

Study on options for the future of
ETNS (European Telephone
Numbering Space)
Final Study Report

**(EXCERPT on options for future
ETNS)**

for submission to

European Commission
Information Society and Media Directorate General
Directorate B – Electronic Communications Policy

by

Authors: Kenneth R. Carter, Dieter Elixmann and John Horrocks

WIK-Consult GmbH
Rhöndorfer Str. 68
53604 Bad Honnef
Germany

The opinions expressed in this study are those of the authors and do not necessarily reflect the views of the European Commission.

Bad Honnef, 28 August 2009

Option A: ETNS is a European number as an alternative to a national number

Description

Under Option A, ETNS would be a non-geographic European number as an alternative to a national number, the main aim being the provision of a European identity in the number. ETNS numbers could be used in conjunction with existing or new electronic communications services to subscribers.

ETNS numbers will be allocated through service providers that will provide existing or new services to subscribers who are based in Europe. These services will as a minimum include the ability to receive incoming calls. Global services such as freephone, shared cost and premium rate services will be excluded because they are not allowed by the ITU.

The services will predominantly be or include telephony calls but other forms of specialised services such as SMS-only or MMS-only services will not be excluded.

Roles and competition

There will be three roles in the operation of ETNS:

- The ETNS Manager who will manage the allocation of numbers via the ETNS Service Providers. This is intrinsically a monopoly role. The ETNS manager will also handle central or common publicity for ETNS.
- The ETNS Service Providers who will sell services that use ETNS numbers to subscribers. These are potentially roles for different parties in competition with each other.
- The ETNS Operator who will have the task of maximising the opportunities for the users of all networks both inside and outside Europe to be able to make calls to ETNS numbers. In practice they will run or establish a number of ETNS Gateways. This is not absolutely a monopoly role but the practical scope for competition is limited and it is best viewed as a single role that could be shared in practice with different companies handling the role in different regions as in a franchise organisation.

Because of the commercial challenge in starting ETNS, we recommend that the same commercial organisation should be allowed to undertake all roles provided that there are safeguards for other ETNS Service Providers. This approach will enable there to be a real ETNS product champion.

Number length

ETNS numbers will have 8 digits following the code +3883.

Number allocation

An ETNS Manager will be appointed following an open competitive process and have a contractual relationship with those countries that hold the country code allocation from ITU.

Numbers would be portable between ETNS service providers.

It could be considered whether the subscriber could have an option to choose any available unallocated number within the ETNS range from an ETNS service provider. This freedom of choice will be an added attraction. Numbers will not be allocated in blocks to service providers.

Network operation

The ETNS Operator will establish as many ETNS gateways as practicable starting in countries inside Europe but extending to those countries outside Europe that originate sufficient calls to ETNS numbers to justify a gateway. It will also run a database for delivery information for calls.

The ETNS Operator will arrange for other operators to add the code +3883 to their routing tables and route calls to the nearest ETNS gateway. The other operators will probably have to pay the ETNS Operator a termination charge for each call that is delivered to the gateway and will charge the caller a retail rate that will cover both their conveyance costs and the termination charge. The termination charge may be a "business as usual" national termination charge.

Whilst the ETNS Operator is responsible for establishing the ETNS gateway the gateway does not need to be built and run physically by the ETNS operator but the function may be out-sourced to an existing operator such as an incumbent or a VoIP gateway operator. Thus high capital costs can be avoided.

When the ETNS gateway receives a call it will interrogate a database that holds translations from the called ETNS number to a delivery number. The delivery number may be:

- a fixed national E.164 number,
- a mobile national E.164 number,

- a SIP address,
- the combination of a routing prefix plus the ETNS number.

The database may be capable of supporting flexible routing where the subscriber is able to change the delivery number to be used depending on their circumstances possible with a pre-assigned daily schedule, e.g. calls are delivered to a home number from 19:00 – 08:00, to a mobile number from 08:00 – 09:00 and 17:00 – 19:00, and to an office number from 09:00 – 17:00 during weekdays.

The ETNS gateway will then route the call to the delivery number and the ETNS operator pays as necessary for any transit charges and the delivery of the call.

The form of the database used by the ETNS Operator will be for them to decide but they may use a form of carrier ENUM.¹

The method of transiting the call to the access operator used by the subscriber will be for the ETNS Operator and/or the ETNS Service Provider and subscriber to decide. For example they may use the PSTN, an international transit network, a telecommunications VPN or the public Internet.

There are four scenarios for delivery of calls:

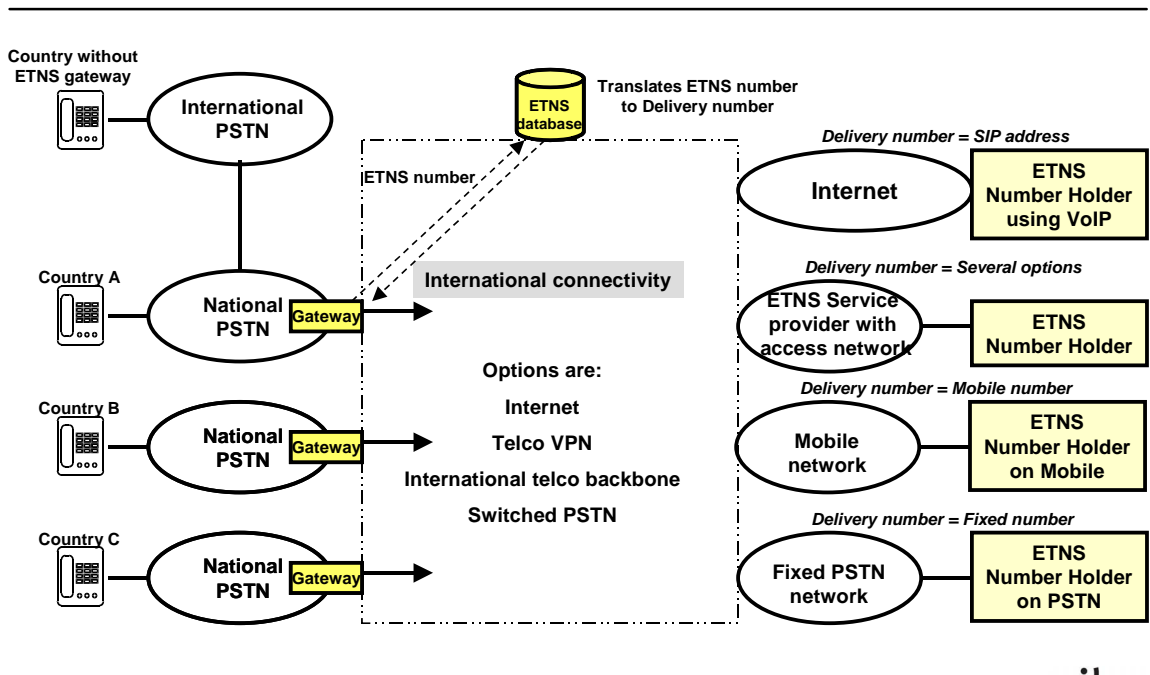
- The access operator and the ETNS Service Provider may be unrelated and the ETNS Service Provider just arranges for the call to be delivered through the access operator. This is commonly known as a number translation service and is how many freephone services operate.
- The ETNS Service Provider may be a VoIP operator who delivers the call over broadband provided by a separate access operator.
- The access operator may also be an ETNS Service Provider and offers the subscriber a service with both an ETNS number and a traditional E.164 number.
- The access operator may also be an ETNS Service Provider and offers the subscriber a service with only an ETNS number. This is in practice unlikely in the short term but could become common if ETNS becomes a major success in the longer term.

The payments between the ETNS Service Provider and the ETNS Operator are a commercial matter.

¹ See Annex A for some more details on ENUM.

The ETNS service provider may also offer out-going calls with the ETNS number as the calling line identity (CLI) but is not required to do so. If the access operator used by the subscriber with the ETNS number is a normal fixed PSTN network then outgoing calls may be used by the PSTN operator in which case the CLI would be the normal fixed number (this is analogous to having a freephone number). Figure 1 illustrates the call routing for incoming calls.

Figure 1. Option A call routing



In countries with an ETNS gateway, the call is routed to the gateway. In countries without an ETNS gateway, the call is routed to a gateway in another country. The gateway interrogates the ETNS database to find out where to deliver the call, i.e. to translate the called ETNS number into a delivery number. This will involve either full number translation or the addition of a routing prefix if routing prefixes are eventually specified internationally. The call is then delivered using the delivery number. The call may be carried internationally over the public Internet, a telco VPN, or any other type of network depending on the possibilities available.

Examples of calls

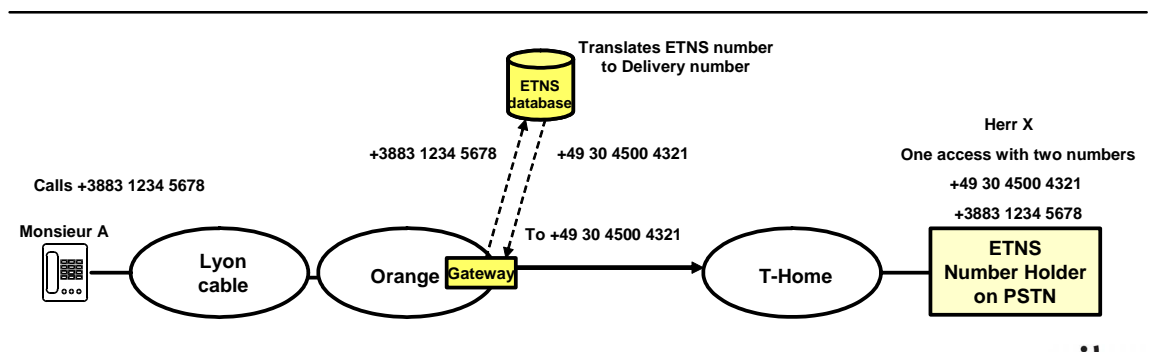
It is too complicated to show all the possible combinations for handling calls on a single diagram so the following examples may help to illustrate the possibilities further.

Example A1

Herr X is an enthusiastic European and wants a European number but he is not interested in technology and still has his home line in Berlin supplied by T-Home where his number is +49 30 4500 4321. He becomes a subscriber of an ETNS service provider and obtains the European number +3883 1234 5678. He tells his French friend Monsieur A in Lyon France about the new number and also his German neighbour Herr B.

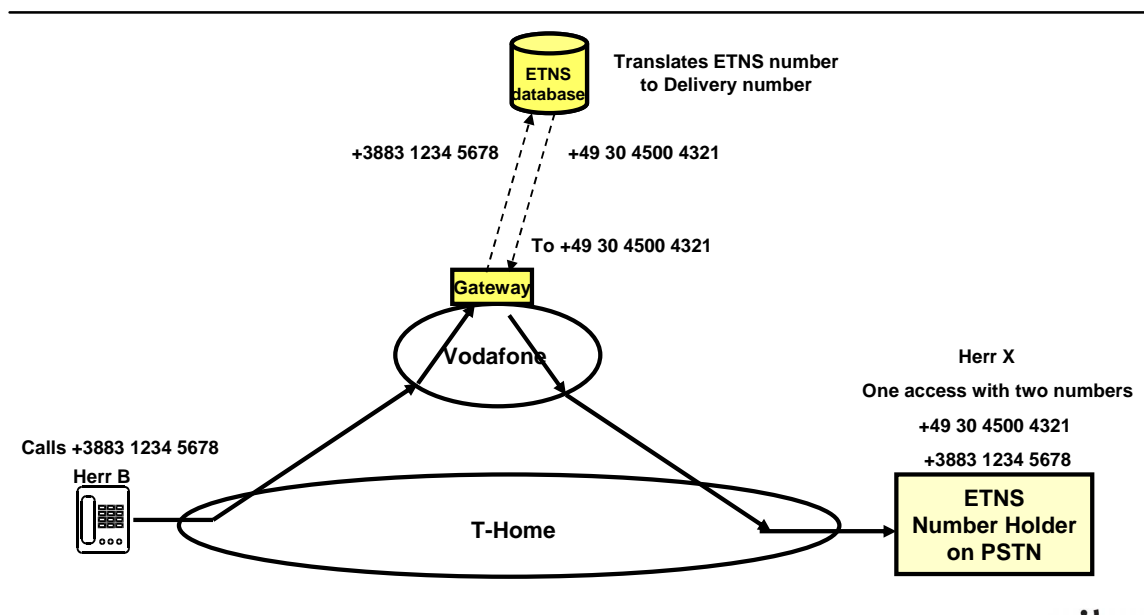
Monsieur A dials +3883 1234 5678 from Lyon to call Herr X. Monsieur A is on a local cable network. The cable operator does not have an ETNS gateway but the ETNS code is entered into its switches. It routes the call to Orange, which runs an ETNS gateway under an arrangement with the ETNS Operator. The ETNS gateway looks up the number in the ETNS database and finds that the call has to be routed to +49 30 4500 4321. The gateway sends the call over Orange's international connection arrangements with T-Home. Figure 1 shows the call path.

Figure 1. Call from Lyon to Berlin in example 1



In Berlin, Herr B also uses T-Home but T-Home has not yet installed an ETNS gateway itself. Herr B dials +3883 1234 5678 to call Herr X. T-Home routes the call to Vodafone which has an ETNS gateway and the gateway obtains the number translation from the ETNS database and finds that the call has to be routed to +49 30 4500 4321. The gateway sends the call back to T-Home for delivery to Herr X. Figure 2 shows the call path.

Figure 2. Call from neighbour in Berlin in example 1



When Herr X calls Monsieur A or Herr B, the calling line identity presented is still +49 30 4500 4321.

Example A2

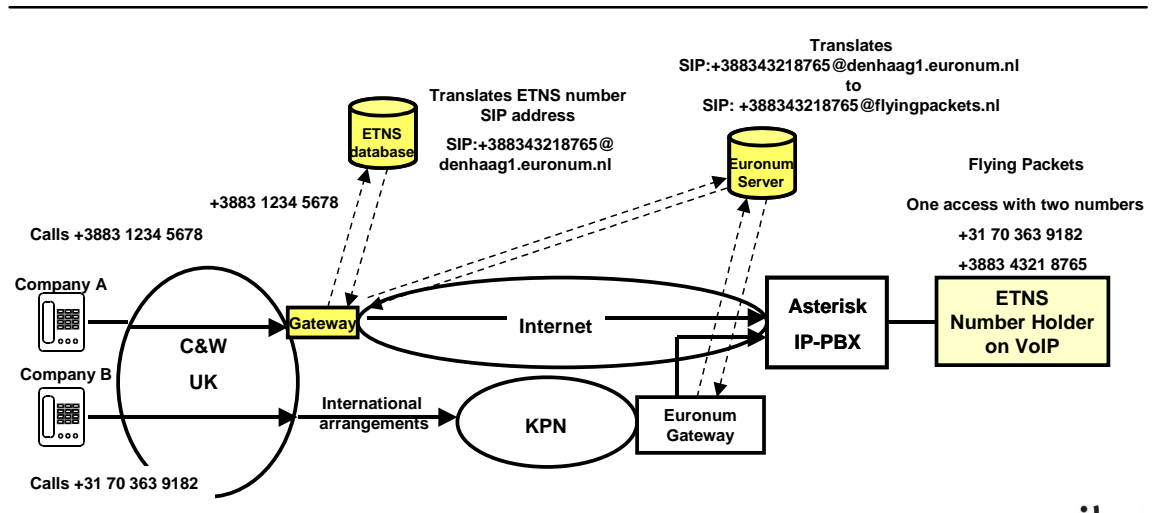
In 2015, Flying Packets AS is a Dutch international delivery company in Den Haag whose owners are very keen on new technology. Some of the clients of Flying Packets are also keen users of VoIP and others are traditional businesses. Flying Packets uses VoIP services from Euronum for its telecommunications and currently has the number +31 70 363 9182. Euronum is also an ETNS service provider. Flying Packets has an open source soft Asterisk IP-PBX.

Flying Packets obtains an ETNS number +3883 4321 8765 from Euronum, as it wants to use it for advertising on a satellite channel that is broadcast to the whole of Europe.

Company A based in UK, using a C&W business service sees the advert and dials the number +3883 4321 8765. C&W has an ETNS gateway, the call is routed to the gateway which looks up the ETNS database. The ETNS database translates the number to the SIP address for Flying Packets in a proxy server run by Euronum, which is +388343218765@den Haag1.euronum.nl. The ETNS gateway sends a SIP message to the proxy server den Haag1.euronum.nl. This server redirects the message to the Asterisk IP-PBX of Flying Packets using the SIP address +388343218765@flyingpackets.nl. The Asterisk IP-PBX responds and the call is established over the Internet between the ETNS Gateway and the Asterisk IP-PBX.

Figure 3 shows the call path for the call from company A and also a call path for the call from company B who is a neighbour company of A, where B dials the non ETNS number +31 70 363 9182. This is shown to provide a comparison.

Figure 3. Calls from UK to Flying Packets in Den Haag



When Flying Packets makes outgoing calls Euronum allows it to choose whether to present +3883 3597 2257 or +31 70 363 9182 as the CLI. Euronum provides an intelligent algorithm to make this choice automatically based on knowledge of the location of ETNS gateways obtained from the ETNS Operator.

Eventually, a few years later, when ETNS has become very well established with near global connectivity, Flying Packets ceases to use its old national number and uses only the ETNS number.

Commercial relationships and charging

The details of the commercial relationships should be left open to the commercial parties to negotiate. However, Figure 4 shows the pattern of charges that is expected and distinguishes between retail charges in green and wholesale charges in blue.

Figure 4. Option A: Commercial relationships

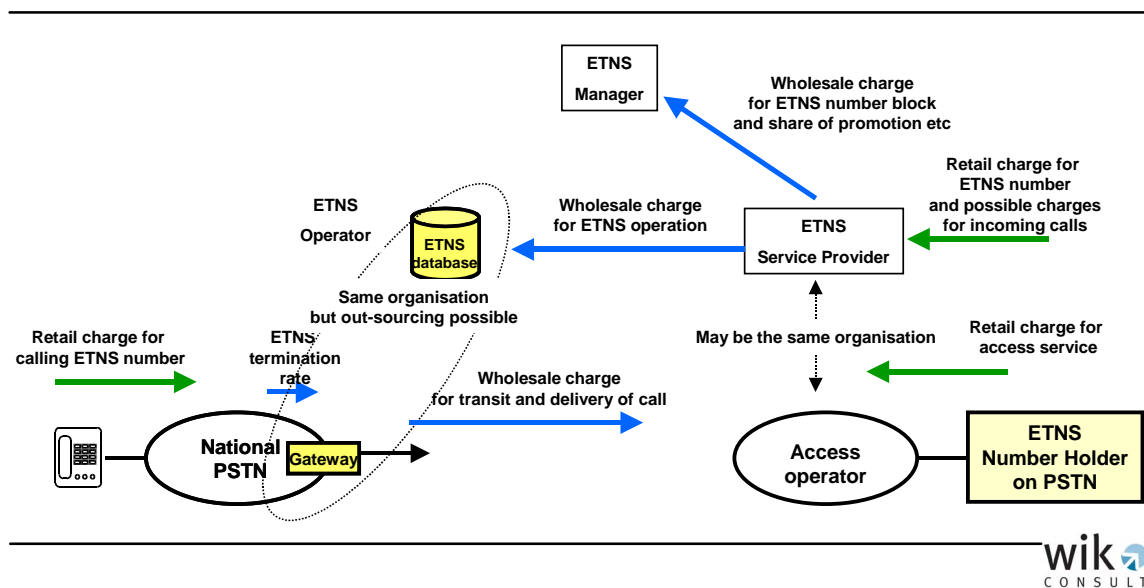


Figure 4 shows the access operator and the ETNS Service Provider as separate parties in which case the ETNS number holder will have two numbers, an ETNS number and a traditional number from the access operator. He or she will therefore have to pay two subscriptions. Depending on the overall economics and commercial judgements, the ETNS number holder may have to pay for incoming calls if the costs of the section of the call from the ETNS Gateway to the number holder cannot be recovered adequately from the termination rate paid to the gateway. Such charges are especially likely if the call is delivered on a mobile network.

It is possible that the ETNS number range could be divided to use more than one termination rate if the commercial players think that this would be valuable.

Benefits

The benefits of Option A are:

- The opportunity for subscribers to obtain non-geographic numbers with a European identity;
- The opportunity for subscribers to change location and access operator throughout Europe whilst retaining their ETNS number;
- The option to remain reachable using a national number and the ability to decide which number or numbers (ETNS and/or national) to advertise or make known in different circumstances;

- Scope for a single company to take the service to market and be the ETNS product champion;
- Scope to overcome the complexity of traditional telecommunications international call handling arrangements by the use of pan-European transit networks, VPNs or the Internet;
- Scope for the ETNS and ETNS Service Provider to offer additional flexible routing facilities where calls are delivered to different places at different times of the day;

Risks and Costs

The main risks and costs are:

- The slow development of global connectivity across the telecommunications networks to the nearest ETNS gateway because other operators fail to add +3883 to their routing tables, retail and wholesale tariff lists and interconnection agreements.
- Other operators set the retail prices for calling ETNS numbers at a too high rate and so callers are deterred from calling them.

The main costs are:

- Investment and time in establishing the ETNS database,
- Investment and time in publishing the service,
- Investment and time in establishing ETNS gateways in most countries in Europe including the relevant commercial interconnection agreements.

We do not have available exact estimations of the cost of establishing this system of ETNS gateways. However, in our discussion with Xconnect, it was stated that the annual cost of administering and managing the gateways would be on the order of several million Euros, but not tens of millions of Euros. The costs of establishing and running gateways and switches in 27 Member States are likely to be on the order of low tens of millions of euros per year. However, this cost could effectively be zero, depending on if there are sufficient offsets should the gateways enable the operator to avoid certain costs associated with termination charges to other networks.

Option B: ETNS is a shorter European number for reaching the contact centres of European organisations

Description

ETNS is used for non-geographic shorter numbers that can be used primarily by call centres and other access points into organisations wishing a European identity. The shorter length of the numbers will make them more memorable and more suitable than longer numbers for inclusion in advertisements. The services supported will include both voice telephony and text messages as there are substantial benefits in enabling response to advertisements by text message, which is both convenient for the user and facilitates automation in the call centres.

Because of the benefits of text communications where the responses can be handled automatically by intelligent computer systems, special emphasis will be given to establishing access by SMS from mobile services.

There will be a very strong emphasis on making the price for calling or texting ETNS numbers the same as a national call or text message and for ensuring that such calls and texts are included in packages of minutes/texts and flat rate subscriptions. It will be extremely important that ETNS is branded as a safe number to call otherwise the value of its use in advertisements will be reduced.

Roles and competition

There will be three roles in the operation of ETNS:

- The ETNS Manager who will allocate numbers via the ETNS Service Providers. This is intrinsically a monopoly role. The ETNS manager will also handle central or common publicity for ETNS.
- The ETNS Service Providers who will sell ETNS numbers to subscribers together with other services. This is potentially a role for many different parties in competition with each other, but because the amount of numbers is limited, the number of ETNS Service Providers will be limited to say 10.
- The ETNS Operator who will have the task of maximising the opportunities for the users of all networks both inside and outside Europe to be able to make calls and send texts to ETNS numbers. In practice they will run or establish a number of ETNS Gateways. This is not absolutely a monopoly role but the practical scope for competition is limited and it is best viewed as a single role that could be shared in practice with different companies handling the role in different regions as in a franchise organisation.

Because of the commercial challenge in starting ETNS, we recommend that the same commercial organisation should be allowed to undertake all roles provided that there are safeguards for other ETNS Service Providers. This approach will enable there to be a real ETNS product champion.

Number length

ETNS numbers will have say 5 digits following the code +3883. Since many people will eventually remember the code +3883 as a single entity, this will be like a 6-digit number.

Because of the short length of the numbers, the numbers will be a scarce resource. The European Commission and the organisation appointed as the ETNS Manager should make the final decision on the length of the number

Number allocation

An ETNS manager will be appointed as ETNS registrar following an open competitive process and have a contractual relationship with those countries that hold the country code allocation from ITU.

The subscribing organisation would have an option to choose any available unallocated number within the ETNS range from an ETNS service provider. Numbers will not be allocated in blocks to service providers. This is important because of the potential for branding and memorability.

Because of the limited quantity of numbers, the European Commission and the organisation appointed as the ETNS Manager should make the final decision on the best method of allocation, which might include an initial auction, a pricing mechanism or restriction of allocations to organisations rather than individuals.

Numbers would be portable between ETNS service providers.

Network operation

The ETNS Operator will establish as many ETNS gateways as practicable starting in countries inside Europe but extending to those countries outside Europe that originate sufficient calls to ETNS numbers to justify a gateway. It will also run a database for delivery information for calls.

The ETNS Operator will arrange for other operators to add the code +3883 to their routing tables and route calls to the nearest ETNS gateway. The other operators will

probably have to pay the ETNS Operator a termination charge for each call that is delivered to the gateway and will charge the caller a retail rate that will cover both their conveyance costs and the termination charge. The termination charge may be a "business as usual" national termination charge.

Because the objective is to make the numbers as reachable as possible the ETNS operator may have to accept a low or zero termination charge to ensure in a negotiation that the operators treat calls and texts to ETNS as normal national calls.

Whilst the ETNS Operator is responsible for establishing the ETNS gateway the gateway does not need to be built and run by the ETNS operator but the function may be out-sourced to an existing operator such as an incumbent or a VoIP gateway operator. Thus high capital costs can be avoided.

When the ETNS gateway receives a call it will interrogate a database that holds translations from the called ETNS number to a delivery number, which will probably be a fixed national E.164 number.

The ETNS gateway will then route the call to the delivery number and pay as necessary for any transit charges and the delivery of the call. The focus is not so much on minimising the cost of these communications but ensuring the ability to handle any surges in demand associated with responses to advertisements.

The form of the database used by the ETNS Operator will be for them to decide but they may use a form of carrier ENUM.

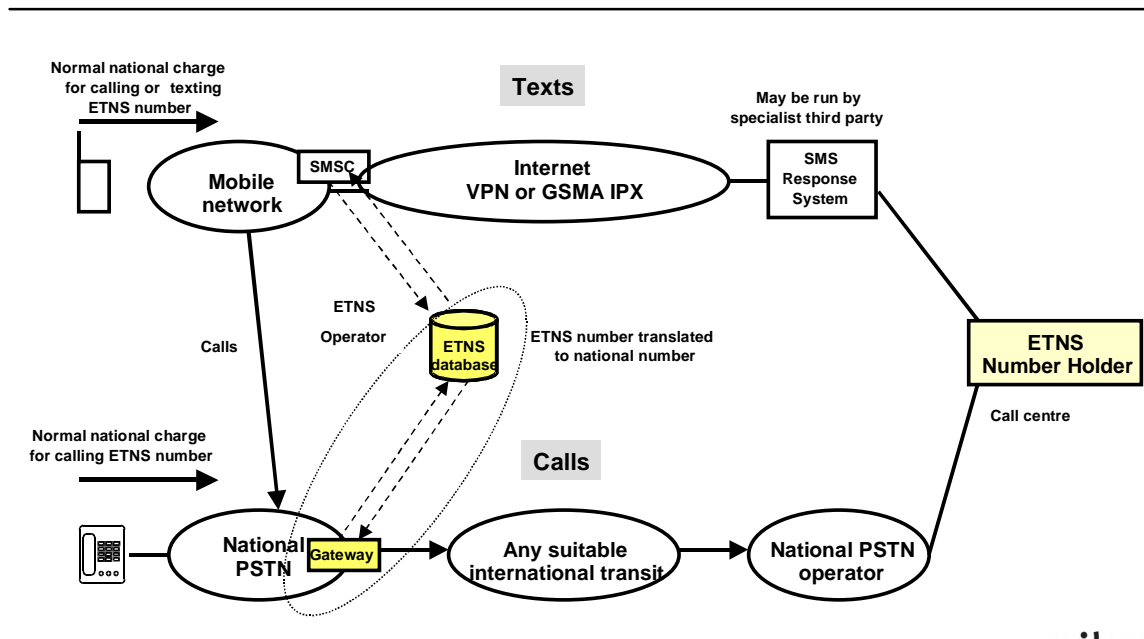
A significant and growing proportion of the traffic to ETNS numbers will be texts generated by mobile users. These texts can be sent to the ETNS number holders directly from the Short Message Centres of the mobile operators using a protocol over the public Internet. Responses from the ETNS number holders could be sent in the same way or sent through the international arrangements of the mobile operators.

The GSMA is developing an international platform to support data and other communications called IPX and this could be used in the future.

The payments between the ETNS Service Provider and the ETNS Operator are a commercial matter.² Figure 5 illustrates the call and text routing arrangements.

² See below section on Commercial relationships and charging for more details.

Figure 5. Option B call routing



1.1 Example of calls

The following examples may help to illustrate the possibilities further.

Example B1

Mercedes runs a TV advertisement for its new car and offers free test-drives with a lucky draw where one in five people who go for a test-drive are offered a free day's rental for the car. The advertisement ends with the simple message:

"Call or Text MERC to +3883 24242 to book your test-drive"

Mr. X in Sweden is watching football and sees the advertisement. Next day he remembers the advertisement and decides to book a test drive. He can remember the number - it is the familiar ETNS number with 24242, so he dials 00 3883 24242. He pays nothing for this call because it is included in the flat rate subscription that he has with Telio. Telio routes the call to the Swedish call centre for Mercedes in Stockholm and they arrange the test drive.

Mr Y in Portugal is watching the same football match and sees the same advertisement. He calls 00 3883 24242 and the call is routed by Portugal Telecom to the call centre for Mercedes in Lisbon.

In both cases the ETNS gateways are programmed to provide this level of intelligent routing.

Mr Z in Woking UK also sees the advertisement. He does not want call a call centre because he has had bad experiences of long waiting times to be answered so he takes his mobile out of his pocket and quickly texts MERC to +3883 24242 and then continues to watch the match. Shortly he receives a text back offering him a test drive next Saturday at 1000 at the Mercedes dealer in Guildford, only 4 miles away. His mobile operator has provided location information with the text and so the SMS response system can make local arrangements for him. He texts back "Y" to accept the message. At 1900 on Friday he receives a text to remind him about the test drive the next morning.

Example B2

Miss K in Belgium is watching a fashion programme and sees an advertisement for a very attractive handbag. The advertisement ends with the simple message:

"Text BAG to +3883 67821 to receive a list of local stockists"

She sends the text BAG and a few minutes later receives three texts with the addresses and phone numbers of local stockists.

Example B3

Company M is an international hotel chain with hotels throughout Europe. They provide a single contact point for bookings and other information. The Contact point has an ETNS number and can be contacted both by calls and texts. The company always sends a text the day before a booking as a reminder.

Communications are handled as described in the other examples.

Example B4

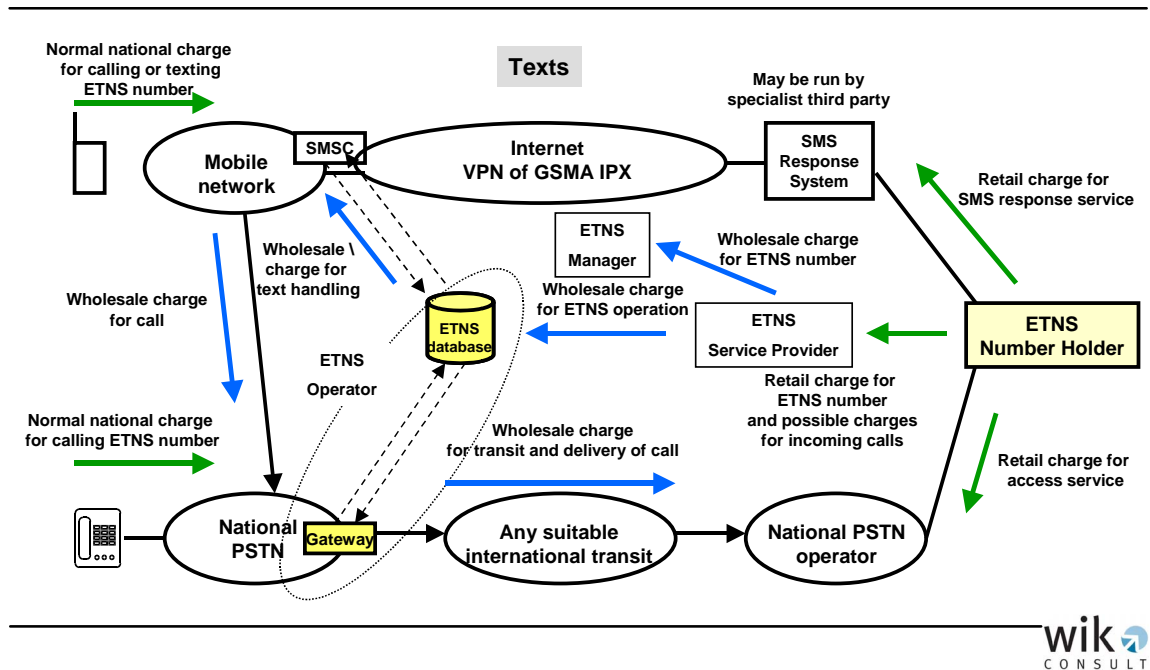
Company N is a vehicle repair and roadside assistance company with coverage of the whole of Europe. They provide a single contact point for assistance using an ETNS number accessible by both calls and texts. In most countries the mobile operators are able to provide reasonably accurate location information in association with the calls and texts.

Communications are handled as described in the other examples.

Commercial relationships and charging

The details of the commercial relationships should be left open to the commercial parties to negotiate. However, Figure 6 shows the pattern of charges that is expected and distinguishes between retail charges in green and wholesale charges in blue.

Figure 6. Option B: Commercial relationships



The commercial arrangements are similar to those for Option A except that it is even more important to ensure that the calls and texts made to ETNS numbers are at national rate and are included in flat rate tariffs and bundles. This may require some payment of incoming calls to be made by the ETNS number holder.

The ETNS number holder would have to pay separately for SMS response services.

These ETNS numbers will be in short supply and therefore the ETNS Manager may decide to make more obviously attractive numbers such as

+3883 0 3883

+3883 11111

+3883 12121

more expensive than other numbers or even to auction some numbers. This would be a commercial decision.

Benefits

The benefits of Option B are:

- The opportunity for businesses and other organisations to obtain shorter memorable non-geographic numbers with a European identity for call and text centres and use in advertising (text response has been shown to increase the response to advertisements by up to three times). The use of texts with call centres is an area of major potential development.
- The opportunity to attract more substantial commercial money than the other options because the benefits extend beyond the simple value of the communications.
- The opportunity for call centres to be re-located anywhere in Europe without changing the number.
- Scope for a single company to take the service to market and be the ETNS product champion.
- Scope for the ETNS Operator and ETNS Service Provider to offer additional flexible routing facilities.

Risks and Costs

The main risks and costs are:

- The slow development of global connectivity across the telecommunications networks and from mobile networks to the nearest ETNS gateway because other operators fail to add +3883 to their routing tables, retail and wholesale tariff lists and interconnection agreements.
- Other operators set the retail prices for calling ETNS numbers at too high a rate and so callers are deterred from calling them.

The main costs are:

- Investment and time in establishing the ETNS database, the gateways and the arrangements for text messages.
- Investment and time in publishing the service.

The start-up costs are probably the highest of the three options.

Option C: European "future proof" numbers

Description

ETNS is a non-geographic European numbering space that provides low cost "future proof" numbers for "contact information" for European citizens and organisations independent of the communications services that they use. The ETNS number acts primarily as an access point for obtaining e.g. current communications coordinates and preferences of the number holder. A variety of things may possibly be obtained, e.g. a SIP server, an e-mail address, a Jabber identifier, a Skype identifier, a web-server; public key credentials, etc. Thus, the ETNS number can be thought of as a unique identifier which can be used to contact the subscriber without respect to the network access the subscriber happens to use.

Unlike options A and B, in option C the support of incoming calls from the PSTN is not an essential part of the service. In Option C the number is independent of the communications service or services that the number holder uses and could be retained even when the number holder ceases to have any means for receiving incoming calls from the PSTN, e.g. they can only be reached by some Internet voice service or by chat or by email. Consequently the length of number proposed is greater than for Option A because more numbers will be needed because their expected average time in use is longer.

ETNS works by adding the numbers into public ENUM³ and the number holder adding and updating their current communications coordinates, either directly or through the ETNS Registrars⁴. Thus, ETNS can be used to support user communications management and the flexible routing of incoming calls but the provision of an incoming call service is not an essential part of the concept.

Public ENUM, specified in RFC 3761, is the "international public database" that links telephone numbers to Internet names and other Internet related destinations and other identities. Any party can interrogate the database over the Internet with the telephone number of an ENUM subscriber and the database will return a list of identities and Internet related destinations that are associated with the subscriber, examples are the subscriber's email address, mobile telephone number or web page. These identities can then be used to establish various forms of communications with the ENUM subscriber, e.g. the party could send an email to an ENUM subscriber having initially known only their telephone number. The public ENUM database can be used both by human users

³ See Annex A for some more details on ENUM.

⁴ See below section on Roles and competition.

and, more likely and more often; by electronic processes (applications) that are providing other forms of communications services.

The "international public database" is part of the Domain Name System of the Internet under e164.arpa. Information relating to an individual number say: +34 98 765 4321 is held under the domain name:

1.2.3.4.5.6.7.8.9.4.3.e164.arpa

The ETNS Manager would be registered with RIPE NCC and ITU as the registry for 3.8.8.3.e164.arpa in public ENUM.

ETNS numbers will be allocated via ETNS registrars who sell the ENUM service to subscribers.

A subscriber who wants to have a "future proof" European number will obtain the number through the ETNS registrar who will offer the subscriber a customised interface for organising incoming calls and for advertising other contact information in public ENUM.

The subscriber will then be able to populate the fields under their ETNS number within public ENUM with their communications identifiers and possible other information such as public encryption keys and to indicate their preferences for receiving communications. The ETNS service provider may also provide easy application software for changing and reprogramming the preferences.

Access to the communications coordinates could take place by:

- a) A human user using a browser or other software application from a computer, a mobile handset or any other device with Internet access;
- b) An automated communication from another service that requires access to the information with this communication being invisible to a human user; or
- c) A human user calling the number and listening to an automated message generated by a gateway in the PSTN that accesses the information over the Internet.

The support of c) could be made optional but its inclusion is implicit in the current text of the Directives, which implies the ability to call the number.

Option C is the option that is furthest away from the original ETNS concept. The main longer term development of this option will be the support of advanced communications over the Internet using information on the called party obtained from public ENUM.

Roles and competition

There will be three roles in the operation of ETNS:

- The ETNS Manager who will act as the registry in public ENUM for ETNS. This is intrinsically a monopoly role. The ETNS manager will also handle central or common publicity for ETNS.
- The ETNS Registrars who will register ETNS numbers for subscribers and who will manage the information added to ENUM on behalf of registrants. ETNS Registrars may also sell other services. This is potentially a role for many different parties in competition with each other.
- The ETNS Operator who will have the task of maximising the opportunities for the users of all telephony networks both inside and outside Europe to be able to make calls to voice response systems that handle information from public ENUM relating to the called ETNS number (see further explanation under the section on networks). In practice they will run or establish a number of ETNS access points. This is not absolutely a monopoly role but the practical scope for competition is limited and it is best viewed as a single role that could be shared in practice with different companies handling the role in different regions as in a franchise organisation. The need for a single ETNS operator could be optional under Option C if telephony access is not considered essential.

In view of the commercial challenge in starting ETNS, one might think of the same commercial organisation could be allowed to undertake all roles, provided that there are safeguards for other ETNS Registrars. This approach might enable a real ETNS product champion to emerge.

Number length

ETNS numbers will have 9 digits following the code +3883. Greater length is needed than is the case for Option A because the numbers will be held for longer and will need a long sterilisation period before re-use.

Number allocation

The ETNS manager, acting as the registry in public ENUM for ETNS, will be appointed following an open competitive process, a call for expressions of interest in the concession, and have a contractual relationship, directly or indirectly, with those countries that hold the country code allocation from ITU.

Any subscriber will be able to obtain any unused number within the ETNS range from an ETNS Registrar - numbers will not be allocated in blocks.

Network operation

As stated in section on Roles and competition the role of a network operator can be considered optional. But if it is not included the texts of the Universal Services Directive will need to be modified, i.e. if accessibility of ETNS numbers from the PSTN is not mandated.

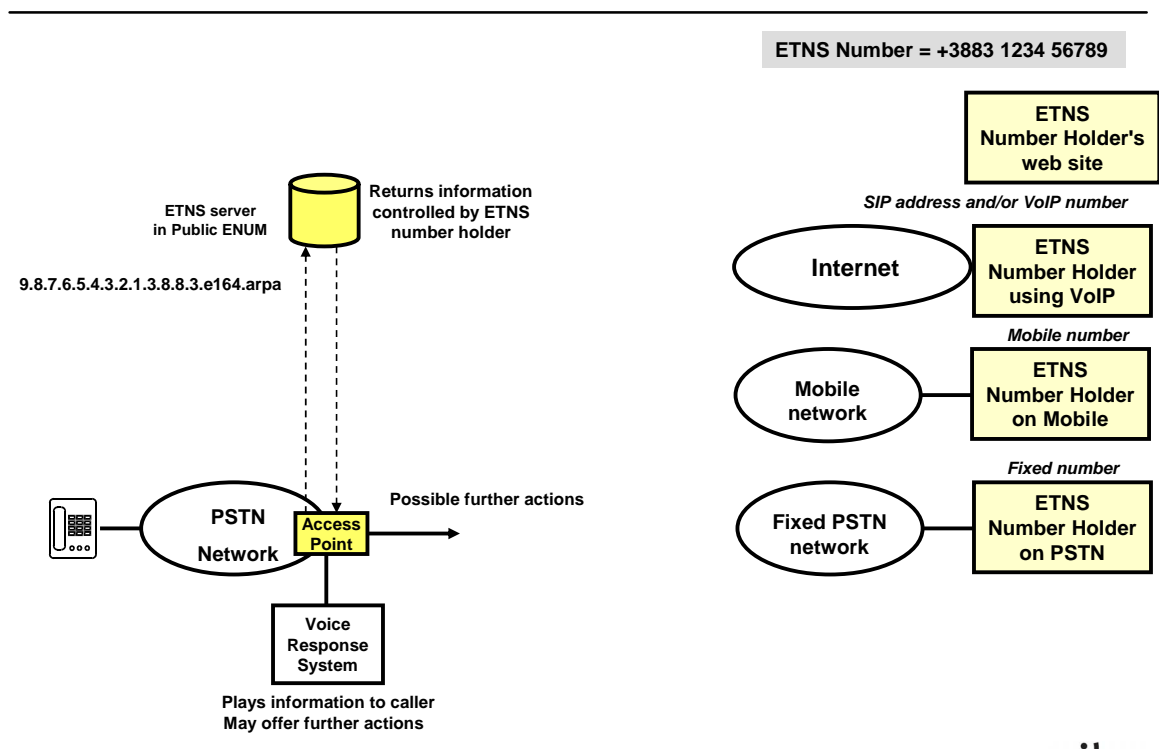
The ETNS Operator will establish ETNS access points in as many countries as possible and calls from fixed and mobile networks to ETNS numbers will be routed to these ETNS access points. At the access point there will be a voice response system that will take the caller through a menu of options for accessing the information stored in public ENUM relating to the ETNS number.

Depending on the commercial judgement of the ETNS operator in terms of the investment that they are willing to make, the ETNS access point may either just deliver the information to the caller or will also offer to connect the call. In all cases where the call reaches an ETNS access point the call will be terminated and handled in a way that is intelligible to a human caller.

After obtaining the information from the access point, the caller may use the information to contact the ETNS number holder in whichever way they choose taking account of any preferences indicated by the ETNS number holder through their ENUM entries. This contact is a second action that will use the information obtained and not the ETNS number.

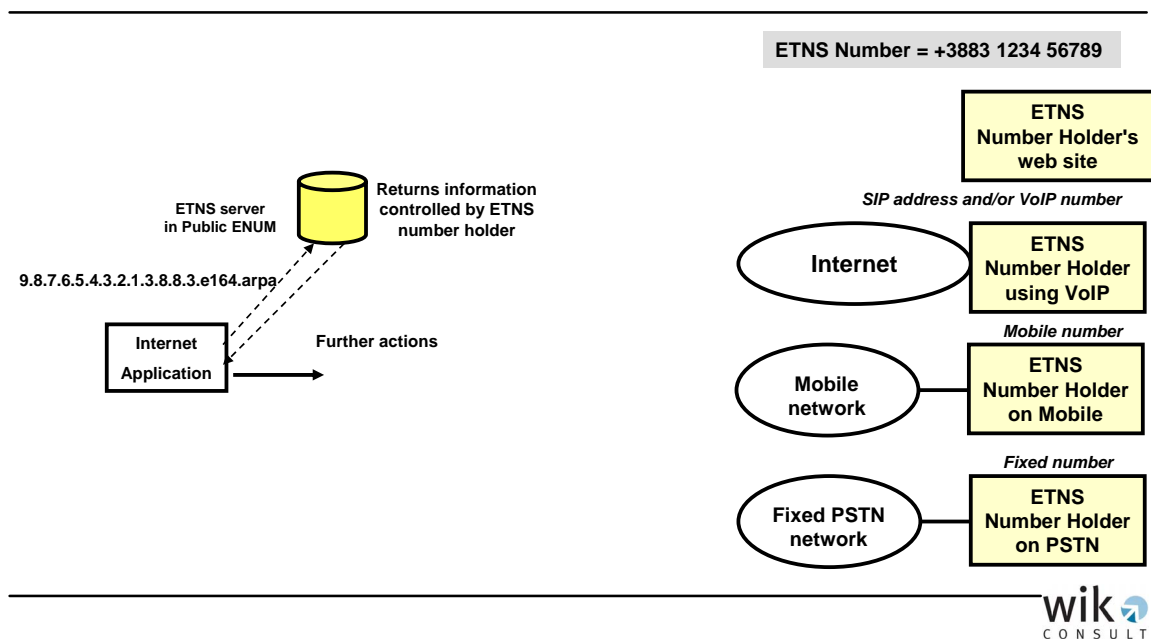
Figure 7 shows the overall concept.

Figure 7. Option C: Overall concept



The description above covers only one part of the concept. If public ENUM develops as some people expect more applications on the Internet will access public ENUM directly over the Internet without needing to use the ETNS access point. Figure8 shows an Internet application accessing public ENUM.

Figure8. Option C: Access from the public Internet



The main difference from Option A is that Option C is a means to obtain information about how to communicate with the number holder, i.e. it is prelude to communications and not the communications itself. The focus is more on the support of advanced communications from applications on a smart phone, for example, over the Internet than on calls from the PSTN.

Importantly the essential investment that the ETNS Operator needs to make and the essential running costs are lower because the ETNS access point does not have to deliver calls through to the called party. It is probable that the charges of the ETNS registrar may also be lower than those of ETNS service providers in the other options.

Example of calls

The following should help to illustrate Option C.

Example C1

Señor P is a coordinator for an international charity. He is based in Barcelona but travels widely in many different countries around the world and, since he works for a charity, has to minimise costs. His travels are frequently changing and he needs to provide a single point of contact for people to be able to contact him. He does not want to use his Spanish mobile phone because of the high roaming charges especially outside Europe. Señor P therefore obtains an ETNS number from Numero1, which is a Spanish based ETNS registrar. He gives this number to all his contacts. Numero1

provides special software that Señor P downloads into his mobile to make it easy for him to update his contact details in public ENUM using a low cost structured text message. Señor P updates this information regularly.

Señor P has given his elderly mother a smart phone and pays her broadband subscription. She simply touches his photo on the screen with her finger. The phone queries the ENUM database. She is given an option of trying to phone him or leaving a voice mail. Her phone automatically does not present options which are not appropriate for her. Señor P travels a lot and his mother is not sure where he is. So she chooses voice mail. Señor P though is told immediately that he has voice mail. Having left his meeting and on way back to the airport in California he listens to it and calls his mother back.

Example C2

The European Guild of Software Engineers (EGSE) wants to improve networking between software engineers and to facilitate contact throughout their careers. It therefore arranges with the ETNS Manager to provide its members an ETNS "future proof" number. ETNS numbers are especially attractive for this purpose because they are not dependent on a particular form of telecommunications access (neither fixed nor mobile service, nor VoIP, nor email address) and so have the best chance of remaining unchanged for a very long time.

The EGSE recruits software engineers and scientists shortly before they graduate and allocates them an ETNS number at that time. The students are able to exchange these numbers and use them to keep in contact with each other during their future careers.

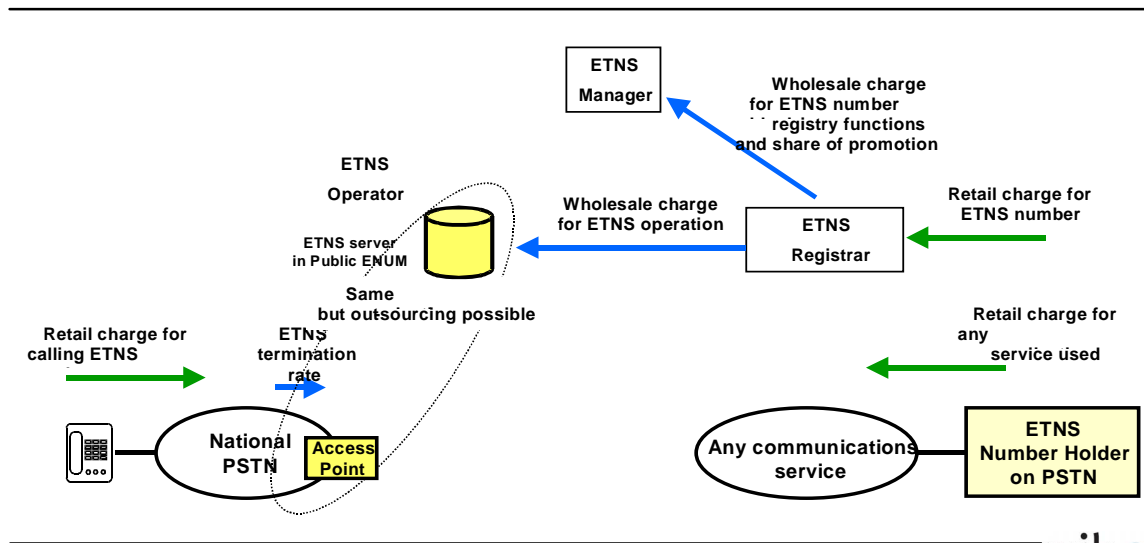
Since many of the EGSE members will be using VoIP, they run clients on their computers that contain contact lists based on the ETNS numbers. These software clients access ENUM using the ETNS number whenever the members wish to communicate with each other. They then use the information obtained from public ENUM to establish direct communications across the Internet. Frequently these communications include live video and wideband speech.

In addition to supporting communications over the Internet, the ETNS numbers can be used as shown in Example C1 so that the members' contact details can be obtained from normal phones in the most convenient way.

Commercial relationships and charging

The details of the commercial relationships should be left open to the commercial parties to negotiate. However, Figure 9 shows the pattern of charges that is expected.

Figure 9. Option C: Commercial relationships



The ETNS number holder pays the ETNS Registrar for the number and the ETNS Registrar pays both the ETNS Manager (registry) and possibly the ETNS Operator.

The ETNS number holder also pays separately for whatever unrelated communications services they use.

Benefits

The benefits of Option C are:

- The opportunity for subscribers to obtain a "future proof" European number at low cost;
- The opportunity for subscribers to make all their communications coordinates known including email addresses and web pages and keep them updated wherever they may be;
- The ability to remain reachable using a national number and the ability to decide which number or numbers (ETNS and/or national) to advertise or make known in different circumstances;
- Scope for a single company to take the service to market and be the ETNS product champion;
- The least dependence on telecommunications of all options;
- The lowest investment cost of all the options.

Risks and Costs

The main risks and costs are:

- The slow development of global connectivity across the telecommunications networks to the nearest ETNS access point because other operators fail to add +3883 to their routing tables, retail and wholesale tariff lists and interconnection agreements. This applies only if the ability to call a number and reach a gateway is included.
- Other operators set the retail prices for calling ETNS numbers at too high a rate and so callers are deterred from calling them. This applies only if the ability to call a number and reach a gateway is included.

The main costs are:

- Investment and time in establishing the ETNS registry;
- Investment and time in publishing the service;
- Possible investment and time in establishing ETNS access points in most countries in Europe including the relevant commercial interconnection agreements (if telephony access to a gateway is included).

Comparison of Options

Table 1 gives a comparison of the different options according to range of different categories: Basic concept, envisaged subscriber focus, number length and number allocation, portability between service providers, main type(s) of communication, “minimum” communications service, database used for providing the service(s), establishment costs, the importance of connectivity and “normal” national retail prices for adoption and diffusion.⁵

⁵ It is beyond the scope of this report to consider the long-term commercial viability of the three proposed options. In order to properly do so would require estimations of demand, modelling of capital and operational expenditures, evaluation of business plans and forecasting capital formation. It is simply not possible to accomplish this within this policy analysis.

Table 1. Comparison of options

	Option A	Option B	Option C
Concept	Non-geographic European numbers	Shorter European number for reaching the contact centres	European "future proof" number
Subscribers	Private and business subscribers based in Europe	(Primarily) European organisations	European citizens and organisations (not limited to subscribers)
Number length	+3883 xxxx xxxx	+3883 xx xxx	+3883 xx xxx xxxx
Number allocation	Through service provider but with choice of any unused number	Through service provider but with choice of any unused number	Through registrar but with choice of any unused number
Portability between service providers	Yes	Yes	Not necessarily linked to service provision
Main types of communications	Voice calls	Voice calls Text messages	Prelude to any form of communication
Minimum communications service	Incoming call to subscriber	Incoming call to subscriber	None or optionally incoming call to access point that reads out contact details
Database	Depends on ETNS operator	Depends on ETNS operator	Public ENUM
Establishment cost	Medium	Higher	Lower
Importance of connectivity and "normal" national retail prices	Medium	Higher	Lower

Comparing the options along the different categories yields the following result:

Envisaged subscriber focus

Option A involves a non-geographic numbering space for individuals and businesses alike, Option B is devoted primarily on organisations, whereas Option C a priori is open to citizens and organisations.

Number length and number allocation:

Options A and C compared to Option B are distinguished primarily by number length. Numbers are allocated either through ETNS service providers (Options A, B) or through registrars (Option C). Each option might provide the opportunity of choosing any unused number.

Portability between service providers

Portability between ETNS service providers is given under Options A and B. Under Option C it is not necessarily linked to service provision.

Main type(s) of communication, “minimum” communications service

Option C differs from options A and B because it is independent of the communications service or services that the number holder uses and does not have the minimum requirement to support calls to the subscriber.

With Option A the main focus is on telephony but text and other services are not excluded. With Option B there would be a much stronger focus on text. With Option C the service is a prelude to any form of communication.

Database used for providing the service(s)

The ETNS operator might choose its actual database solution for the provision of services under Options A and B, even if it is probably ENUM, whereas Option C inherently will be based on Public ENUM.

Establishment costs

Option A is a medium cost option. Option B is more expensive because of the need to support text as well as telephony but the commercial benefits of Option B are much higher and so there should be much stronger commercial support.

Option C is the lowest cost option and the one that is simplest to implement, especially if the requirement to support telephony access to the numbers for the retrieval of contact information is dropped.

Connectivity, “normal” national prices

In our view, the importance of connectivity and “normal” national retail prices for adoption and diffusion is lower, or even non-applicable, under Option C, medium under Option A and higher under Option B.

Annex A. ENUM

This annex provides a brief description of ENUM concepts.

ENUM⁶ is a protocol which enables mapping of E.164 telephone numbers to IP-based services by means of the DNS Internet naming system. ENUM accesses information stored in so-called NAPTR (Naming Authority Pointer) records within DNS. In so doing, ENUM allows regular telephone numbers to be associated with a variety of different Internet and other services. For example, ENUM can link to a fixed or mobile telephone number although it typically has to be reached via a VoIP gateway.

Public ENUM, specified in RFC 3761, is the "international public database" that links telephone numbers to Internet names and other Internet related destinations and other identities. The "international public database" is part of the Domain Name System (DNS) of the Internet under e164.arpa. Information relating to an individual number say: +34 98 765 4321 is held under the domain name:

1.2.3.4.5.6.7.8.9.4.3.e164.arpa.

Public ENUM subscribers opt-in to provide specific information into this domain in DNS. Examples are the subscriber's email address, mobile telephone number, SIP address or web page. Public ENUM is accessible by any user on the Internet, i.e. any party can interrogate the database over the Internet with the telephone number of an ENUM subscriber and the database will return the list of identities and Internet related destinations that are associated with a particular subscriber. These identities can then be used to establish various forms of communications with the ENUM subscriber, e.g. the party could send an email to an ENUM subscriber having initially known only their telephone number. The ENUM database can be used both by human users and by electronic processes (applications) that are providing other forms of communications services.

In addition to public ENUM, ENUM technology and the ENUM protocol are used widely in IP-based telecommunications networks (e.g. Next Generation Networks) by telecom carriers, VoIP operators or other service providers over the public Internet. These implementations usually do not use the public tree .e164.arpa. i.e. they may be located either under another domain name on the public Internet or within a private IP domain. Thus, they may not be accessible at all from the public Internet. Where they are reachable from the public Internet access may be granted only to specific parties. Such implementations are called "private ENUM" or "carrier ENUM".

⁶ ENUM is not an acronym. The name is meant to suggest an "electronic numbering system".

For more information on ENUM related issues see the websites of the Internet Architecture Board (IAB), Internet Engineering Task Force (IETF), and RIPE in the list of references.

Annex B. List of acronyms and references

CC Country Code: an ITU term referring to the initial three digits of a telephone number which defy the country to which a call is placed. The structure of E.164 Country Codes and International Codes is a 1 to 3 digit Country Code followed by a 1 to 4 digit Identification Code. Thus the +3883 code is comprised of the 3-digit 388 Country Code, plus the 1-digit 3 Identification Code.

DNS Domain Name System: the system of databases which associates various sorts of information with domain names in order to translate hostnames to IP addresses for Internet access. It also stores other information such as the list of mail exchange servers that accept. Most applications on the Internet make use of DNS.

E.164 ITU-T Recommendation; the international public telecommunication telephone numbering plan (see <http://www.itu.int/rec/T-REC-E/e>)

ENUM, see Annex A

ITU International Telecommunications Union: a standards organization, founded as the International Telegraph Union in Paris on May 17, 1865, dedicated to international radio and telecommunications; it focuses on standardizing allocations of the radio spectrum and organizing interconnection arrangements between different countries to enable international telephone calls

NGN Next Generation Networks

PBX Private Branch Exchange

PSTN Public Switched Telephone Network: the network of public circuit-switched telephone networks, originally fixed-line analogue telephone systems; the PSTN is now almost entirely digital

RIPE NCC (Réseaux IP Européens Network Coordination Centre): an independent, not-for-profit membership organisation that supports the infrastructure of the Internet through technical co-ordination in its service region

SIP Session Initiation Protocol: an application-layer data communications control protocol for creating, modifying, and terminating sessions with one or more participants; SIP is designed to be independent of the underlying transport layer; it can run on TCP, UDP, or SCTP

VoIP Voice over IP: a set of data communications protocols and technologies to enable voice to be sent over individual IP-based networks or over the Internet

RIPE ENUM WG <http://www.ripe.net/ripe/wg/enum/index.html>

RIPE NCC and ENUM <http://www.ripe.net/rs/enum/index.html>

IAB (Internet Architecture Board) instructions to RIPE NCC on ENUM
<http://www.ripe.net/enum/instructions.html>

IETF WG on Telephone Number Mapping (ENUM)
<http://www.ietf.org/html.charters/enum-charter.html>