ENUM in the Netherlands

A report by the Dutch ENUM group (NLEG)

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The concept of ENUM is often associated with ‘Electronic Numbering Mapping’, but this is an interpretation which was placed on it retrospectively: to those who thought it up ENUM was a word for a new concept, not an abbreviation. ENUM is now starting to become an internationally accepted concept in the ICT world. ENUM facilitates communication through all kinds of channels using a single telephone number. As a result, ENUM is one of the new developments in the ICT world which holds great promise for the users of the Internet and mobile telephony. Whether this promise will also be fulfilled depends in practice on many different factors, such as the commercial proposition, ease of use and consumer confidence. But one thing is certain: if the right basis is lacking, new developments have no chance, however great their potential.

ENUM forms part of the Internet world, also uses telephone numbers and is thereby a form of communication which provides a framework for the convergence of the Internet and telephony, a subject in which the Directorate-General of Telecommunications and Post (DGTP) is particularly interested. In 2001 we sounded out market interest in a national ENUM activity in line with international developments. Organizations in both the Internet world and the telephony world turned out to be prepared to devote energy to it, and hence the Dutch ENUM group, NLEG, came into being.

I hope that I have aroused your interest and that you are now wondering what ENUM actually is, what it could mean for you and what the precise basis is which has been devised for NLEG. All these things can be found in this booklet, which I warmly recommend to you. I am glad that in such a short time this working group, made up of parties from diverse backgrounds and interests, has come up with results that really count for something. This ensures that in the Netherlands ENUM is getting off to a good start.
I wish ENUM in the Netherlands a successful future.

The Director-General for Telecommunications and Post

Mark Frequin

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1 Summary

ENUM links a unique Internet domain name to each telephone numbers. Thus making it possible to reach persons or organisations in various ways using their telephone numbers: by e-mail, through his website, through VoIP (telephoning via the Internet), etc. A person or machine using ENUM only needs to know (or having programmed) the telephone number of the person or organization sought – and not the various numbers and addresses – to communicate with him or her in these various ways.
Behind ENUM is an Internet protocol drawn up by the Internet Engineering Task Force (IETF) which describes how a unique Internet domain name is linked to a telephone number. This domain name refers to the various specific numbers and addresses which the telephone number user can have included on an ENUM database.

After a public workshop on ENUM in June 2000, the Dutch ENUM Working Group (NLEG) was set up with representatives of market players and of the Directorate-General for Telecommunications and Post (DGTP) at the Ministry of Economic Affairs. The NLEG has studied how ENUM can be implemented in the Netherlands in accordance with international guidelines. This report is the result of that study. It describes how ENUM ought to operate in the Netherlands and answers, in outline, the question of which principles the process by which someone can register for ENUM should follow and which parties can play a part in this process.
These principles are set out in the report in the form of recommendations. Because ENUM is a new service with no practical experience, the NLEG proposes making a start with a field trial to test the model, the assumptions and market interest.
According to the NLEG, ENUM has so much potential that it must be looked at seriously. Nor is the NLEG alone in this: in a number of neighbouring countries concrete initiatives for field trials have been started or consideration is being given to setting up and implementing ENUM.

ENUM services lie in the grey area between the Internet and telephony, and consequently it is not always clear who is responsible for which part. Careful introduction and clearly described registration practices are therefore of great importance. One of the features of ENUM is that personal details of those who register are stored. In implementing ENUM the privacy provisions of the Personal Data Protection Act must therefore be taken into account.
This report makes recommendations for ENUM registration and deregistration and the processing of the data stored in ENUM. The guiding principle is what is called the ‘opt in’ principle, which means that a person himself decides whether to register and what information he wants to have recorded. This principle ensures that registrants’ privacy is dealt with carefully.

No new technology has been developed for ENUM. A link is created between a user's telephone number and the associated access information based on the Internet's DNS (Domain Name System). Obviously, therefore, the registration required for the DNS portion of ENUM should be structured in a similar way to the registration of domain names on the Internet.
As regards the registrars (those who record the registered telephone numbers and the associated access information), the working group foresees a free market, similar to that of the present registrar market for registering .nl domain names.
The government considers that it has a certain responsibility in the area of ENUM in the Netherlands. Earlier this year DGTP therefore applied for and obtained control over the Dutch zone of ENUM. The government's responsibility is based on its ultimate responsibility for telephone numbers that come under the Dutch country code (31) and the growing social importance of the Internet. The NLEG considers that in principle the government should not be directly involved in the management of ENUM, but must be able to intervene if social confidence in the service is at risk. The role of the government will be defined in detail in consultation with interested parties. The starting point is that as far as possible the creation of a framework for ENUM should be left to the market. After the role of the government and the results of the field trial have been established, if there is sufficient interest a national registry will be definitively designated.

This report first gives an explanation of ENUM: how does it work and what possible applications are there? This is followed by a summary of the process for making ENUM into a workable service and a description of the tasks and responsibilities of the various players. As a future course of events, it is proposed that the ideas in this report be submitted to the market. After that a field trial will be held to get answers to existing questions and to reveal any questions raised by the market consultation. The report concludes with a list of all the recommendations. The appendices comprise information which supports the recommendations and other statements in the report, information on international experience of ENUM and references to literature about ENUM.

2 Introduction

ENUM stands for Internet protocol RFC2916, which describes how a unique Internet domain name can be linked to each telephone number (see Section 3 for an explanation of how ENUM works). The Internet Engineering Task Force (IETF), the organization which makes the Internet standards and has proposed making the ENUM protocol a standard, is engaged, with the International Telecommunication Union (ITU), the specialist body of the United Nations which deals with the public telephone numbers, in making agreements about operational and procedural aspects surrounding ENUM.[1] On 6 June 2001 DGTP held a public workshop on ENUM. At this workshop it was decided – even before international agreement was reached on implementing ENUM – to think about the structure of the Dutch ENUM zone. A working group, the Dutch ENUM Group (NLEG), was created, and its findings are set out in this report.
This introductory section covers the purpose of the report, the structure of the working group, the approach followed and the layout of the report.

2.1 Purpose of the report

The NLEG's aim is to define a framework for the organization of the Dutch portion of ENUM, in accordance with the proposal from the IETF and ITU. The framework must indicate how ENUM can be implemented in the Netherlands in a workable way which is acceptable to users and providers. This report is the result of the working group and comprises the framework for ENUM consisting of principles to be applied for ENUM and an implementation model with the tasks and responsibilities of the parties concerned. In detailing the framework, there have been regular consultations with countries which are also working on organizing ENUM.
The NLEG is using this report as a starting point for consulting market players and to see whether there is sufficient interest in a field trial. The report also serves as an information source for people and parties who want to know more about ENUM and about the roles of the various parties in it.

When the report mentions a 'user', without any addition, what is meant is the person who by means of a telephone number calls up another party's ENUM access information. When the term means something else it is described as such, for example 'the user of a telephone number'. The person who arranges for his access information to be included in ENUM is referred to by the term 'registrant'.

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[1] For more information see Liason statement IETF/ITU, Berlin, 19-26 October 1999; http://www.itu.int/osg/spu/enum/wp1-39_rev1.html

2.2 NLEG

The Dutch ENUM Group was formed in October 2001 and consists of a broad representation of parties who have indicated that they wish to contribute their thoughts on implementing ENUM. Participation in the working group was on a voluntary basis. DGTP acted as the chairman of the group. The following organizations formed part of the NLEG. (The contact details for the participants can be found in the Annexes)

Organization	Angle
ISOC	Promoting the Internet and the interests of Internet users
KPN	Telecom operator (fixed/mobile), participation in ETSI and ITU
NLIP	Representing the interest of Internet providers
Nominum	DNS knowledge and expertise, active in other ENUM working groups (UK) and ITU
OPTA	Telecom Regulatory Authority, expertise on management of telephone numbers, competition, privacy
RIPE/NCC	Tier-0 ENUM manager, management of DNS and IP addresses
SIDN	Registry of domain names under .nl, management of domain names
EZ/DGTP	Chairman of working group, final editing of this report Regulation, delegation, link with EU countries, EC, ECTRA, ITU

2.3 Approach and structure of report

This final report by the working group has come into being thanks to contributions from its various members. Final editing was carried out by DGTP.

So that the report can also be used as an information source for non-experts, it was decided to include a brief tutorial, as Section 3, on ENUM applications and how ENUM works. This is followed (in Section 4) by the most important principles in the areas of registration, deregistration and interim changes. The legal framework and registration requirements form the basis of this section. Section 5 deals with the tasks and responsibilities of the parties involved. Section 6 covers the future sequence of events, including the field trial step and the conditions it is subject to. The report ends with a list of all the recommendations.

3 Background to ENUM

This section describes the background to ENUM, how it works and the possible applications. First it says something about the origin of the idea for ENUM and its significance. Paragraph 3.3 gives a number of examples of possible applications of ENUM and the section ends with a paragraph on how ENUM works.

3.1 Genesis

The number of means of communicating with or accessing people has increased greatly in the last few years. It is not unusual for someone in the Netherlands to have a fixed-line telephone number at home and at work, a fax number, a mobile number and one or more e-mail addresses. Nor is it unusual for someone to have their own website. All these numbers and addresses will hardly fit on a business card and it takes a lot of effort to notify all the interested parties of a change to one of these numbers or addresses. Except for the fixed-line telephone numbers, which can generally be called up through a directory enquiry service, many of these numbers and addresses cannot be obtained from a single location. In addition, a consumer must have various devices to be able to use all these means of communication.
Consideration has been given in an international context to methods of linking the various means by which a single person can be accessed. In 1999 the idea of linking a unique Internet domain name to a telephone number was launched. Through this domain name, accessibility information can be called up which is associated with the telephone number. The mechanism for making this link is called ENUM. Over the last few years the details of the Internet protocol for ENUM have been worked out by the IETF.

3.2 What is ENUM?

ENUM stands for an Internet protocol (RFC2916) which describes how a unique Internet domain name is derived from every telephone number. This domain name refers to (part of) a database in which all the numbers and addresses – the so-called access information – are included which the registrant has specified, such as e-mail addresses, a fax number, a personal website, a VoIP number, etc. The access information which the registrant has specified forms the so-called ‘ NAPTR records’. The ENUM user only needs to know the telephone number in order to communicate with the registrant in whatever form. In the e-mail address space in a new e-mail message the user can type a telephone number. To make this possible software must first be installed on the user’s PC which will translate the

telephone number into an Internet domain name.
Market players and governments see in ENUM a way of enabling communications services to grow. It is therefore not surprising that in various countries they are jointly developing initiatives for investigating ways of implementing ENUM[2].

3.3 Possible applications of ENUM

To give an idea of the added value which ENUM could have, a number of possible applications are described below. These are only examples of what might be possible. The NLEG has not involved itself in developing applications, but only with the preparations for setting up the ENUM platform. Responsibility for the development of applications lies with the market.

- Users can send e-mails, faxes and other messages from a computer or mobile phone to a telephone number. The advantage of this is that (private) telephone numbers are generally known, can easily be obtained or are programmed already. They are in the phone book or can be called up via a directory enquiry service. In this way, thanks to ENUM, the e-mail address of a private Internet user can be found through the phone book.
- Users can use ENUM as a search mechanism on their PC. Via his PC, every Internet user can call up a registrant's access information by reference to the registrant's telephone number. The Internet user keys in the telephone number on his PC and receives a list of access information. Websites can also be found in this way. The person can then decide how to approach the registrant.
- Via ENUM, companies which have a well-known 0800 number but are less fortunate with their Internet domain name have an alternative as regards their accessibility on the Internet. They can make their website accessible (also) via their 0800 number.
- Telephone traffic between telephones and computers equipped with VoIP becomes possible without assigning individual telephone numbers to those computers. It is sufficient for the computers to have their usual domain name or IP number, and thanks to ENUM they can be phoned from an ordinary telephone on the public telephone network. A service provider can set up a so-called gateway for that purpose which can be accessed from the telephone network. The user phones the gateway, which consults ENUM for the translation of the telephone number to the address used on the Internet (SIP address, IP number, etc.) and ensures that the connection is made.
- Using ENUM, enabling messages to enter at a single point becomes very simple. The registrant can indicate that he wants to receive all the incoming messages (e-mail, fax, voicemail etc.) in the same

2 For example , the UK ENUM Group, in which government and business participated, presented a report in April 2002 about ENUM titled: "Prelimary report on the implementation of ENUM in the UK".

mailbox, for example his e-mail box. Whether or not the same mailbox is used no longer depends on the choice which the sender of the message makes, but on the choice of the recipient.

- A registrant only needs a single telephone number printed on his business card and notify changes to his access information at a single point, namely with the registrar. In ENUM, a business registrant can specify various alternative numbers, for example those of his secretary or colleagues, with his priorities if desired. A private registrant, who generally speaking already has an entry in the phone book, can use ENUM so that people can be referred to his private e-mail address. If, for example, he wants to transfer to a different provider, that address changes, and he only needs to notify the registrar and not all his contacts.
- A registrant can indicate how he prefers to be approached. If he has more than one telephone number or address, he can indicate to which number or address information is to be sent. Certainly in the case of different e-mail addresses for work and private use ENUM is a means of combining efficiency and privacy.

In short, ENUM can be regarded as an address card-index box which is accessible in all kinds of ways (especially through the Internet and telephone inputs) and provides access information. The user himself decides how to approach a registrant.

3.4. How does ENUM work?

ENUM ensures that a registered telephone number on the worldwide network is translated into an Internet domain name. Behind this domain name is the access information. In that way the access information associated with that telephone number can be called up via the Internet.
Using ENUM, existing structures are linked to each other, namely the international telephone numbers as laid down in Recommendation E.164 of the International Telecommunication Union (ITU) and the Domain Name System (DNS) by means of which the Internet operates. The Internet domain name zone e164.arpa has been created for ENUM.
To make a domain name from a telephone number, the number must first be reversed, as Internet domain names start with person-specific features and end with the generic features of a number. With telephone numbers it is precisely the other way around: they start with a country code, followed by the region code and then the personal number.
The conversion of a telephone number into a domain name works as follows:

1. take a telephone number preceded by the country code, for example:
   +31 70 3516372
2. reverse the number:
   27361530713

3. put full points between the figures:
   2.7.3.6.1.5.3.0.7.1.3.
4. finally, put after the number the domain .e164.arpa which has been created for ENUM:
   2.7.3.6.1.5.3.0.7.1.3.e164.arpa

Figure 1 shows schematically how this reversal proceeds.

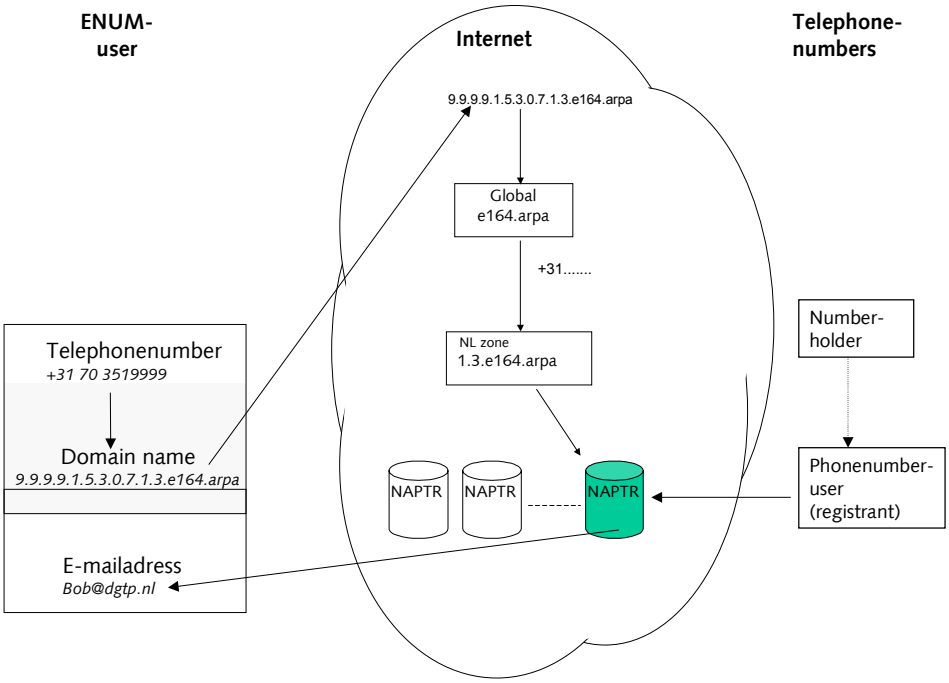

Figure 1: Example of reversal of a telephone number in an e-mail.

The ENUM user does not notice anything of this reversal, it is done using software in his PC. For instance, the user types the telephone number in his web browser and indicates what item of information he is looking for (e-mail address, telephone number, web address, etc.). In the PC the number is converted to a domain name. This is sent to ENUM servers on the Internet, which send back the NAPTR records associated with the name. The access information and any priority indicated for them are stored in these. The user gets the requested address back on his PC. ENUM therefore in fact functions as a mechanism for translating a telephone number into a domain name with the requested address or number associated with it. Figure 1 gives an example of the conversion of a telephone number to an e-mail address using ENUM[3].

3.5. Alternatives to ENUM

Some parties supplying DNS services, such as Verisign, have pointed out that the typical services which ENUM makes possible could also be based on other zones. For example, a service provider could become the registry of a self-chosen zone and could base ENUM-type services on it. In a certain sense this already happens in the United States, where trial projects are in progress which have been designed on the basis of zones such as .enum.org. In addition it has been pointed out, including by governments and the European Commission, that these applications must not experience unfair competition from the internationally standardized ENUM variant.

The NLEG considers that these alternative forms enjoy their own raison d'être side by side with ENUM. For example, they could be useful to providers of services or large companies which want to provide services specially to their own customers or employees.

These forms, which resemble ENUM, differ essentially from it, however. ENUM is an Internet standard by which, regardless of the provider or network, the same translation is given from a telephone number to a domain name. In the case of the alternative forms, the (private) registry decides, by reference to its own terms and conditions, who has access to or is allowed to use his 'ENUM services' and in what way.

[3] More detailed technical information of the working of ENUM can be found in "ENUM-Mapping the E.164 Number Space in the DNS", Geoff Huston, Telstra in: *The Internet Protocol Journal*, Volume 5, Number 2, June 2002.

4 Registration, deregistration and updating of information

To make ENUM into a workable and successful platform, it must be structured in such a way that confidence is maintained in the telephone numbers used and the access information included. The choice has been made in this chapter to take the process of the registration and deregistration of the registrant as a guide to explaining the organization surrounding ENUM. This provides a logical route, with the further advantage that it provides a structured framework for the presentation of the NLEG's recommendations.
First we identify the parties who will be involved in the NLEG's vision in relation to ENUM. Then the process from registration to deregistration from ENUM is described in three steps.

4.1. Parties with a direct interest in ENUM

Various parties are involved with ENUM, and these are described in this paragraph. We only deal with the roles and designations of these parties. In the next section we cover their tasks and responsibilities.

The registrant

The registrant is the person who makes his access information available to others through ENUM. The ENUM domain name by which that is done has been derived from a telephone number whose registrant is the number user within the meaning of the Telecommunications Act. The registrant is thus the person whose information has been included in ENUM and must not be confused with the person who uses the Internet to find an address through ENUM.

The registrar

The registrar is the party who manages the registrant's access information and ensures that it is publicly available on the Internet.

The registry

The registry is the manager of the Dutch ENUM zone, or 1.3.e164.arpa. The registry forms, as it were, the top of the Dutch ENUM pyramid and ensures that reference is made to the registrars' servers on which the access information is located.

Because of the hierarchical structure of the DNS, there can only be one registry for the Dutch ENUM zone. To prevent abuse of this position, requirements are laid down regarding the impartiality of the registry and the costs and quality of its service. In addition every registrant must have equal and open access.

The government

At the present time DGTP has control over the Dutch zone of ENUM and will play a role in the appointment of the registry. The government does in fact have a role within ENUM based on its responsibility for Dutch telephone numbers and by reason of the social importance of the Internet, but wants to remain at a distance from actual implementation. Out of its responsibility for telephone numbers, the government assigns numbers to number holders via the Independent Post and Telecommunications Authority (OPTA).

The number holder

Telephony services providers comprise a specific section of the number holders. They enable their users to use individual telephone numbers from the number blocks assigned by OPTA. Examples are the numbers for fixed telephony and mobile telephony. There are number holders with individually assigned numbers, such as the holders of service numbers; 0800 and 0900 numbers. This is explained in more detail in the appendix on telephone numbers.

Other possible players

To ensure the correct use of telephone numbers within ENUM, a number of checks must be carried out relating to registering, modifying and deleting details in ENUM. This validation, as it is called, is described in detail in the following paragraphs. The details of the actual approach to and implementation of validation have yet to be worked out. Several of the players referred to above may be involved in validation, for example the registry, the registrars and the number holders. There may also be new players.

Figure 2 is a schematic overview of the position of those with a direct interest in ENUM.

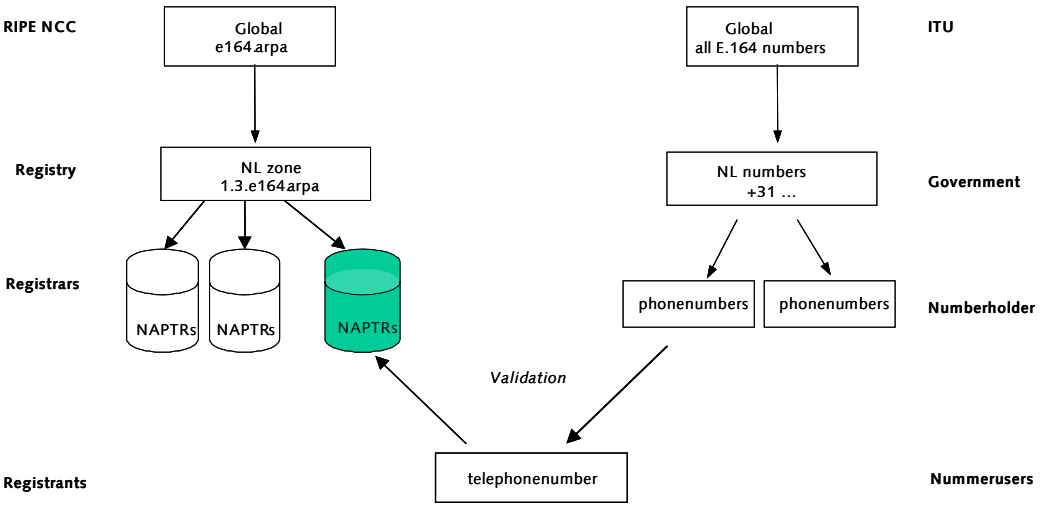

Figure 2: Summary of ENUM players.

4.2 Registration

Individuals, companies or organizations wanting to enhance their accessibility on the Internet through ENUM will need to register with the registrar of their choice. Registration must fulfil a number of requirements to discourage improper use. This concerns not only improper use by the registrant himself, but above all abuse by third parties, for example in the form of the unnoticed interception of someone's message traffic through ENUM. For example, the telephone world has a phenomenon known as slamming, by which telephone subscribers are snatched away by another telephone company from the company of their choice without them being aware of it. In the NLEG's view this and other undesirable or fraudulent practices must be countered before ENUM is implemented, so as to avoid a false start and a poor image.

Above all, there is a statutory obligation to handle personal details carefully. Dutch privacy legislation has a number of guidelines for files in which personal details are processed (which is the case with ENUM); this concerns aspects of the Telecommunications Act and the Personal Data Protection Act. The Personal Data Protection Act defines the conditions under which personal details may be processed. An important aspect of these is that personal details (under which the access information in ENUM falls) are allowed to be processed if the person concerned has given his or her unambiguous consent. If the registrant himself registers and indicates what details he wants to have recorded, that

constitutes express consent for the processing of his details, and one of the conditions for lawful processing is thereby fulfilled.

Recommendation 1
Registration in ENUM must be in accordance with the 'opt in' principle; that is, the registrant expressly registers, and he himself indicates what information he wants registered.

As regards registration it is important to establish first of all that the person who is registering is indeed the person he or she claims to be. The registrant will have to provide identification.
In some cases registration with a registrar will be carried out by the registrant himself, for example if he or she is a private individual. Registration can also be through an intermediary, however, for example the representative of a company or a third party if a registrant is not himself capable of registering. In these cases one must be certain that the intermediary is authorized to register a registrant. It is undesirable for a telephone number to be included in ENUM without the user having given consent. As regards registration in ENUM it is necessary to confirm that the person registering the registrant has been instructed to do so by that registrant.

Recommendation 2
Registration in ENUM requires confirmation of the registrant's identity.

Recommendation 3
Registration in ENUM requires verification that the application is being made by or on behalf of the registrant.

The rights of a user of a telephone number, laid down in the Telecommunications Act, mean that only telephone numbers which are in use as such can be utilized for use in ENUM. If not in use, the number concerned would be able to be given a different use from that laid down in the associated Numbering Plan, and that is prohibited. Also, confusion could be caused among the public if some telephone numbers were not in use for the purpose designated in the Numbering Plan but are in fact used in ENUM.
In addition, there are numbers for which no purpose has yet been laid down in the Numbering Plan. These too cannot be used for ENUM.
The appendix on telephone numbers goes in detail into the Numbering Plan and the rules surrounding the use of telephone numbers.

Recommendation 4
Registration in ENUM requires a check on whether the telephone number being registered is actually in use by the registrant.

4.3 Changes to ENUM information

Once a registrant has been registered for ENUM, his access information must be put in the NAPTR records. The registrant will sometimes want to modify these details. This paragraph includes recommendations for modifying the contents of the NAPTR records.
Following on from the principle that only the registrant is authorized to register or arrange for his telephone number to be registered for ENUM, similarly he alone is authorized to introduce the access information linked to it, or arrange for it to be introduced, into the NAPTR records and subsequently to modify it. Here too checking is important: are the contents of the NAPTR records really being modified by or on behalf of the registrant?

> Recommendation 5
> When the access information is introduced into the NAPTR records or modified, it is necessary to verify that this is being done by or on behalf of the registrant.

A registrant could include third parties' access information in his NAPTR records. However, it is undesirable that this should be done without the knowledge or consent of that third party. Costs are connected with the receipt of, for example, e-mails. If the registrant uses a third party's information, those costs would have to be incurred for the receipt of messages intended for the registrant. This is possible, but that third person must agree to it.
There are other reasons why it is undesirable that a registrant should be freely able to arrange for a third party's access information to be included. These concern mainly ENUM's image. Internet users must be able to assume that they will not receive any unwanted e-mails (spam) as a result of ENUM. That is also why it must be an ENUM requirement that the registrant has consent from a third party and hence is authorized to link his access information to his telephone number in ENUM.

> Recommendation 6
> A registrant who inputs the NAPTR records or arranges for them to be input must be authorized to use this access information.

The NLEG considers that checking need not be carried out in advance. If it turns out retrospectively, for example because a third party complains about it, that a registrant has included information on that third party without being authorized to do so, and misuse has evidently occurred, the complete registration of the registrant concerned can be deleted from ENUM. The purpose of a severe sanction of this kind is to prevent unauthorized use of the information on third parties.

Recommendation 7
If it turns out that a registrant has included access information on a third party, or arranged for it to be included, in the NAPTR records without being authorized to do so, registration of the telephone number in ENUM will be cancelled.

4.4 Deregistration

Based on the recommendations set out above, orderly termination of the use of ENUM is also possible. As the registrant has all the rights regarding his registration plus the contents of his access information, so he himself can terminate his registration or if necessary 'empty' it.
A different situation applies when the registrant is no longer the user of the telephone number concerned but has not cancelled the associated registration in ENUM. If the telephone number has been disconnected and after a so-called 'cooling-off period' given to another telephone user, the danger arises that messages for the new user will finish up in the wrong place. The NLEG considers that in the interests of the correct use of telephone numbers this must be avoided. If the telephone number has been transferred to another user, the old registration must in any case be removed.
But it is also important that the old registration should be removed even if the telephone number has not yet been transferred to another user and has only been blocked, as the use of a telephone number in ENUM must always be linked to the use of the telephone number in accordance with the purpose for which it was assigned. This means that when use of the number is terminated, the registration in ENUM must also be terminated.

Recommendation 8
If, after registration in ENUM, the registrant's use of the telephone number concerned ends, the number must be removed from ENUM.

If the use of a telephone number is terminated by the registrant, the number reverts to the number holder. In the case of a private telephone connection, for example, this will be the telephone service provider who supplied the connection. The provider can re-assign the number, but will require that it should no longer be recorded in ENUM so that he can release it to a new user. He will want to be certain that he is supplying the number to a new customer 'clean'. As the party directly interested in the deletion of the registration, the number holder must therefore be able to request deletion.

Recommendation 9
If a user no longer uses a telephone number, the number holder is authorized to have it deleted from ENUM.

5 Tasks and responsibilities

This section describes the tasks and responsibilities of the various players within ENUM, such as registrant, registrar, government and number holders. But firstly it covers the international organizations – to which the Dutch 'branch' is subordinate – at the top of the ENUM hierarchy.

5.1 International organizations

Because ENUM is an Internet protocol which continues to build on the Domain Name System, one is dealing with the international organizations which carry responsibility and perform a management role within DNS: the Internet Architecture Board (IAB) and the RIPE Network Coordination Centre (RIPE NCC). In addition, the use of international telephone numbers within ENUM means that the International Telecommunication Union (ITU) is involved.
Currently within the Internet, DNS takes care of the conversion of domain names to technical addresses: the IP addresses. For example, it provides the right IP address in relation to a web page which is sought, by reference to which the server on which the web page runs can be found. A relatively new DNS facility is relevant for ENUM: the use of NAPTR records. Using these records, a multitude of information can be associated with a single domain name.
The DNS, and hence also ENUM, operates according to the principle that every domain name must be unique and can only be assigned once. The system is therefore arranged in a strictly hierarchical way. In DNS terms the manager of a domain name has acquired the 'delegation' of that domain name and he is responsible for assigning other domain names which are assigned under 'his' domain name. Thus the SIDN has the delegation of the .nl domain and is responsible for assigning the names in that domain.

In the case of ENUM the zone e164.arpa has been chosen. This zone has been delegated to the Internet Architecture Board (IAB). The technical management of e164.arpa has been contracted out by the IAB to RIPE NCC. The IAB is, as it were, the administrative manager, RIPE NCC the technical manager. In the management hierarchy of the DNS, IAB is responsible for drawing up the rules under which names can be assigned, and RIPE NCC is responsible for the implementation of these rules and the management of the required technical facilities, the name servers.
RIPE NCC takes care of the delegation of the various country codes within ENUM. For that purpose it has received instructions from the IAB[4] which stipulate how applications are to be handled and under

[4] See http://www.ripe.net/ripeencc/pub-services/enum/instructions.html

what conditions approval for the delegation of a country code within ENUM is requested from the Telecommunication Standardization Bureau (TSB) of the ITU. The TSB is the bureau responsible for assigning the country codes for telephony. When an application is made for delegation of a country code within ENUM, TSB checks that the government of the country concerned consents to it.
All delegations of zones within the DNS are also subject to a number of general rules, such as rule RFC1591. This describes the requirements imposed on the delegated party of a so-called 'top-level' domain . As regards the appointment of the delegated party it is important that he should be regarded as the representative of the interests of both the local and worldwide Internet community. He must handle applications for domain names in a non-discriminatory way and his technical competence must enable him to perform his tasks properly. If that is not being done, the delegation can be withdrawn. RFC 1591 expressly provides that for delegations to underlying zones the same principles apply as for RFC 1591 itself and that these zones are not subject to any additional requirements.

5.2 the Dutch government

ENUM links internet domain names to telephone numbers. These resources are used in different environments: telephony and the Internet. Not only are the two environments subject to different regulatory regimes, certainly as regards assignment procedures, but the government's involvement is also different in the two environments. This makes the government's role in ENUM, at the interface between the two, a complex one. It will therefore be useful to scrutinize the government's role and responsibilities in the two sectors.

ENUM: between telephony and the Internet

Although strictly speaking, because of the way it works, ENUM falls within the domain of the Internet, telephone numbers are the vital factor. An ENUM domain name can be regarded as a 'translated telephone number', derived from an international telephone number. The domain name, invisible to users, is only the technical vehicle for the representation of the telephone number and its routing by the DNS .
In telephony, the responsibility of governments for telephone numbers is internationally grounded in the ITU. Both market players and governments participate in the ITU and conform to its recommendations. Recommendation E.164 of the ITU lays down that member states are responsible for the management of telephone numbers which come under their own country code. The Netherlands is represented at the ITU by DGTP, which thereby has ultimate responsibility for telephone numbers which come under the Dutch country code (31). Based on this DGTP defines the framework and rules for the distribution of the Dutch telephone numbers to end-users. The fact that telephone numbers are used in ENUM means that, given its responsibility for the national telephone

numbers, the government must also ensure that ENUM operates properly and reliably.

The Internet has its origins in the scientific world and only became integrated into social and economic life a short time ago. In its present form and size the Internet has largely come into being through self-organization, without government involvement. Many governments, particularly in the Western world, recognize that the market can continue to manage the Internet independently. Self-regulation is the starting point, provided a number of general principles are fulfilled, which in the Dutch situation, for example, are set out in the government policy document Legislation for the Information Superhighway. This principle determines the scope of the government's involvement: not acting, or acting as little as possible, in those areas where self-regulation has been shown to work effectively.
Because of its responsibility for the public interest, the government nevertheless keeps its finger on the pulse. Developments in the field of the Internet and telecommunications go fast, and can have a profound effect on social and economic life. A clear example is the rise of Internet domain names. Whereas ten years ago domain names were still a relatively unknown phenomenon, nowadays it is no longer possible to conceive of a society without them. Government policy in the area of Internet domain names is in a state of flux, at world level by means of participation in the Governmental Advisory Committee (GAC) of the Internet Corporation for Assigned Name and Numbers (ICANN), at European level within the European Commission, but also at national level. For the Dutch situation the government has set out its policy in the government policy document Review of SIDN [Foundation for Internet Domain Registration in the Netherlands]. In its policy in respect of ENUM the government must take account of all these developments and if necessary act in line with them.
ENUM is also a standard on which (new) services will be based. Standardization benefits individuals and companies, as it creates interoperability, harmonization and the streamlining of technology and services. It is the Dutch government's role, where possible, to create conditions for developments in the area of standardization and to contribute to standardization.

On the basis of the above, the government considers that it has a certain responsibility in the area of ENUM. DGTP has therefore applied for the delegation of the Dutch ENUM zone. The application has now been approved by both RIPE-NCC and the TSB of the ITU and delegation has therefore passed to DGTP. This ensures that government and market players together determine the preconditions for implementing an ENUM platform which enjoys the confidence of companies and individuals. It is important to companies that it enables them to develop and offer ENUM services, whilst individuals can be confident that ENUM and the services based on it satisfy the Dutch statutory frameworks.

Relationship between government and registry

The question is whether the present anchoring of the government's responsibility – in the form of delegated party for the ENUM zone – is the most suitable. The NLEG considers that in line with the principle of self-regulation the government ought to keep its distance as regards the management of ENUM. The management of ENUM and all the operational aspects should as far as possible be left to the market. On this aspect there is no reason why the government should have any role.

> Recommendation 10
> There is no reason why the government itself should manage ENUM and the operational aspects of doing so. As far as possible implementation of ENUM must be left to the market.

In the NLEG's opinion, the government should investigate whether there are alternatives to the present implementation of delegation. In the present form, it is obvious that the government will contract out the operational activities. It is also possible, however, for the ENUM zone to be delegated afresh to a new registry subject to conditions which government and market players have formulated together. These can be based on the assumptions in this report. The NLEG also considers that definitive implementation of the delegation cannot take place sooner than after the public debate on the report and the completion of the field trial. Aspects may emerge during the field trial which the (future) registry will need to take into account. In making the final choice the government must weigh up all the interests and ensure that wide support exists.

> Recommendation 11
> The government must investigate whether there are alternatives to how delegation is presently implemented. The eventual choice can be made after consulting market players and on completion of the field trial.

5.3 the Dutch players

The registry

In the future there will be a single registry in the Netherlands for ENUM. It will have the following two key tasks:

1) Recording the reference from the domain name in which a telephone number is expressed to the IP address and the domain name of the server on which the access information is stored.
2) Recording the reference in the registry's name-server (via a zone file) and maintaining this record during the use of ENUM.

The registry does not itself have access to NAPTR records, and is positioned as an independent party at the top of the reference pyramid. The details of both the domain name and the name server to which

reference is made will be supplied only by the registrars, who are the only customers of the registry. As described above, someone who wants to place his access information in ENUM will apply to a registrar. After registration, the access information will be recorded on a server and in that way the IP address and domain name of the server on which they are recorded are known. The registrar then informs the national registry, so that the national registry can record the correct reference.

Because there is a single registry – and hence no market forces – the registry must :

- be independent of all the registrars;
- apply cost-oriented tariffs for the registrars;
- be an organization whose efficiency can be assessed, with a transparent approach;
- be given a minimal package of tasks in order to carry out the registry function;
- guarantee equal and open access to its services for all registrars;
- ensure that it is easy for a registrant to change registrars.

Besides keeping the Dutch 'ENUM service' operational, the registry must ensure that ENUM is given the chances in the Netherlands that it deserves and that the service itself is implemented reliably and safely. For example, the registry will have to draw up rules which the registrars must abide by, and as a minimum these rules must incorporate the recommendations discussed in the previous sections. The registry must also see that the rules are enforced. Sanctions applied in the case of irregularities can be derived from those which are usual as regards the management of Internet domain names.
The costs of the registry will in principal have to be covered by a tariff for the registrars which has yet to be determined. This too is similar to the situation prevailing in relation to Internet domain names. Registrants will pay their registrars, directly or indirectly, an annual fee for the ENUM services; in turn the registrars will pay the registry.
The registry's most important role will relate to the registration and deregistration of registrants. In addition, it will fulfil a role when a registrant changes registrars ('portability'). As long as an ENUM registration remains active, the registry has the task of maintaining onward references on its name servers. The registry will also act in the case of irregularities (see recommendation 7) and in the case of the deletion of onward references (see recommendation 9).

The registrar

The market for registrars is a free market. This means that any party fulfilling the conditions which the national registry applies can offer the ENUM services. Obviously, the present Internet Service Providers will be interested in becoming registrars, but in principle there are no obstacles to other parties signing up as registrars, such as companies which already maintain their own name servers.

Registrars will have to conform to the policy rules drawn up by the national registry. As a minimum, the registrar's tasks consist of :

- passing on the required information to the registry (domain name, name server with NAPTR records and user information). It is expected that registrants' NAPTR records will generally be stored on the registrar's servers.
- carrying out the required checks, including those referred to in recommendations 2 to 5 in this report.
- deleting, or having a third party delete, registrations as referred to in recommendations 7 and 9.

He will have to cover the costs of carrying out the above tasks and the tariffs payable by the registrar to the registry from the registration subscription tariff and the income from the services he offers his users.

The registrant

It is up to the registrant himself whether he wishes to use ENUM and/or the services based on it. It is also up to him when he wishes to discontinue such use. When he wishes to register as a registrant, he is free in the choice of a registrar. To be registered as a registrant he must meet the following conditions:

- he must establish his identity;
- he must show that the telephone number is in use by him;
- he must be authorized to use the access information specified by him. Information on third parties must not be included in the registrant's NAPTR records without consent.

When the registrant ceases to use a particular telephone number, he is obliged to arrange for it to be deleted from ENUM.

The number holder

The market for providers of telephony or telecommunication services is a free market. Any party fulfilling the conditions laid down by the government can supply services using numbers made available by the government. That party then becomes the holder of a block of numbers and in turn makes the individual numbers available to users. In addition, there are also number holders who are simultaneously the users of the numbers; this is the case, for example, with the 0800 and 0900 numbers. The appendix on telephone numbers deals with the concepts of number holder and user in greater detail.

The tasks of a number holder in ENUM consist of:

- cooperating in carrying out the actions in recommendations 8 and 9. The number holder has access to the information about the use of telephone numbers which is required for this.
- depending on the structure of the validation, cooperating in or fulfilling roles in relation to the implementation of recommendation 4 and 7.

6 Future course of events

In the foregoing sections the NLEG has set out its vision regarding the implementation of ENUM in the Netherlands. What does the future course of events look like? Implementing ENUM will only make sense if there is broad market support for it. For that reason, the future course of events consists of the following two steps: an extensive market consultation exercise and, if this shows sufficient support, a field trial to test the concept. This section describes the future course of events.

6.1 Consultation exercise

The NLEG's results will be submitted to the market through an extensive consultation exercise. The aim will be to secure agreement on the framework for ENUM and to gauge interest in participation in a field trial. This document forms the basis for the consultation exercise.
DGTP will invite and request market players to respond to the starting points presented in this report. They will also be asked whether they are interested in the field trial and whether they wish to put forward ideas for it.
The results of the consultation will be used to evaluate the model, sharpen its focus where required, and get a clear picture of how much interest there is in a field trial. The modified proposal will serve as the framework for the field trial.

6.2 Field trial

ENUM is a new concept of which we have as yet no experience. Because of this unfamiliarity and the absence of practical experience, the NLEG proposes beginning a field trial once the consultation exercise is over. The field trial will test the framework as regards effectiveness and feasibility. A further aim of the trial will be to chart market interest in ENUM. This will be done by examining the extent to which the market will develop sufficient ENUM-based services.

6.2.1 Purpose of the field trial

The purpose of the field trial is twofold:

1. Assessing the framework set out in this report for the design of the ENUM platform and the translation of that framework into concrete terms. In the field trial a study will be made of whether, based on a case study translated into concrete terms, the starting points and organization model are a valid basis for a broader introduction of ENUM in the Netherlands.
2. Assessing whether sufficient services will be developed on an ENUM platform designed according

to the assumptions described in this report. Is there sufficient market interest in ENUM? The field trial must provide information on the extent to which commercial services will be developed on the ENUM platform. This is necessary if we are to be able to assess whether the broad introduction of an ENUM platform is desirable.

Both aims will need to be split into as many measurable elements as possible. For each element it will be necessary to indicate when the trial has or has not been successful. After this, a start will be made on translating the two objectives into more detailed concrete terms. The parties setting to work on the field trial will be given the scope to flesh out in detail the objectives to be attained.

The first aim focuses mainly on developing and guaranteeing a platform which is reliable for the registrant. The following elements can be distinguished here:

- Making operational the principles set out in Section 4. It is of great importance to the success of ENUM that these principles should be guaranteed.
- Assessing the tasks and responsibilities of the various parties and the conditions they must meet, as described in Section 5.

We will have succeeded in the first aim of the trial if it can be shown that the principles can be guaranteed and the main outlines of the framework remain intact. If this is the case, the operational concept used in the trial can serve as an example for the further implementation of ENUM in the Netherlands.

The second aim is to estimate how far sufficient attractive services will be developed on the ENUM platform. This will be done by collecting information on ENUM services and their use. This concerns forming a picture of ENUM's commercial possibilities, their use and the costs associated with them. A clear picture must emerge of how attractive ENUM is to the market. The following questions may be relevant in this context:

- How many players are interested in the registrar role?
- How many registrants register within a particular period, in proportion to the total target group (market penetration)?
- How intense is ENUM usage? How often does an Internet user consult ENUM?
- What are the one-off and recurring costs of the ENUM platform?
- Are enough commercially attractive services being developed?

In collecting information about the use of ENUM and the ENUM services allowance must be made for the experimental stage the project is at and the scale of the trial. Setting up and designing an ENUM service and making it operational could well turn out expensive for a trial of limited size.

The results of the trial will be evaluated. Based on this evaluation, the parties concerned will decide how attractive designing an ENUM platform is to the market and whether it provides sufficient commercial potential for widespread implementation in the Netherlands.

6.2.2 setting up the field trial

After the consultation exercise and adoption of the ENUM report, if there is enough interest the NLEG will continue by setting the field trial in motion. Two conditions which the trial must meet are:

- The trial must be finite, so that any modification and redelegation is possible, for example if Dutch implementation turns out to be odds with the policies – yet to be formulated – of the EC and ITU.
- The trial must be an open one, so that those taking part cannot secure a privileged position, for example as registrar.

The NLEG is drawing up a plan of approach for the field trial which will include at least the following elements:

- the aims of the trial, as far as possible elaborated as elements which can be assessed;
- the target group for the trial (potential registrants);
- the sequence of steps to be gone through (including the completion time);
- the costs of the trial and how they will be shared;
- the parties required to implement the trial;
- the way in which the trial will be evaluated.

A broad invitation will then be made to the market to take part in the trial on the basis of the plan of approach.

Recommendation 12

Start a field trial of ENUM if there is sufficient interest. The aim of this trial is to test the framework presented in the report, to translate it into concrete terms and to collect market information.

7 List of the recommendations

Recommendation 1

Registration in ENUM must be in accordance with the ‘opt in’ principle; that is, the registrant expressly registers, and he himself indicates what information he wants registered.

Recommendation 2

Registration in ENUM requires confirmation of the registrant’s identity.

Recommendation 3

Registration in ENUM requires verification that the application is being made by or on behalf of the registrant.

Recommendation 4

Registration in ENUM requires a check on whether the telephone number being registered is actually in use by the registrant.

Recommendation 5

When the access information is introduced into the NAPTR records or modified, it is necessary to verify that this is being done by or on behalf of the registrant.

Recommendation 6

A registrant who inputs the NAPTR records or arranges for them to be input must be authorized to use this access information.

Recommendation 7

If it turns out that a registrant has included access information on a third party, or arranged for it to be included, in the NAPTR records without being authorized to do so, registration of the telephone number in ENUM will be cancelled.

Recommendation 8

If, after registration in ENUM, the registrant’s use of the telephone number concerned ends, the number must be removed from ENUM.

Recommendation 9

If a user no longer uses a telephone number, the number holder is authorized to have it deleted from ENUM.

Recommendation 10

There is no reason why the government itself should manage ENUM and the operational aspects of doing so. As far as possible implementation of ENUM must be left to the market.

Recommendation 11

The government must investigate whether there are alternatives to how delegation is presently implemented. The eventual choice can be made after consulting market players and on completion of the field trial.

Recommendation 12

Start a field trial of ENUM if there is sufficient interest. The aim of this trial is to test the framework presented in the report, to translate it into concrete terms and to collect market information.

APPENDIX 1: Membership of working group

Organization	Name	Aspect
ISOC	Michiel Leenaars	Promoting the Internet and looking after the interests of Internet users
KPN	Pieter Nooren	Telecom operator (fixed/mobile), participation in ETSI and ITU
NLIP	Anita Regout, Pim van Stam	Representative of Internet Providers, knowledge and expertise in Internet technology, competition, privacy
Nominum	Anton Holleman	Knowledge and expertise in DNS, active in other ENUM working groups (IITU, UK)
OPTA	Sander Woutersen	Knowledge and expertise in management of telephone numbers, competition, privacy
RIPE/NCC	Mirjam Kühne	ENUM Tier 0, management of DNS and IP addresses, international contacts with other ENUM Tier 1's
SIDN	Jaap Akkerhuis, Bart Boswinkel	Management of domain names, registry domain names under .nl.
EZ/DGTP	Thomas de Haan, Manon Meihuizen	Chairman of working group, link with EU countries, EC, ECTRA, ITU regulation, delegation
Stratix Consulting Group	Ed Verzijl, Jolanda van Bussel	Report and final editing

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APPENDIX 2: Personal Data Protection and Telecommunications Act

Privacy and the Personal Data Protection Act

This appendix outlines the privacy aspects relating to ENUM. In this context, ENUM means a database which includes the domain name, derived from a telephone number, in the e164.arpa-domain, plus the access information linked to that telephone number. The privacy aspects of services based on ENUM, such as sending an e-mail directly, are not considered here.
The Personal Data Protection Act is the result of the implementation of the European Data Protection Directive RL 95/46/EC [translator's note: in full: Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data]. The Act includes many 'open standards' (such as 'not irreconcilable with the objective', 'adequate', 'appropriate guarantees', etc.), so that one has to judge how the law is to be interpreted in each specific case.

Personal data

The Personal Data Protection Act applies to any processing of data which relates to an identifiable or identified person (personal data). The question first of all, therefore, is whether the data included in an ENUM database are personal data within the meaning of the Act. The domain names which are derived from a telephone number can easily be converted to that number. A telephone number is a data item concerning an identifiable person. Hence personal data are included in an ENUM database. Access information on persons is also included. This too can be converted to an identifiable person and thus falls under the definition of personal data within the meaning of the Personal Data Protection Act.
Under the Personal Data Protection Act someone must be designated who is responsible for processing the data. The responsible persons in the context of ENUM are all those who register the registered telephone numbers plus the associated access information: the registrars.

Purpose

Personal data may only be collected for 'well-defined, expressly described and justified purposes'. The responsible person must therefore define these purposes.

Personal data may only be processed if:

- the person concerned has unambiguously consented to such processing;
- the data processing is required for performing or concluding an agreement to which the person concerned is party;
- the data processing is required to take care of the justified interests of the responsible person or of a third party to whom the information is being supplied, unless the importance of the fundamental rights and freedoms of the person concerned, in particular the right to protection of his or her privacy, takes priority.

It is therefore important to inform the person concerned, when he registers for ENUM, about the processing of his information and to have him give his express consent for it to be processed.

The processing of the information must be compatible with the purpose for which it has been obtained. In that context the personal data must be 'adequate, relevant and not excessive', having regard to the purposes for which it is being collected or is subsequently processed.
Where no other information is obtained other than that which the ENUM user provides as access information and wishes to link to his telephone number, and no processing is carried out other than routing requests to the access information in question, these requirements will probably have been met.

Security

The responsible person must take the necessary steps to ensure that the personal information is correct and accurate. For ENUM, this means a duty of validation, both for the registered telephone numbers and for the access information linked to them.
The responsible person shall take appropriate technical and organizational measures to secure personal information against loss or improper processing. These measures will guarantee appropriate security, taking account of the state of the technology and the costs of implementation, against the risks which processing the information and the nature of the information to be protected involve. The measures will concentrate inter alia on avoiding the unnecessary collection and further processing of personal data.
When the person responsible arranges for personal data to be processed by a third party, he shall ensure that the technical and organizational security measures continue to be guaranteed and that the measures continue to be adhered to. The third party is obliged to observe confidentiality regarding the personal data of which he is aware and must enforce an appropriate level of security regarding it.
The responsible person must include all this in an agreement with the third party and ensure that the third party does in fact fulfil his obligations.

Notification requirement

The responsible person is obliged to notify the processing of personal data to the Data Protection Commission. He must specify the following information:

- the name and address of the responsible person;
- the purpose or purposes of processing;
- a description of the categories of those concerned and of the data or categories of data relating to them;
- the recipients or categories of recipients to whom the data can be supplied;
- any intention to pass on data to countries outside the European Union;
- a general description so that a provisional assessment can be given of the suitability of the intended measures for ensuring the security of processing.

Rights of those concerned

Those concerned are entitled to receive the following information from the responsible person:

- The identity of the responsible person and the purposes of the processing for which the information is intended, and further information in so far as it is required, having regard to the nature of the information, the circumstances under which it is obtained or the use that is being made of it, in order to guarantee to the person concerned that it will be processed properly and carefully.
- A list of personal data which relates to him and which the responsible person processes, the purpose of the processing and those to whom the information may be supplied.

The person concerned can request the person responsible to improve, add to, delete or protect the personal data relating to him if it is factually incorrect, is incomplete or irrelevant for the purposes of the processing, or is otherwise being processed contrary to a statutory provision. For ENUM this means that a registrant can request the registrar to delete personal data from an ENUM database if he ascertains that it has been included in that database without his knowledge.

Privacy rules

An organization can draw up a code of conduct, usually called a privacy regulation, stating how the organization concerned handles personal data obtained. The organization concerned can submit this code to the Data Protection Commission for review so that prior to any registration it can obtain a declaration regarding whether the way in which the registrar handles personal data is in accordance with the Personal Data Protection Act. When drawing up a code of conduct registrars will do well to involve the Data Protection Commission at an early stage.

Privacy and the Telecommunications Act

To determine whether Section 11 of the Telecommunications Act (Protection of personal data and privacy) applies to ENUM one must first determine whether the provider of ENUM is classed as a provider of a public Telecommunications Service or a public Telecommunications Network within the meaning of the Act. If we confine ourselves to ENUM's role of making access information on a person available to an applicant, hence in the role of an information service, that will not be the case. The question then is whether ENUM is a subscriber directory within the meaning of the Telecommunications Act, to which Section 11.6 applies.

The concept of subscriber directory is not defined in the Telecommunications Act or any related regulations. An ENUM user does, however, qualify as a subscriber, as he is party to an agreement with a provider of telecommunications services because he has a telephone number (Section 11 of the Telecommunications Act). A subscriber directory has the function, however, of searching for contact information (generally telephone numbers) on a person based on his name and where applicable other information (such as an address). Such a service thus provides information on a subscriber. The ENUM service does not give information about a subscriber but about a telephone number, as access information can be retrieved which is linked to that that telephone number.

The function of ENUM is to search for contact information based on a telephone number which is already known. Personal data such as name, address and town play no part in this and because of the 'opt in' principle are only included at the registrant's request. This information is not needed to identify the subscriber, as is the case with a subscriber information service.

In addition the ENUM system is different from that of a subscriber directory because in ENUM the information on the registrant is included at his own request, whilst I the case of a subscriber information service the provider of the service is the person who wants to include the information on the subscriber. The subscriber must be protected against that. This does not apply to ENUM because the registrant himself decides what information he wants to have included.

The Telecommunications Act protects, in Section 11.6, the interests of subscribers by stipulating that in a subscriber directory only that personal data may be included which is required to identify a subscriber, unless the subscriber has unambiguously consented to additional personal data being included. In ENUM, in principle no personal information is included which is needed to identify a subscriber, but only to be able to reach the registrant in other ways. As already stated, this information is included at the subscriber's express request. Moreover, under Section 11.6 at the subscriber's own request he is not or is no longer included in the subscriber file, his personal details are not or are no longer made available for commercial or charity purposes, his address is not specified in full, and his gender is not specified in any way.

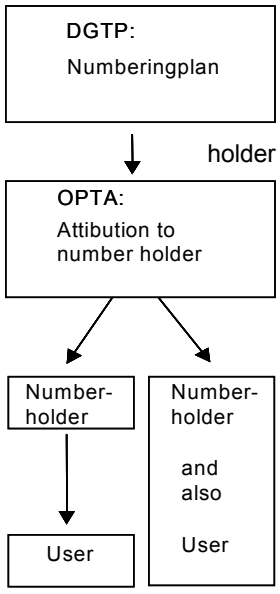
Conclusion: the provisions in the Telecommunications Act regarding subscriber directories do not apply to ENUM, but in view of the 'opt in' principle applied, there is sufficient privacy protection in ENUM.

APPENDIX 3: Telephone numbers

This appendix gives a brief introduction regarding the regulatory affairs of telephone numbers. This is an area in which not many parties are directly involved and which for most readers of this report probably desires detailed explanation. The appendix describes how the assignment of numbers is regulated by the government, what number holders are and above all what the rights and duties of users of telephone numbers are.

The assignment of telephone numbers

The assignment of telephone numbers is regulated in the Telecommunications Act. This states that 'the Minister determines the Numbering Plans'. A Numbering Plan only records which numbers are intended for which application; hence a Numbering Plan is above all a usage plan. The 'Numbering Plan for telephone and ISDN services' is the most prominent. In practice DGTP decides on the various Numbering Plans on behalf of the Minister. OPTA subsequently decides who gets what number.



Because numbers are a public good, they are never the property of the holder, but are, as the Act says, 'assigned to' the applicant, the so-called number holder. If a block of numbers has been assigned to him, a number can in turn allocate individual numbers to third parties, who are called 'users'. The approach to the assignment of telephone numbers is shown schematically below.

In principle OPTA can assign to three kinds of applicants:

a) a provider of a public telecommunications network;
b) a provider of a public telecommunications service;
c) a natural person or legal person who uses a public telecommunications service.

There are limiting conditions, however, as a result of which not every number can be assigned to everyone. These are comprised in the 'Ministerial Regulation on Restrictions on assignment of numbers', in which the type of holders referred to at item c) are excluded on pragmatic grounds from a number of categories of numbers (see the table below), because too great an administrative burden would otherwise be created for OPTA. At present OPTA can only assign the categories concerned to providers of public telecommunications networks and services. In turn, these distribute them to their customers, who thus become users of the numbers concerned.

This regulation has been revised a number of times in recent years, with on each occasion the ability to assign more numbers to category c). Prompted by new developments, DGTP and OPTA are together looking at whether existing restrictions on indirect assignment could be further lifted.

The present status is that the following types of numbers can be assigned to the following categories:

Number series	Purpose	a) and b) providers of public networks and services	c) users (natural person and legal person
01 to 05; 07	Geographic numbers	X	
06	Mobile telephony and semaphony	X	
067	Data services	X	X
0800	Information services	X	X
082	Virtual Private Networks (VPN)	X	
084 and 087	Personal assistant	X	X
090x	Information services	X	X
1 series	Short numbers	X	X

The table shows that the indirect distribution of numbers via providers of telephone services applies to (the large numbers of) geographic and mobile numbers, but not, for example, to the numbers for information services. These can be assigned by OPTA directly to end-users and can therefore be additionally interesting to end-users for ENUM use.

Who is the user?

From ENUM's point of view it is important to know whether a prospective registrant is in fact the rightful user of a specific telephone number. As described in the report, ENUM's image is related to the occurrence of improper use of telephone numbers. It is therefore important that a prospective registrant be validated. The principles for this are laid down in the report, but not their further elaboration, because various methods are possible. This paragraph deals briefly with two search methods for tracing the actual user of a telephone number, with the associated advantages and disadvantages. This is intended as background information for the further elaboration of validation.

In principle one can search forwards and backwards for the user. Searching forwards means that the search begins at OPTA. For directly assigned numbers this is simple, but for indirectly assigned numbers one can find at OPTA only the name of the holder of the block of numbers of which the number concerned forms part. The holder of a block of numbers is always a provider of networks and/or services. Currently there are six holders of blocks of mobile numbers and 21 holders of blocks of geographic numbers (see the OPTA-website: www.opta.nl). Via the provider concerned, the actual user or the technical status of the number concerned can subsequently be traced.
Searching backwards means that a user himself states who has assigned the number to him and provides the evidence for that statement. If desired, this can be verified with the provider or OPTA.

A possible complexity (in the case of searching forwards) arises from the use of number portability. With this, a number in block assigned by OPTA to provider A is used by a customer of provider B. In the Netherlands the following registers exist in the area of assigned and ported numbers:

- COIN, a database managed jointly by operators with only the ported numbers and the corresponding (new) number holder. The database is used for routing between operators.
- An OPTA register of number allocations (individual and blocks) with the corresponding first number holder, hence without porting information.
- A second OPTA register containing ported numbers based on quarterly information supplied by operators. This register is not guaranteed to be accurate or up to date.
- A database of all the telephone numbers of all the public telephony providers made available for publication. This database was established because of the Number Information Services Universal Service Obligation laid down in the Telecommunications Act and also includes a substantial proportion of the unpublished numbers (particularly connections to KPN's fixed network).

Hence there is no unique database in which on-line information on all numbers with corresponding current number holders can be found. This information can therefore only be obtained by consulting several databases.

Rights of the user

With the possible introduction of ENUM the question arises whether the user of a telephone number can use his number within ENUM. A holder to whom a number has been assigned can allow a third party to use it on the basis of Section 4.9 of the Telecommunications Act. If he does so, he must ensure that the numbers assigned to him are used in accordance with the provisions of Section 4 of the Telecommunications Act, i.e. a number is not used for a purpose for which other numbers have been designated. The Telecommunications Act does not state explicitly what rights the user of a

number enjoys, except for the rights in the area of number portability. It follows from this, as a minimum that a user can continue to use his number for ENUM if he can ‘take his number with him’ on the basis of the provisions for number portability.
The other rights enjoyed by a user to whom a holder has assigned a number can be determined by looking at the agreement between the holder and the user.
When a user of a telephone number wants to use it for applications within ENUM, he is therefore not using the number contrary to the Telecommunications Act. Whether he is using the number contrary to his agreement with the holder, must be decided by looking at the individual agreement.
Within ENUM a telephone number serves only as a unique code which makes available the access information which the user has specified. The number is not used other than to make a ‘translation’ to the ENUM domain name to which the access information has been linked. It is therefore unlikely that an agreement between a holder and a user will lay down that the user is not allowed to use the number to couple his other access information with it. Even if this were the case, it remains to be seen how far such a restriction is permitted, as the holder is not the ‘owner’ of the number. The holder would therefore be unable to exercise an exclusive right on the basis of which he could impose restrictions going beyond those included in the legislation.
Conversely, the question arises whether a user is entitled to continue use of his number within ENUM when his agreement with the number holder for the supply of services ends and there is no entitlement to number portability. Use of the number for the purpose set out in the Numbering Plan then lapses. Section 4.6 of the Telecommunications Act includes a list of cases in which assigned numbers can be withdrawn. According to the explanatory note to that article, a number assignment can be withdrawn in cases where the intended use is not fulfilled or where use is discontinued. The fact that a number assignment can be withdrawn means that the holder allows use of the number on condition that its assignment continues to exist. This, plus the desire to use numbers for their proper purpose justifies the holder’s ability to take a number back if it is no longer being used. In that case its use for ENUM must also be discontinued, as such use would prevent a new user using the number in ENUM.

Conclusion: there are no legal obstacles to the user using his telephone number for ENUM. Only if he no longer uses the number must its use for ENUM be discontinued.

Duty of validation with respect to the user

What validation obligations do number holders, who have made telephone numbers available to third parties, have regarding the use of those numbers within ENUM? The only one mentioned in the Telecommunications Act is the general obligation to ensure that the use of the assigned numbers is in accordance with Chapter 4 of the Act itself. That chapter states only that a number may not be used for a purpose for which other numbers have been designated.

Conclusion: no obligation can be deduced from the Telecommunications Act on the grounds of which a provider of a public telecommunication service must ensure that a user who registers for ENUM is using a number which has actually been assigned to him. Such an obligation can rather be deduced from the Personal Data Protection Act, which imposes on the person responsible for a registration the obligation to ensure the accuracy of the information included.

APPENDIX 4: Operational requirements

ENUM could greatly affect the way in which people deal with communications and the Internet. It is expected that the ENUM functions will be incorporated into programs and services and hence will 'disappear under the bonnet', so to speak. In most cases the Internet user will not be aware that he is using ENUM, just as he is currently unaware that he is using the DNS when he makes a connection with the Internet.
ENUM's embedded nature is an advantage from the point of view of user-friendliness, but a disadvantage as regards identifying the cause of problems. If ENUM breaks down, the user will notice only that no connection is made, and he will be unable to discover that the problem lies at ENUM's door. This makes it difficult to trace what is going on if an alternative has to be used. ENUM could consequently become as critical a factor as the DNS, and comparable requirements will therefore have to be imposed on the technology and procedures to be used. The main outlines of these are set out in this paragraph.

Technical requirements

- The servers with the NAPTR records must always be redundant.
- These servers must be at different locations.
- The servers must be connected to different networks, for example networks of different service providers.
- The remainder of the infrastructure must not have a single point of failure.
- The servers must be readily accessible nationally and internationally, for example by locating them in the vicinity of Internet Exchanges.
- The servers must be able to handle 5000 queries a second.
- The servers must be secure against unauthorized access.
- Modifications to each server must be logged.
- There must be a maintenance contract for 24 hours a day, seven days a week for the servers and other infrastructure.
- There must be a recovery plan for the servers in the event of calamities.
- The servers must be laid out in such a way that they are not sensitive to so-called cache pollution and other external attacks.
- The servers must provide a digital signature so that ENUM users can verify the integrity of the access information.

Procedures registry

The registry must develop procedures for:

- rules of policy and enforcement;
- requirements which a registrar must meet;
- the registration of registrars;
- deregistration and the transfer and termination of a registrar's business;
- settlement of costs;
- information exchange between registry and registrar;
- regular reporting;
- audits;
- problems which may arise;
- settling disputes.

Procedures registrar

The registrar must develop procedures for:

- subscription terms and conditions for registrants;
- registration and deregistration of registrants;
- modifications to access information by registrants;
- modifications to access information by the registrar on the instructions of the registrant;
- handling questions, complaints, error reports, etc. from registrants;
- settling disputes;
- handling error messages from the equipment;
- adding and removing servers and other equipment;
- regular reporting;
- dealing with problems which may arise.

APPENDIX 5: Developments in other countries and hyperlinks

Various countries are working on the implementation of ENUM and making preparations for field trials. This paragraph briefly describes developments in the United Kingdom, Austria and Sweden. In the United States both Verisign and Neustar are engaged in field trials. Information about these trials and other developments in the area of ENUM can be found on the websites referred to below.

ETSI report on ENUM

In July 2002 the European Telecommunications Standards Institute (ETSI) published the ENUM administration in Europe report. This report outlines a general framework of requirements and assumptions for the introduction of ENUM in Europe and also proposes a number of possible models for the implementation of ENUM. The report deals extensively with the guarantees for the integrity of the DNS and the E.164 number use, and into the validations required for these. The report is largely based on contributions from people who are members of national ENUM working groups in their own countries.

UK ENUM GROUP (UKEG)

In April 2002 the UKEG issued a report on the implementation of ENUM in the United Kingdom. In it, the concept of ENUM was elaborated, possible models for its implementation were extensively evaluated and a structure was drawn up for a field trial. This field trial has a completion time of twelve months.

ENUM in Austria

In Austria is a consultation sequence for ENUM has taken place. The number of responses to the consultation was limited. There was no response from the Internet service providers. Those who did respond, however, showed enthusiasm for the concept. There also turned out to be sufficient interest in a field trial. This will be carried out from July 2002 to March 2003 and its purpose is to evaluate the technical and legal framework. Five hundred registrants will take part in the trial.

ENUM in Sweden

A report on the introduction of ENUM was issued in Sweden in March 2001. This report was drawn up by Post & Telestyrelsen, an organization similar to OPTA. Consultation was carried out for this report

too, showing that there is sufficient market interest in ENUM. The recommendation in the report is that prior to decision-making within ITU a trial should be carried out and this should be evaluated by Post & Telestyrelsen.

References and hyperlinks

	Institutes, interest groups
IETF 'Telephone Number Mapping working group'	http://www.ietf.org/html.charters/enum-charter.html
ITU activities in area of ENUM	http://www.itu.int/osg/spu/enum/index.html
ICANN on the Verisign/Telcordia ENUM trial	http://www.icann.org/melbourne/info-verisign-revisions.htm
INTUG report on 'Instant Messaging and ENUM'	http://www.intug.net/views/IM_ENUM.html
	Standardization, protocols
IAB Technical Comment on the Unique DNS Root	http://www.ietf.org/rfc/rfc2826.txt?number=2826
IETF RFC 2915 'The Naming Authority Pointer (NAPTR) DNS Resource Record'	http://www.ietf.org/rfc/rfc2915.txt
IETF RFC 2916 'use of DNS for storage of E.164 numbers'	http://www.ietf.org/rfc/rfc2916.txt?number=2916
SIP (Session Initiation Protocol)	http://www.cs.columbia.edu/sip/
	Companies and initiatives
Bango	http://www.roibot.com/w.cgi?R1764_bango1
Netnumber	http://www.netnumber.com/
Neustar	http://www.enum.org/
Venster	http://www.venster.nl/
Verisign and Telcordia's ENUM testbed	http://www.verisign-grs.com/webnum/
	Governments
ENUM consultation by ART (NRA France)	http://www.art-telecom.fr/publications/synthese-enum-ang.htm
ENUM consultation by DTI (NRA United Kingdom)	http://www.dti.gov.uk/cii/regulatory/enum/index.shtml
Field trial for ENUM in Australia	http://www.rtr.at/enum
ENUM report by PTS (NRA Sweden)	http://www.pts.se/dokument/getFile.asp?FileID=2191
DGTP study 'ENUM quick scan''	http://www.dgtp.nl/cgi-bin/dgtp/show.pl?val=D&layout=d&var=categorie
DGTP presentation at RIPE conference	http://www.ripe.net/ripe/meetings/archive/ripe-38/presentations/RIPE%20over%20ENUM%20V3%20clean_files/frame.htm

APPENDIX 6: List of definitions

Registry	The manager of the root (top) of the Dutch domain, the NL zone: 1.3.e164.arpa
Registrar	The person who records the registered telephone numbers and associated access information
Registrant	User of a telephone number who registers for ENUM
Access information	Addresses and number on which someone can be reached
User	Person who uses ENUM to call up access information on a registrant
'Opt in' principle	The registrant himself decides whether, and if so what, information is included in the NAPTR records
DNS	Domain Name System
ETSI	European Telecommunications Standards Institute
GAC	Governmental Advisory Committee
IAB	Internet Architecture Board
IANA	Internet Assigned Numbers Authority
ICANN	Internet Corporation for Assigned Name and Numbers
IETF	Internet Engineering Task Force
ITU	Internet Telecommunication Union,
NAPTR records	The access information which the registrant has specified to the registrar.
RIPE-NCC	RIPE Network Coordination Centre
TLD	Top Level Domain Name
VoIP	Voice over IP: telephony using the Internet protocol