Office of Utility Regulation

ENUM – Accessing multiple customer services through Telephone Numbers

Opportunities for Guernsey

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Information Note

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1. The Development of ENUM in the UK

The UK is currently considering how, and in what manner to implement a new development in numbering protocols. ENUM - an acronym for *E*lectronic *NUM*bers – is an addressing protocol which facilitates convergence between traditional telecoms and internet worlds by enabling a range of communications mechanisms (e.g. mobile telephone, fax, email, etc.) to be identified for a participating customer by mapping that customer's telephone number into the Internet domain name system using a system developed by the IETF's (Internet Engineering Task Force) Telephone Number Mapping working group, a technical body that develops Internet Standards.

This sounds complicated but in practice should be easy to use. Users make calls by dialing up a single phone number in the usual way and within seconds they will be given choices of how they can complete the call in a variety of different ways. If widely taken up, ENUM potentially offers a mechanism to contact anybody, anywhere on the communication terminal and using the communications service that is most efficient or convenient for both parties.

Currently, the UK is considering how to take best advantage of the potential benefits and opportunities this technology offers. Led by the Department of Trade and Industry ("DTI"), and with the assistance of OFTEL, the UK telecommunications regulator, a working group - UKEG – has been established. The Group's main tasks are to make recommendations on the preferred options for implementing ENUM in the UK as well as to highlight any regulatory issues that need to be considered if ENUM is to be commercially implemented in the UK. It is also likely that the DTI will be undertaking a public consultation on this initiative later this year.

There is also a limited trial being undertaken – with the assistance of the DTI and OFTEL – and it is envisaged that these trials will continue until the end of 2003.

2. Objectives of this Information Note

The future development of ENUM raises a number of matters that will need to be considered in greater detail before the technology could be commercially exploited in the Bailiwick. Of particular importance will be the level of control the Bailiwick of Guernsey exercises over the number ranges used as this will influence how the technology can be deployed in the Bailiwick in a manner that maximises the benefits to Guernsey. The Director General proposes to pursue these matters further when the technology is more advanced and will consult where appropriate.

The purpose of this Information Note is to make interested parties in the Bailiwick aware of the new technology and to encourage them to consider how it might be exploited in Guernsey. The Note is also designed to raise awareness of the opportunities that may exist for certain organisations to be more closely involved in both the trials and the working group activity that is currently on-going in the UK. The benefits of being involved at the early stages of the development of the system in the UK are clear in that the Bailiwick's numbering system is within the UK national numbering plan and therefore any ENUM solution in the Bailiwick will probably draw heavily on experience and developments in the UK.

3. What is ENUM?

ENUM is a key Internet DNS [1] -based emerging protocol, supported by its own architecture of databases that specifically targets the convergence of the telecoms and internet worlds. Put simply, ENUM allows one to type a standard telephone number into a Web browser (or similar tool) and receive back the number-holder's email address, Web URL or other data that can be used to contact the number-holder. This data can also show that person's preferred means of contact, facilitating connection using the cheapest or most effective or most efficient means available – for example IP telephony if it is available, or fax in the case of simple page-image transfer. The list of contact details can be amended, added to, or updated without changing the telephone number to be used for access. Figure 1 below demonstrates this graphically.
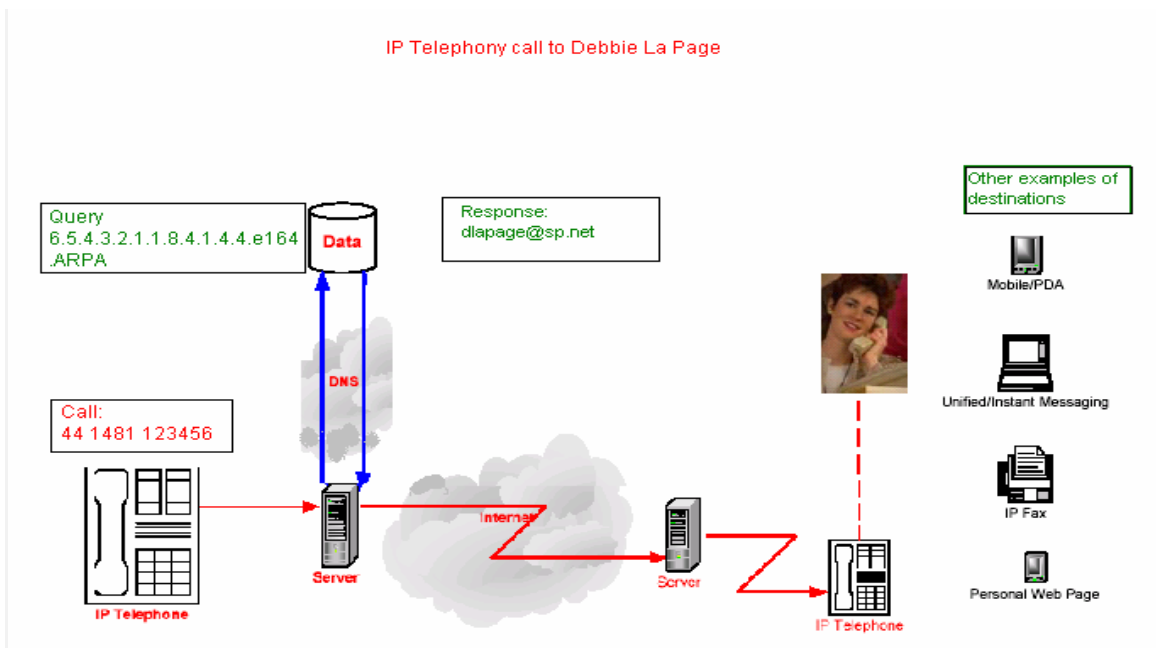

Figure 1

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[1] Domain Name System

4. How does ENUM Work?

The standard RFC 2916 specifies that ENUM will utilise a format that appends telephone numbers to the suffix e164.arpa[2]. The following example demonstrates how the technique would work. The example takes a Bailiwick phone number [+44 1481 123456] and translates it into a format that the DNS system can understand. The conversion process is as follows:

Step 1: Write the E.164 number in its full form, including the country code, then remove all non-digit characters with the exception of the leading "+". This results in +441481123456.

Step 2: Remove all characters with the exception of digits and put "dots" between each digit.

> *This results in 4.4.1.4.8.1. 1.2.3.4.5.6.*

Step 3: Reverse the order of the digits and append "e164.arpa"

> *This results in 6.5.4.3.2.1.1.8.44.1.4.4.e164.arpa.*

Each and every digit to the left of the domain is a zone in DNS terms, and authority for zones can be delegated at each digit. Although this does not have to be done, it makes the system more scaleable and would enable Guernsey lookups to be handled by a different server to those for Jersey for example. A DNS look up is then made using this domain name format from which will be returned a set of NAPTRs[3] records that correspond to this number. Details held within the NAPTRs would previously have been specified by the user who has the rights of use to that particular e.164 number.

This permits both individuals and enterprises the ultimate right to decide what Internet services are available for this number. This data can be stored by order and preference, which is important, as this will allow user applications to be written to exploit this information. For example: a VoIP[4] application can be written to always search for a SIP[5] address associated with a telephone number. If a SIP address exists then a voice session can be set-up between two IP clients rather than the original IP call being routed to the PSTN[6].

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[2] The Address and Routing Parameters Area top level domain, used for network infrastructure. e164 relates to the telephone number that uses a string of decimal digits to uniquely indicate a public network termination point

[3] Naming Authority Pointer Resource Records. A DNS resource record that specifies a regular expression-based rewrite rule, which when applied to an existing string, will produce a new domain label or a Uniform Resource Identifier (URI)

[4] Voice over IP

[5] Session Initiation Protocol. SIP is an emerging protocol for Internet conferencing, telephony, presence, event notification and instant messaging. The protocol initiates call set-up, controls routing, authentication and other signalling for IP communications.

[6] Public Switched Telephone Network

As well as SIP URIs[7] for VoIP calls, the DNS entries can contain mobile phone, voicemail, e-mail addresses for Voice Profile for Internet Mail (VPIM)-based universal messaging, PGP[8] keys for secure messaging, or Lightweight Directory Access Protocol (LDAP)-based white page resources for advanced caller identification. The DNS entries could even contain H.323[9] addressing information. In fact, any URL can be placed inside, allowing clients to be contacted using a variety of communications mechanisms - even a web home page.

Since each NAPTR record has ordering and preference values for the URI associated with it, powerful and flexible communication strategies can be applied. For example, the configuration could be set to use VoIP if the mobile phone is unreachable or to use email if the fax number is busy. Despite these endless possibilities, ENUM depends, of course, on a particular phone number having some kind of resource on the Internet associated with it. However, the vast majority of phone numbers correspond to simple PSTN phones. These numbers will have no corresponding entries in the DNS. ENUM is primarily of use if a user has several ways of being contacted (i.e. mobile, email, fax)

5. The Issues for Guernsey

At this early stage of the development of ENUM, the OUR is highlighting the opportunity for interested parties to participate in the trials currently taking place in the UK on ENUM or to join the OFTEL ENUM working group. This type of participation will clearly bring with it an understanding of the technical and commercial opportunities afforded by ENUM as well as an understanding of how the UK implementation of ENUM will take place. Given the fact that the Bailiwick operates within the UK number range, it is likely that implementation within the Bailiwick will be linked to that in the UK somehow.

However, there are some fundamental regulatory issues that will need to be considered for the longer term development of ENUM in the Bailiwick, such as whether the number allocations for the Bailiwick form part of the mainland UK Tier 1 & 2 registries or have a registry for the Bailiwick. There are also a number of issues that need to be considered that may impact upon the way in which ENUM develops – among these are matters relating to data confidentiality, the demand for numbers, identity hi-jacking and the fact that monopolies may result for the administration of ENUM.

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[7] URI – Uniform Resource Identifier
[8] Pretty Good Privacy (PGP) is a popular program used to encrypt and decrypt e-mail over the Internet. It can also be used to send an encrypted digital signature that lets the receiver verify the sender's identity and know that the message was not changed en route.
[9] H.323 is a standard approved by the International Telecommunication Union (ITU) in 1996 to promote compatibility in videoconference transmissions over IP networks.

The Director General proposes to consider these matters further as the technology and the regulatory regime elsewhere develops and will consult on any issues that are considered appropriate for consultation at a later date. However for now, the purpose of this paper is to highlight the opportunities and the steps that interested parties may take to be come more closely involved.

6. How to become involved

If your organisation is interested in being more closely involved in ENUM then you may wish to join the OFTEL working group established to examine both the regulatory and practical issues associated with the implementation of ENUM. To be involved in the trial or the working group please contact:

> *Tony Holmes*
> Chairman UKEG
> tel: +44 (0) 1732 475517
> Email: tony.ar.holmes@bt.com

To assist organisations considering this course of action, Annex 1 of this information note describes, at a high level, the ENUM structure. Annex 2 contains a short summary of developments on ENUM throughout Europe and some other useful links where further information can be obtained.

Should you require further information relating to this information paper please contact the OUR directly at:

> Office of Utility Regulation,
> Suite B1 & B2,
> Hirzel Court,
> St. Peter Port,
> Guernsey GY1 2NH.

Email: info@regutil.gg
Tel: 01481 711120

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ANNEX 1: ENUM Structure

The diagram below shows the core ENUM relationships, from the international level through to the end-user, apart from the Registrar, who assembles and enters the customer data in the relevant databases. An explanation of the various tiers is set out below.
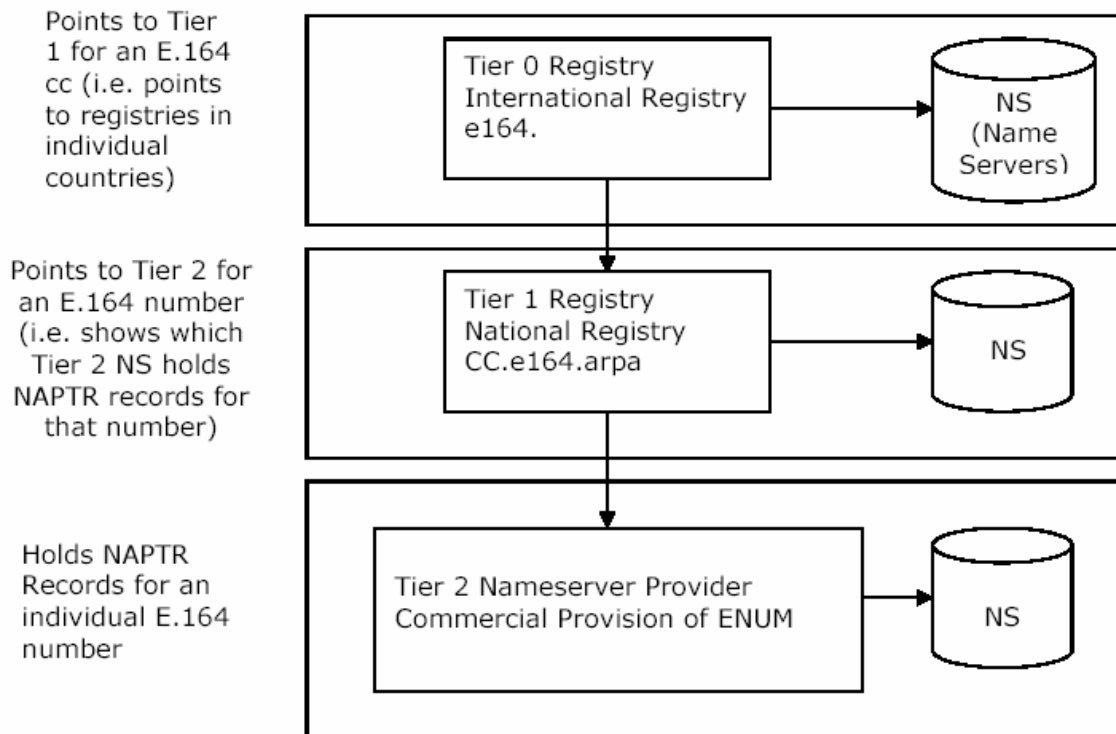
Tier 0 Entity; Entity that maintains the name server for the e164.arpa zone containing the authoritative NS records for domain names corresponding to recommended E.164 Country Codes or portions thereof, as defined by ITU member states.

Tier 1 Entity; The entity that operates the Tier-1 ENUM service within a country or Region and has (a) pointer(s) to the Tier 2 Entity or Entities for all ENUM-enabled telephone numbers in that country.

Tier 2 Entity; The entity that hosts the NAPTR resource records associated with each telephone number.

Annex 2: ENUM Initiatives in Europe

In **France**, very detailed plans have been developed for study and trial of ENUM, with the preparatory administrative work already completed and the study part commenced in January 2003. Trials are scheduled to start in September of this year with completion in June 2004, followed by 2 months evaluation.
http://www.itu.int/osg/spu/enum/Implementations/France/france-enum.doc.

In **Sweden** a Public Consultation was undertaken in August 2001 by the National Post and Telecom Agency. Different views were expressed on Tier 2 role – the incumbent felt the operators should have this role – other organisations did not agree. Most telecoms players wanted to participate in a trial. The National Post and Telecom Agency requested delegation of 6.4.e164.arpa and an ENUM trial was to start in July 2002 and finish in July 2003. (REF http://www.itu.int/itudoc/itut/_workshop/enum/009.html). Progress seems to have stalled as it appears a set of Working Groups completed their pre-trial studies only at the end of 2002, without mention of any trial results.

In **Switzerland** a Public Consultation was undertaken in February 2002 by OFCOM (REF http://www.ofcom.ch/).

In **Ireland**, ComReg has initiated a consultation to assess whether there is sufficient interest in the topic to carry out a trial to enable some familiarity with the system and to identify the opportunities and challenges presented by ENUM. (http://www.comreg.ie/_fileupload/publications/ComReg0336.pdf)

In **Austria**, the focus of the national trial is on understanding ENUM technology issues and the potential of ENUM to provide new applications and services. Initial studies commenced in 09/2001 and the trial platform was set up one year later in 09/2002. Interestingly, the trial includes coverage of E.164 numbers issued under the International Country Code (and sub code) 878.10 as well as the Austrian Country Code 43. Participants include NIC.AT, Telekom Austria, RTR, Infonova, Siemens, Kapsch, Alcatel, ÖFEG. Services running or planned on the system include SIP and H.323 (multimedia), Voice, Fax, Email, Web.

The **Netherlands** has set up an ENUM forum "NLEG", which carried out a preliminary study of ENUM culminating in a report in December 2002. The next stage will be a detailed consultation, which will lead to decisions on whether to carry out a trial and, if so, in what format.

Other Useful Links

Internet Engineering Task Force: http://www.ietf.org/html.charters/enum-charter.html

International Telecommunications Union: http://www.itu.int/home/index.html

UK ENUM Group (also contains links to other resources) www.ukenumgroup.org