five calls are free of charge, where in other areas there is a charge for each call. For call completion an extra charge is always required. The call to another NPA directory service will be charged as a normal long distance call.

Directory Services in Japan

In Japan, NTT offers national directory enquiry services and operates a national database for this purpose, which includes all residential customers. The access number for this service is 104 and the cost for the customer is ¥ 30 (approximately 0,25 ECU) per number given. Mobile numbers are not included in this database and to ask for these numbers, special access numbers of mobile operators have to be used. Plans exist to connect the databases to one national database.

The International directory enquiry service is not offered. The customer can use a specific number, e.g. 0057 to access an operator, but this service is in some way hidden, because this service is not published broadly in the country.

Plans exist to offer additional services, e.g. call completion based on the national directory enquiry service. Actions for using electronic means, e.g. X.500 have started.

Directory Services in Australia

In Australia several access codes from the number series 01X exist for reaching different types of directory services, e.g. national, international. Telstra has been mandated to provide an "overall" national directory service, which can be reached by using number 013. The national database includes all PSTN, mobile and fax numbers but no numbers from customers which do not want to be in the directory ("silent numbers").

The international directory service can be reached with number 0101 and each operator is allowed to offer his own service.

Both services are free of charge today.

Annex 9 National Directory Enquiry Services

Country	network operator / Service Provider	Shortcode for Service	Price of Service (national currency)	Price of Service (ECU)
Denmark	Sonofon	1890	2,66 DKK/min from Tele Danmark fixed: ? from Tele Danmark mobil: ?	
	Tele Danmark	118	7,20 DKK + 2,50 DKK/min from Sonofon: 7,20 DKK + 2,50 DKK/min + 2,66 DKK/min	
Finland	Telecom Finland	020202	2,66 FIM/call + 3,2 FIM/min + local charge rate	
	SNO (Finnish Telephone Numbering Service)	118	2,66 FIM/call + 3,2 FIM/min + local charge rate	
France	France Telecom	12	3,65 FF from phone boxes: free of charge	
Germany	Deutsche Telekom AG	01188	from Deutsche Telekom AG: 0,23 DM/360 sec. (peak) 0,23 DM/720 sec. (off-peak) for calls from the mobile networks (C/D1/D2/E-Plus) the caller has only to pay the time dependent charge (DM/min) which is mentioned below, no fixed rate	
	DeTeMobil (C / D1)	2555	Analogue network (C): 1,66 DM/min (peak) 1,12 DM/min (off-peak) <i>Prices effective from May 1995:</i> GSM network (D1): (residential): 1,64 DM + 1,99 DM/min (peak) 1,64 DM + 0,39 DM/min (off peak) (business): 1,64 DM + 1,38 DM/min (peak) 1,64 DM + 0,56 DM/min (off peak)	
	Mannesmann Mobilfunk (D2)	2288	<i>Prices effective from May 1995</i> D2-Fun (residential) 1,65 DM + 1,89 DM/min (peak) 1,65 DM + 0,39 DM/min (off peak) D2-Classic (business) 1,69 DM + 1,29 DM/min (peak) 1,69 DM + 0,56 DM/min (off peak)	
	E-Plus	1188	Profitarif: 1,19 DM/min (peak) 0,49 DM/min (off peak) Partnertarif: 1,64 DM/min (peak) 0,44 DM/min (off peak)	
Italy	Telecom Italia (SIP)	12	755 Lit/number	
Spain	Telefonica	003	45,6 pesetas for 1 number	
Sweden	Telia	07975	10,80 Kr./min from Comviq GSM: 10,80 Kr./min + (5 Kr./min or 2,80 Kr/min)	
Switzerland	PTT	111	1,49 SFr./min	
The Netherlands	PTT	068008	60 cents per call max. 3 numbers	
UK	BT	192	25p for 2 numbers	

Annex 10 International Directory Enquiry Services

Country	network operator / Service Provider	Shortcode for Service	Price of Service (national currency)	Price of Service (ECU)
Denmark	Tele Danmark	113	from Tele Danmark: 7,20 DKK + 3,50 DKK/min from Tele Danmark mobil: 7,20 DKK + 3,50 DKK/min + 2,80 DKK/min from Sonofon: 7,20 DKK + 3,50 DKK/min + 2,66 DKK/min	
Finland	Telecom Finland	020208	8.07 FIM per call + local charge rate	
France	France Telecom	19 33 12 CC	7,29 FF	
Germany	Deutsche Telekom AG	00118	from Deutsche Telekom AG: free of charge from Analogue network (C): free of charge for calls from the other mobile networks (D1/D2/E-Plus) the caller has only to pay the time-dependent charge (DM/min) which is mentioned above and no fixed rate	
Italy	Telecom Italia (Iritel)	176 (for European countries)	755 Lit/number	
	Telecom Italia (Italcable)	1790 (for other than European countries)	906 Lit/number	
Spain	Telefonica	025	136,8 pesetas for 1 number	
Sweden	Telia	07977	10,80 Kr./min from Comviq GSM: 10,80 Kr./min + (5 Kr./min or 2,80 Kr/min)	
Switzerland	PTT	191 192 193	2 SFr. per number	
The Netherlands	PTT	060418	free of charge	
UK	BT	153	45p for 2 numbers	

Annex 11 Examples of cross-border access demand

Example 1:

Mr. X. wants to call from country A to his home country B. Unfortunately the number has changed and he has just heard a German announcement "Bitte rufen Sie die Auskunft an". Mr. X. tries to access the directory enquiries service of country B by dialling the Country Code of country B followed by 1188, but does not succeed (announcement: "The area code you have dialled does not exist"). The only remaining possibility is to call the directory enquiry service of country A. But what is the access number for this service? Mr. X. doesn't know the number so he tries 1188. In country A 118 is used by national directory services. The staff of the national directory service are very helpful and Mr. X. obtains the correct access number for the international directory service. After dialling the new international directory service number, new problems besides the language barrier arise. The name the person Mr. X wants to contact contains letters which do not exist in country A (a double surname with a hyphen and with letters specific to country B). So the spelling and the checking in the database takes time. Nevertheless in the end, Mr. X is given the correct number.

Example 2:

A customer of country A visiting country B wants a number in country C. He has two ways of solving this problem:

- he could call the international directory enquiry in country B
- he could call via "country direct service" to country A and ask for a connection to the international directory enquiry in country A

He is not able to call the international directory enquiry service of country A directly. Nor is he able to call the national directory enquiry service in country C (even if no language problems exist).

Annex 12 Allocation of DNICs in different European countries

Allocation of DNICs in the UK

Oftel has proposed the following Scheme on how DNICs should be allocated³⁴:

Registered DNICs

- assignment of DNICs to public data networks only. Public network means a network offering a public correspondence type service to any customer. Within the UK it covers the PTOs and those private networks which offer their services for sale.
- the use of X.75 protocol is the most useful criterion for determining whether or not a network should be allocated a DNIC
- priority will be given to networks which require connections to overseas networks

Sharing of DNICs

- DNIC holders are requested to limit their use of the numbering range. This is for the reason that few networks are likely to require the whole or major part of the numbering resources of any DNIC
- users may be required to share a DNIC
- user may be required to come to an agreement on the practical operation of sharing a DNIC
- at this stage it is very uncertain if or when DNIC sharing may be required

Latent DNICs

- latent DNICs will be allocated to networks which are likely to become networks which will qualify for registered DNICs in the foreseeable future
- latent DNICs are also subject to shared DNICs

Recovery

- Oftel reserves the right to recover a DNIC from any operator who ceases to operate a network for which a DNIC is required.

Allocation of DNICs in Germany

In Germany a temporary procedure for the assignment of DNICs was set up in 1992. The applicant is obliged to follow some principles regarding acceptance of international rules (ITU-T Rec. X.121), privacy issues and dataprotection laws. After being assigned a DNIC the applicant has to report on the establishment of connections to other national or international data networks within 6 months. The allocation will be published nationally and through ITU-T TSB Operational Bulletin. The administration has the right to monitor the use of each DNIC every 6 months and if they are not in use, to recover the DNIC. The ageing period after such a recovery is 6 months. The assignee has the right to give back a DNIC at any time. For the assignment of DNICs a fee must be paid by the assignee.

Allocation of DNICs in the Netherlands

Regulation on the assignment of Data Network Identification Codes (DNICs) came into force on 11 August 1994. The regulation is summarised below:

- The Minister assigns DNICs
- The assignment is based upon ITU-T Recommendation X.121
- The use of the numbering space by the DNIC holder can be limited to one tenth or several tenths of the total space. The remaining space could be assigned to other parties who would then share the DNIC with the DNIC holder.
- A request for a DNIC or DNIC numbering space can be refused if:
 - The network has no connection with a network for which a DNIC has already been assigned or will not have such a connection within a year.
 - The above mentioned connection does not allow easy addressing by subscriber (e.g. an X.75 connection between X.25 networks allows simple single stage addressing) or will not allow such addressing within a year.
 - The traffic volume over the above mentioned connection to and from subscribers in the Netherlands will develop insufficiently.
 - The volume of the use of the numbering space will develop insufficiently.
- A request for a DNIC numbering space is answered by a decision within three months
- Any assignment of a DNIC or DNIC numbering space is timely published
- The assignment is granted for five years. The assignment is prolonged with another five years every time unless efficient use of DNICs urgently requires other actions.
- The assignment could include instructions which could be changed at each prolongation of the assignment period with five years. The instructions will include that the developments

³⁴ Oftel document: Future Arrangements for the allocation of Data Network Identification Codes (DNICs)

concerning the items under c (see above) meet the expectations given at the time of the request. The instructions will also include that, in case of DNICs sharing, the Minister is entitled to oblige the DNIC holder to co-operate with other sharers of his DNIC in achieving interconnection agreements.

- The Minister can withdraw a DNIC at the request of the DNIC holder or when the DNIC holder does not comply with the instructions mentioned under item g. The same applies to withdrawal or change of DNIC numbering space of a DNIC holder or DNIC sharer.
- Any withdrawal or change of a DNIC or DNIC numbering space is timely published.

Today the Netherlands has no legal basis to price the DNICs. However, it is expected that the legislation may be changed in April 1996 allowing also pricing of numbers.

Allocation of DNICs in Sweden

Work on allocation procedures is under way. Today, under present legislation, pricing is not available.

Allocation of DNICs in Switzerland

The following rules are not official and are subject to modification. A set of definite rules should be finalised by 1.1.1996.

DNICs are allocated for a five year period. DNIC may be reallocated on the demand of the applicant. No DNIC is allocated permanently.

1. The applicant must operate a data transmission service based on packet switching technology and must provide services to third parties. The network used for that purpose must be interconnected internationally with similar services (according to ITU-T Recommendation X.75)
2. DNICs are allocated according to the ITU-T Recommendation X.121.
3. Any application for the allocation of a DNIC must contain the numbering plan of the corresponding network as well as information concerning the type of services which are provided and the number of subscribers.
4. The allocation enters into force only at the moment when the applicant proves that his network is interconnected internationally.
5. OFCOM informs the ITU-T about the allocation of Swiss DNICs. The applicant is responsible for the exchange of interconnection information between network operators.
6. OFCOM withdraws the allocation of a DNIC if the applicant ceases to offer data transmission services to third parties.
7. In some exceptional cases, the allocation of two DNICs to the same organisation is possible.

The pricing of DNIC is under consideration

Allocation of DNICs in Belgium

1. The applicant has to declare voluntarily that he complies with the terms of reference regarding the universal service.
2. The applicant has to declare in writing that he will follow the ITU-T recommendation, approved in 1978 and most recently amended in 1988, and any future modifications;
3. The applicant has to establish interconnection via the X.75 standard with at least 1 other data transmission service that has numbering space at its disposal; moreover, those who apply for numbering space, have to systematically communicate to the BIPT the names of the services with which their service is connected, as well as the DNICs or parts of DNICs they have been granted;
4. The applicant has to state the number of "digits" (*) that follow the DNIC together with their meaning, in order to identify a real or virtual termination point for the various networks and services with a description of digits indicating a geographical zone in which the termination points are situated;
5. The applicant has to communicate to the BIPT any other information that allows a perfect understanding of the numbering plan used;
6. The applicant has to give an objective estimation of his future needs for the next five years regarding numbering capacity, as well as the evolution in time of points 3), 4) and 5) mentioned above;
7. Any change in the material configuration of his network or his services having an impact on the primary attribution by the BIPT of data numbering capacity, has to be communicated in writing by the applicant to the Institute well in advance;
8. The applicant has to communicate his address, telephone and fax number and the name of the service for which the numbering space will be used (this information will be sent to the ITU)

*) "digit" means the decimal numeral from 0 to 9, generally coded in the form of 4 bits (half an octet). The use of the value of the hexadecimal coding of these 4 bits (the values 10 to 15 being presented by the letters A to F) has not been specified by X.121. Any (internal or external) use of the values A to F has to be communicated to the BIPT for information.

Pricing of DNICs not possible for legislative reasons. At present DNICs present only minor commercial value and change of legislation only for the reason of pricing of DNICs is not appropriate. Pricing of DNICs may only be considered when making major changes to the telecommunications legislation, which is expected to take place in the future.

Allocation of DNICs in Ireland

Conditions for allocation of DNICs in the Republic of Ireland

1. The Service Provider must operate a public data service based on packet switching technology and offering a public correspondence type service for sale to third parties.
2. The Service Provider must have a current licence from the Minister which covers the operation of a public data service.
3. The service must be provided on a network which includes one or more stand alone platforms with full switching, control and management functionality physically located within the Republic of Ireland.
4. The Regulatory Office of the Department reserves the right to inspect the service platforms at any time.
5. The network must be directly connected by means of X.75 protocol to one or more other networks for which a DNIC has already been registered.
6. The network must provide national access to and from other networks within the Republic of Ireland which are registered by ITU-T (CCITT) as having been assigned DNICs.
7. The network must provide international access to and from other networks which are registered by ITU-T (CCITT) as having been assigned DNICs.
8. The Service Provider must provide in a timely and non-discriminatory manner, interconnection on request from other Service Providers within the European Union and with registered DNICs. Details of the interconnection agreements shall be made available by the Service Provider to the Regulatory Office of the Department on request. Shortage of resources will not be an acceptable reason for delaying interconnect.
9. No request for interconnect shall be refused without prior agreement from the Regulatory Office of the Department.
10. The DNICs and associated number ranges assigned to the Republic of Ireland are a limited national resource controlled by the Regulatory Office of the Department.
11. Details of the service shall be made available by the Service Provider to the Regulatory Office of the Department on request to facilitate initial DNIC and number range assignment and ongoing planning for DNIC numbering.
12. The Regulatory Office of the Department will assign a DNIC and usable number range to an applicant when all conditions have been satisfied and register the assignment with the ITU-T (CCITT).
13. The DNIC and usable number range will be assigned to the named Licensee in the service licence referred to in condition 2 and may not be transferred to a third party.
14. The assignment will be valid for a period of 5 years and the service provider may apply for renewal 6 months before the assignment expires.
15. Responsibility for number assignment within the permitted usable number range will be the responsibility of the Service Provider subject to rules laid down by the Regulatory Office of the Department from time to time.
16. The Service Provider will apply to the Regulatory Office of the Department for additional number range capacity when required.
17. Service Providers may be required to share DNICs and the Regulatory Office of the Department will give 3 months notice to incumbent(s) when a new Service Provider is to be assigned a spare block of numbers associated with a DNIC in use.
18. The Regulatory Office of the Department reserves the right to recover a DNIC from any Service Provider who ceases to operate a network for which a DNIC has been assigned or who has been found to be in breach of these conditions or the conditions of the Department's Service Licence.
19. The Regulatory office of the Department reserves the right to reassign DNICs or number ranges subject to 12 months notice to the affected Service Providers but will endeavour to keep such changes to a minimum compatible with national and international long term requirements and obligations.
20. No DNIC and associated number range is allocated on a permanent basis and Service Providers should make provision in their service contracts with customers to cover this condition.
21. The Regulatory Office of the Department will levy an annual charge for allocated DNICs and number ranges based on current published rates. At present DNICs and number ranges are zero rated.

Annex 13 List of DCC and DNIC of zone 2

List of Data Country Codes (DCC) and Data Network Identification Codes (DNIC) (includes number range 2 and all CEPT countries) Position on 15 January 1996 ITU Operational Bulletin No. 612 and updated according ITU Operational Bulletin; last change 30.06.1996

Data Country Code	Country	CEPT member	assigned DNIC	Purpose/Operator	Price of one DNIC
276	Albania	yes			
213	Andorra	yes	213 5	ANDORPAC	
283	Armenia		283 0	ArmPac	
232 233	Austria	yes	232 1 232 2 232 3 232 4 232 5 232 6 232 9	Circuit Switched Data Service 300 b/s (DATEX-L300) Packet Switched Data Service (DATEX-P) Teletex Service Circuit Switched Data Service 2400 b/s (Datex-L2400) Circuit Switched Data Service 4800 b/s (Datex-L4800) Circuit Switched Data Service 9600 b/s (Datex-L9600) Packet Switched Data Service of Radio Austria (RADAUS)	
257	Belarus		257 0	BELPAK	
206	Belgium	yes	206 1 206 2 206 3 206 4 206 5 206 7 206 8 206 9	DCS DCS (Packet Switched Data Service) DCS.FAX /DCS.BULK (fax group IV) CODENET DCS DCS DCS via telex DCS via PSTN	free of charge
218	Bosnia and Herzegovina	yes			
284	Bulgaria	yes	284 1 284 3	BULPAC SBTCNET	
219	Croatia	yes	219 1	CROAPAK (Croatian Packet Switching Data Network)	
280	Cyprus	yes	280 2 280 8 280 9	CYTAPAC-PSDN, subscribers with direct access CYTAPAC-PSDN, subscribers with access via telex CYTAPAC-PSDN, subscribers with access via PSTN-X.28, X.32	
230	Czech Republic	yes	230 1	NEXTEL	

Data Country Code	Country	CEPT member	assigned DNIC	Purpose/Operator	Price of one DNIC
238 239	Denmark	yes	238 1 238 2 238 3 238 4 238 5	DATEX (Circuit Switched Network) DATAPAK (Packet Switched Network) DATAPAK (Packet Switched Network) Transpac SONOFON GSM	4 digit: 10.000 Dkr/y 5 digit: 1.000 DKr/y
248	Estonia	yes	248 0	ESTPAK	
288	Feroe Islands		288 1	FAROEPAC	
244	Finland	yes	244 1 244 2 244 3 244 4	DATEX (Circuit Switched Data Network CSDN) of Telecom Finland DATAPAK (Packet Switched Data Network PSDN) of Telecom Finland Finpac (Packet Switched Data Network PSDN) of Helsinki Telephone Company Ltd. Telivo Ltd.	4 digit: 40.000 FIM/y
208 209 210 211	France	yes	208 0 208 1 208 2 208 3 208 4 208 5 208 9	Transpac Noeud de transit international Grands services publics Administrations Air France SIRIS Interconnection Transpac/PSTN	free of charge
282	Georgia		282 1	IBERIAPAC	

Data Country Code	Country	CEPT member	assigned DNIC	Purpose/Operator	Price of one DNIC
262 263 264 265	Germany	yes	262 1 262 2 262 4 262 5 262 7 263 1 263 6 264 0 264 1 264 2 264 3 264 4 264 5 264 6 264 7 264 8 264 9 265 0 265 1 265 2 265 3 265 4 265 8	ISDN/X.25 Circuit Switched Data Service (Datex-L) Packet Switched Data Service (Datex-P) Satellite Services Teletex CoNetP EPS DETECON SCN INFO AG NWS ALCANET IDNS INAS-net EuroDATA MEGANET SNSPac MMONET BB-DATA-NET WestLB X.25 Net PSN/FSINFOSYSBW PAKNET DB TNET DRENET	free of charge
202	Greece	yes	202 3	Packet Switched Public Data Network (HELLASPAC)	
290	Greenland		290 1	DATAPAK (Packet Switched Network)	

Data Country Code	Country	CEPT member	assigned DNIC	Purpose/Operator	Price of one DNIC
216	Hungary	yes	216 0 216 1 216 5 216 6	Circuit Switched Data Service Packet Switched Data Service Packet Switched Private Data Networks (DNIC shared by a number of private networks) Packet Switched Public Data networks (DNIC shared by a number of public networks)	
274	Iceland	yes	274 0	ISPAK/ICEPAC	
272	Ireland	yes	272 1 272 3 272 4 272 8	International Packet Switched Service EURONET EIRPAC (Packet Switched Data Networks) PostNet (PostGEM Packet Switched Data Network)	
222 223 224	Italy	yes	222 1 222 2 222 4 222 6 222 7	Rete Telex-Dati (Amministrazione P.T. / national) ITAPAC (SIP / national) Rete Fonla-Dati (SIP / national) X.32 users of ITAPAC ITAPAC (ITACABLE / international)	
247	Latvia	yes	247 1	Latvia Public Packed Switched Data Network	
295	Liechtenstein	yes			
246	Lithuania	yes	246 2 246 3	Vilnius DATAPAK LITCOM	
270	Luxembourg	yes	270 3 270 4 270 9	RAPNET (Regional ATS Packet Switched Network) LUXPAC LUXPAC (X.28, X.32)	
294	Macedonia, The former Yugoslav Republic of	yes			
278	Malta	yes	278 2	MALTAPAC	
259	Moldova	yes			
212	Monaco	yes			

Data Country Code	Country	CEPT member	assigned DNIC	Purpose/Operator	Price of one DNIC
204 205	Netherlands, The	yes	204 0 204 1 204 3 204 4 204 6 204 9 205 1 205 3 205 5 205 7	Datanet 1 international Datanet 1 X.25 access Europanet Unisource / Unidata Unisource / VPNS Datanet 1 / X.28, X.32 access RAM Mobile Data (Netherlands) BV France Telecom Network Services Nederland BV Rabofacet BV Trionet v.o.f.	free of charge
242 243	Norway	yes	242 1 242 2 243 1	DATEX (Circuit Switched Network, CSDN) DATAPAK (Packet Switched Network, PSDN) FDPAK	under consideration: 4 digit: 50.000 Nkr/y 5 digit: 20.000 Nkr/y 6 digit: 5.000 Nkr/y
260	Poland	yes	260 1 260 2 260 3 260 5 260 6 260 7	POLPAK NASK TELBANK PKONET KOLPAK CUPAK	free of charge
268 269	Portugal	yes	268 0 268 1 268 2 268 4 268 5	TELEPAC COMNEXO CPRM-Marconi SIBS France Telecom Redes e Servicos de Portugal, SA	free of charge
226	Romania	yes	226 0	ROMPAC	

Data Country Code	Country	CEPT member	assigned DNIC	Purpose/Operator	Price of one DNIC
250 251	Russian Federation	yes	250 0 250 1 250 2 250 3 250 4 250 6 250 7 250 8 250 9 251 0 251 1 251 2 251 3	ROSPACK SPRINT Networks IASNET MMTEL INFOTEL ROSNET ISTOK-K TRANSINFORM LENFINCOM SOVAMNET EDITRANS TECOS PTTNET	
292	San Marino	yes	292 2	X-Net SMR	
231	Slovak Republic	yes	231 1	EuroTel	
293	Slovenia	yes	293 1 293 2	SIPAX.25 SIPAX.25 access through ISDN	
214 215	Spain	yes	214 1 214 5 214 7 214 9	Nodo internacional de datos Red IBERPAC France Telecom Redes y Servicios MegaRed	
240	Sweden	yes	240 0 240 1 240 3 240 5 240 6 240 7 240 8	ISDN - Packet Switched Service Datex (Public Circuit Switched Data Network) Datapak (Public Packet Switched Data Network) Telenordia AB Flex 25 (Public Packet Switched Data Network) Private X25 Networks (DNIC shared by a number of private networks) TRANSPAC Scandinavia AB	free of charge

Data Country Code	Country	CEPT member	assigned DNIC	Purpose/Operator	Price of one DNIC
228 229	Switzerland	yes	228 2 228 4 228 5 228 6	TRANSPAC-CH Telepac (public access) Telepac (private access) DataRail	under consideration, free of charge today
286	Turkey	yes	286 0 286 1 286 3 286 4	TELETEX DATEX-L Turkish Packet Switched Data Network (TURPAK) TURPAK	
255	Ukraine	yes	255 0	UkrPack	
234 235 236 237	United Kingdom	yes	234 1 234 2 234 4 234 9 235 0 235 1 235 2 235 3 235 4 235 5 235 7 236 0 237 0	International Packet Switching Service (IPSS) Packet Switched Service (PSS) British Telecom Barclays Network Services Mercury Data Services Mercury Communications Ltd. Kingston Communications (Hull) PLC. Paknet Ltd., Newbury Nomura Computer Systems Europe Ltd (NCC-E) JAIS Europe Ltd. FEDEX UK AT&T ISTELE Tanspac Network Services (TNS)	free of charge
225	Vatican City	yes	225 0	Packet Switching Data Network (PSDN) of Vatican City State	
220	Yugoslavia		220 1	YUGPAC (Yugoslav Packet Switched Public Data Network)	

Annex 14 List of references

- [1] Commission Directive of 29 June 1990 on competition in the markets for telecommunications services (90/388/EEC)
- [2] Communication from the Commission to the European Parliament and to the Council: Future development of the market in directories and other telecommunications information services in a competitive environment COM (95) 431 def., 10.10.1995
- [3] CEPT Recommendation T/SF 1 (The Hague 1972, revised at Puerto de la Cruz 1974, at Malaga-Torremolinos 1975, at Stockholm 1976 and by correspondence 1990) Long Term Standardisation of National Numbering Plans
- [4] Number Portability: A paper by the Office of Telecommunications of the United Kingdom; OFTEL 4 March 1996
- [5] ECTEL comments on Non-Discriminatory Access to Numbering Resources, 29 February 1996
- [6] ETNO comments on the first interim report of "Non-discriminatory access to numbering resources", 13 September 1995
- [7] Austel: Australia's Telephone Number Plan. A discussion paper on numbering administration issues, October 1992
- [8] North American Numbering Plan, Numbering Plan Area Codes - 1995 Update; Bellcore letter IL 95/01-018, 31.1.1995
- [9] Tph 28 - a Well Working Standard for International Directory Inquiry Service. Kent Jansson, Department of Computer and Systems Science, Stockholm University and Royal Institute of Technology, 16 Jan 1995
- [10] Paradise: International Report: Piloting International Directory Service, May 1994
- [11] Oftel document: Future Arrangements for the allocation of Data Network Identification Codes (DNICs)
- [12] ISO/IEC 9594 series

ITU related

- [13] ITU Operational Bulletin
- [14] CCITT Recommendation X.121, 09/92, ITU 1993
- [15] CCITT Recommendations X.500 - X.521. Datacommunication networks: Directory. Geneva 1989
- [16] ITU-T Recommendation E.115 "Computerized Information Service for Telephone Subscriber Numbers in Foreign Countries (Directory Assistance), Reserved for Operators" (03/93). New draft revised Recommendation E.115 "Computerized Directory Assistance"
- [17] ITU-T SG7 meeting in Geneva, 15-26 April 1996, Com 7-293-E
- [18] ITU-T Recommendation E.104 "International Telephone Directory Assistance Service and Public Access"

ETSI related

- [19] ETSI ETR 79: 1994-03: Security architecture for the Directory
- [20] ETSI ETR 124: 1994-03: Error handling for the Directory
- [21] ETSI ETR 125: 1994-03: Introduction to OSI Directory functional standards
- [22] Draft Technical report DTR/NA-019002 "Intra-community access to operator/assistance services and to directory services"; 9 February 1994

Annex 15 Comments of ENF members

Annex 16 Comments of individual ECTRA countries