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Report on the 5th ENUM Day of 28 September 2005 held in Frankfurt am Main

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1. Welcome and Presentation of the Results of the ENUM Field Trial

Welcome and presentation of the results of the ENUM field trail (Andreas BäB, DENIC eG)

At the start of the fifth ENUM Day, the participants were welcomed by Andreas BäB, a member of DENIC's Executive Board, He then informed them of the outcome of the field trial that DENIC had been running over several years.

Andreas BäB explained how DENIC's various departments had been working with the ENUM project team throughout the field trial and then moved on to present its most essential findings. He outlined DENIC's work in supplying information and in providing support for the whole discussion surrounding ENUM, such as through the organization of events like the ENUM Days, through participation at international events with a focus on ENUM or through the setting up of an information platform on its ENUM webpages. He felt it was also worth mentioning the numerous bilateral conversations with prospects and the formulation of joint projects with various different partners.

He also summarized the technical work that DENIC had contributed to the field trial, explicitly mentioning the challenges in providing the name service for 9.4.e164.arpa, the creation of an automated registry system, the development of the technical interfaces for the registrars, the generation of technical documentation and the evaluation of various validation procedures. He singled out particularly the activities of the working party that had been set up in December 2004 and had worked as a team establish the details of the registry/registrar interface, the draft proposals for the ENUM-COMPLAINT process and the operations policy for 9.4.e164.arpa. This teamwork had also laid the foundation for the operations-policy documents that were now ready and available for consultation at http://www.denic.de/en/enum/aktuelle_arbeit/dokumente/Dokumente.html.

Andreas BäB moved next to a detailed presentation of the results of the ENUM field trial. He placed particular emphasis on those central aspects that had been taken into consideration in drawing up the operations model and in defining technical processes. He mentioned individually the following central components for the future regular ENUM operation:

- 1) Consideration of authentication and authorization for all services and processes, including within DENIC's ENUM domain-registry system. A high level of security is guaranteed through the use of public-key cryptography in combination with digital x.509v3 certificates. Moreover, it is to be possible for all Internet subscribers to have access to the DNS and whois services. A

limit is to be applied to the number of permitted accesses to the whois service within a given period of time using ACLs (access control lists).

- 2) A realtime registry interface (RRI) is to be available as an ENUM domain-registry system right from the very beginning of the regular operation, and compatibility with heritage systems is to be ensured through additional e-mail interfaces. Realtime registration is to implement a scalable, failsafe 24/7 operation.
- 3) The name service for 9.4.e164.arpa is to be callable worldwide. There are to be regular quasi-instantaneous zone updates. DNS security is to be assured through various software, hardware and monitoring measures as well as through a 24/7, failsafe scalable operation.
- 4) Ensuring the integrity of ENUM domains is to be guaranteed through telephone-number validation. In addition, processes are to be made available for updating data, deleting ENUM domains, repeat validations (revalidations) and objections to delegations.
- 5) All the necessary measures are to be taken to ensure compliance with the legal framework conditions for maintaining data protection. Individually, these are:
 - o The only data to be published is to be that which is technically necessary for the provision of the ENUM service;
 - o Publication of any other data is to require the explicit consent of the domain holder;
 - o It is to be possible to record pseudonym addresses for the communication data.

In summarizing the outcome, Andreas Bäß ascertained that the field trial had turned out to be a major success, since it had proven possible, on a national scale and with the consent of all those concerned, to work out an operations model and to evaluate ENUM's functional feasibility. He went on to state that the time had come for ENUM's transition to regular operation. Especially against the background of systems in competition with ENUM (such as private alternatives to public ENUM or comparable approaches under e164.org, .tel or .mobi), it was particularly necessary to offer ENUM as an open standard in a real operation as soon as possible. ENUM had numerous advantages compared with the alternatives already in existence, including the fact that it is an open standard and that competition is encouraged in tier 2 (i.e. between the individual registrars). In addition, DENIC is a provider with generalized support and with the ability to act quickly to provide an open, non-discriminatory and technically optimized access. DENIC was thus aiming to make the transition to a regular ENUM operation at the turn of the year 2005/2006.

Andreas Bäß' presentation to the ENUM Meeting and all the other information concerning this event are to be found at: <http://www.denic.de/en/enum/allgemeines/veranstaltung/ENUM-Tag.html>

The next presentation came from Sandra Stickelmann. She introduced the proposal for DENIC's future ENUM operations model.

Presentation of the proposal for DENIC's future ENUM operations model (Sandra Stickelmann, DENIC eG)

In order to ensure easy migration from the ENUM field trial to the regular ENUM operation, DENIC, in close cooperation with trial participants, had produced a draft of an operations policy containing definitions of the principles, responsibilities, contractual relationships, new processes and the ENUM registry system for everyone involved in a future regular operation. Sandra Stickelmann began by explaining the principles for the operation of 9.4.e164.arpa. These are, on the one hand, an efficient, attractively-priced service with a high level of availability and, on the other hand, a secure, stable operation, compliance with all national and international laws and standards that are of relevance for ENUM and making sure that the only telephone numbers it is possible to map as ENUM domains are those that correspond to numbers in the E.164 number space. In addition, the absolute protection of domain holders' data is firmly anchored in these principles, as is guaranteeing competition in Tier 2. These principles form a framework whose basis is the cooperation of all the interest groups represented in ENUM and which also provides for an unmistakable assignment of responsibilities. Sandra Stickelmann presented a chart clearly showing all those involved in the registry process and explained the individual responsibilities of the registry, the registrar and the ENUM domain holder. It is particularly when it comes to capturing data in the context of the future regular ENUM operation that it is essential to lay down clear rules and responsibilities in order to guarantee that the data is correct at all levels and to ensure that matters arising out of the laws governing data protection are considered in a commensurate manner.

Particular attention had also been paid to the contractual relationships between the individual parties involved, since these, in the form of DENIC's ENUM Domain Guidelines and its ENUM Domain Terms and Conditions, would form the legal basis for the regular operation under 9.4.e164.arpa.

She then moved on to a presentation of the subjects of validation and the new ENUM-COMPLAINT procedure. Once again, the main emphasis was on a clear division of tasks and responsibilities.

Validation for ENUM domains means, firstly, ensuring that anyone setting out to register an ENUM domain also has the right to use the corresponding E.164 number (known as initial validation) and, secondly, ensuring that this legitimate right of use remains intact throughout the whole life of the ENUM domain or, put differently, making sure that any change within the E.164 number space can be traced and explained (known as revalidation).

Validation had been clearly placed within the realm of responsibility of the registrars. Registrars, however, had the choice between developing their own validation methods or of using the services of third parties, sometimes called validation-service providers.

In order to be able to take counteraction quickly in the event of erroneous delegations having been made, DENIC was planning a procedure to be called ENUM-COMPLAINT for its regular operation. It was to be possible for ENUM-COMPLAINTs to be submitted to DENIC by e-mail, telefax or letter. This process would involve all the parties concerned and would proceed a step at a time to sort out the facts of each situation. If it were ever to be established that an erroneous delegation had occurred, that would constitute grounds for terminating the registration contract without notice. All those affected by the procedure would be given adequate information regarding its outcome.

Turning to the ENUM registry system, Sandra Stickelmann reported briefly on its current development status and what the full-scale system was going to be like in regular operation. It was going to be a fully automated ENUM RRI registry system, to be preceded by an ENUM test system. There would also be an ENUM whois for submitting queries about ENUM domain information.

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Her presentation finished by looking forward to each of the steps that were to occur between then and the introduction of the planned regular operation, namely:

- o publication of DENIC's ENUM Domain Guidelines and its ENUM Terms and Conditions
- o provision of an ENUM test environment
- o provision of an ENUM RRI registry system
- o provision of the ENUM whois
- o addition of further information on the ENUM operation on DENIC's webpages, and
- o the introduction of ENUM to become a part of DENIC's member training.

All further information about the future operations model for ENUM at DENIC is to be found in the presentation at: http://www.denic.de/media/pdf/enum/veranstaltungen/stickelmann_20050928.pdf.

2. Regulation

Regulation (Dr. Mirko Paschke, German Federal Network Agency)

Dr. Mirko Paschke began by telling participants that the regulatory body had changed its name. It used to be known as the Regulatory Authority for Telecommunications and Posts. On the basis of the new German federal law on the organization of the energy sector (abbreviated to "EnWG" in German), its new name in full, as of 13 July 2005, had become Federal Network Agency for Electricity, Gas, Telecommunication, Post and Railway. There had, however, been no change in substantive or administrative competences as regards the telecommunications and postal segment. The Federal Network Agency thus remained the responsible body for administering the German number space, whereby Top Level Domains and second-level domains (TLDs/SLDs) had been kept apart from the administration of telephone numbers.

Dr. Paschke reviewed the important milestones in the ENUM trial from the perspective of the Federal Network Agency and reported that the agency was planning to appraise the final report as soon as it possibly could after DENIC had submitted it, along with its operations policy. It was then going to submit its own report to the German Federal Ministry of Economics and Labour ("BMWA") and this would include a proposal for the procedure to be followed thereafter and possibly also proposals regarding the regulatory framework conditions for the regular ENUM operation.

Dr. Paschke's presentation is available at:

http://www.denic.de/media/pdf/enum/veranstaltungen/paschke_20050928.pdf.

3. Standardization of Protocols

Standardization of ENUM at the IETF (Richard Shockey, co-chair ENUM IETF WG, NeuStar Inc.)

"Resistance is pointless; VoIP is on the march. No new investments are being made in the old SS7 technology". That is how Richard Shockey started his presentation on ENUM. He went on to underpin it further with other facts about the US VoIP and IP-PBX markets and to issue a warning about the imminent hypes surrounding VoIP for Internet users. He summarized ENUM's development history up until then, beginning with the setting up of the ENUM working group at the IETF in 1999 and moving on to talk about new concepts, such as ENUM for LNP (local number portability), IRIS for ENUM and VoIP

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peering. Richard Shockey presented the two concepts of “private ENUM” and “carrier ENUM” and explained the difference between them. Whereas “private ENUM” offered the possibility of mapping telephone numbers on URIs with access to them restricted to a closed user community, considering the confidential character of the data, the idea in the forefront of “carrier ENUM” was to facilitate data exchange for service providers under the e164.arpa domain in order to be able to find interconnection points. The two different concepts also addressed different markets. It was carrier ENUM that was at the time being worked on by the IETF’s ENUM working group. This promising concept was intended to make it possible for the carriers to switch their networks together on an IP basis.

There had also been further developments in the status of ENUM in northern America, which Richard Shockey moved on to talk about. The US ENUM Limited Liability Company (<http://www.enumllc.com/>) was going to start the trial for 1.e164.arpa before the end of 2005. The trial conditions had been approved by the US government. The request for delegation was going to be sent to RIPE NCC shortly afterward. The period of the trial had been limited to one year. He drew attention to the complication that 18 independent countries had telephone number spaces under the +1 dialling code.

In winding up his presentation, Richard Shockey turned again to ENUM’s potential, which might take on massive importance, especially for NGN networks, if ENUM were to be used as the signalling technology. In the field of VoIP peering he also saw ENUM as the fundamental technology of the future. The slides that accompanied his presentation are available at:
http://www.denic.de/media/pdf/enum/veranstaltungen/shockey_20050928.pdf

Lessons learned from ENUM trials and implementations – future directions (Richard Stastny, Öfeg)

The Austrian trial had made the transition to a regular operation back in December 2004. Richard Stastny, who had accompanied that trial, started his presentation with the experience he had built up during it. Since he was also actively involved in the field of standardization for ENUM with the IETF and ETSI, the second part of his presentation concentrated on future developments with ENUM. Richard Stastny explained why a number of obstacles stood in the way of the successful marketing of ENUM. One of these was the difficulty of selling ENUM to final customers as a stand-alone product. ENUM has to be available in the background as a service and be integrated in VoIP products. Another of the obstacles was that, to begin with, it would be primarily callers who would benefit, since the use of VoIP with ENUM would minimize the costs of their calls. Call recipients, on the other hand, would have the bother of making sure their ENUM domains were really available, but would not derive any direct financial benefits. The situation was rendered even more difficult, according to Richard Stastny, by the fact that many VoIP providers did not equip their final customers with SIP addresses that were publicly accessible. Accessibility via a public SIP address is a prerequisite for the use of ENUM on VoIP. He concluded that it ought, basically, to be possible to overcome all these obstacles, but the big unanswered question was whether the market participants were sufficiently interested in creating consistent end-to-end solutions. Richard Stastny reiterated ENUM’s benefits, such as financial savings for callers, improved end-to-end quality and an enhanced range of functions and then mentioned some of the ENUM-based projects already implemented in Austria, such as the Generic Gateway. In the second part of his presentation, he explained the interactions of Carrier ENUM and the effect it had in supporting user ENUM. User ENUM needed public SIP addresses and the exchange of IP traffic. The purpose of carrier ENUM (i.e. the use of ENUM technology) in this situation was understood to

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mean that is not the end user who decides whether or not their telephone number is to figure in the DNS, but the carrier. By using Carrier ENUM it becomes possible to find the network boundaries between the various operators and the various IP networks. PSTNs can thus also be integrated in it. No decision had as of then been taken as regards the domain under which this particular ENUM technology would be placed. Benefits would arise if a domain were to be used under e164.arpa. The name given to this is "public-carrier ENUM", since it is to be found in the public DNS. This solution would offer the advantage of records also being available for public queries. It would seem to be logical to build scalable solutions on this, which would be separated from smaller solutions for local communities (which are also sometimes referred to as "walled gardens").

More details and further information can be consulted in the speaker's slides:
http://www.denic.de/media/pdf/enum/veranstaltungen/stastny_20050928.pdf.

4. Technology

Number portability using ENUM and SIP (Adrian Georgescu, AG Projects)

In his presentation on the subject of number portability, Adrian Georgescu spoke about the advantages of ENUM and a SIP-based solution. He analyzed the current situation as regards PSTN services and compared these with the new VoIP services. Important requirements on the user side are: the insistence on modern technology, a fast Internet connection, attractive PSTN tariffs, the absence of geographic constraints and, especially, a contact address that would, ideally, retain its validity for life.

The portability of telephone numbers guarantees that their use will not depend on any specific provider. This, however, has its weaknesses, such as lengthy processing periods or the impossibility of taking a number from a geographic area into a mobile-telephone network or even across a border into another country. According to Adrian Georgescu, porting domains and numbers in the IP field does not encounter these difficulties. Here, it is possible for web addresses to be transferred from the administration of one Internet service provider to another in next to no time and without a massive administrative burden. The change in the underlying IP address is generally not even noticed by users. By applying SIP and ENUM, it is possible to bring these advantages into Internet telephony too. This is done by mapping the IP address of the SIP telephone onto a SIP address and saving this in a NAPTR record under an ENUM domain. In this way the telephone numbers used for addressing do not depend on either the underlying technology or the provider of the particular communication services. The process of porting an SIP account was also clearly illustrated in the speaker's slides, which are available at: http://www.denic.de/media/pdf/enum/veranstaltungen/georgescu_20050928.pdf.

Adrian Georgescu admitted that he did, however, see problems in practice. At that time, many service providers did not supply their VoIP customers with public SIP addresses, and the technology they were using was not ENUM. Rather, they had opted for proprietary technologies with the aim of building up closed user groups, which they hoped would be as large as possible, giving them a better chance of customer retention. It was, however, his conviction that there was no real future for such "walled gardens".

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5. PSTN

Challenges concerning numbering and routing (Dr. Martin Fröhlich, Telefónica)

In his presentation, Dr. Martin Fröhlich dealt with the challenges concerning numbering and routing when trying to embed a line-switched technology (PSTN) in a packet-switched one (VoIP). He did so taking the perspectives of both a large classical telephony company and a carrier active in the IP world, transposing their requirements. ENUM represented the gateway for connecting the two addressing worlds with one another.

The speaker listed a whole series of tasks that VoIP service providers ought to be concerned with, going beyond the provision of a voice service. Examples are the issuing of numbers, invoicing services, handling emergency calls and compliance with legal and regulatory requirements. It was his view that for end users the "feel" of using VoIP ought not to differ from what they were used to with conventional telephones and that there were demanding expectations as regards the availability and reliability of the voice services. His final point was that telephony was actually already more than a hundred years old, and that users were very familiar with its use.

This presentation is available at:

http://www.denic.de/media/pdf/enum/veranstaltungen/froehlich_20050928.pdf

6. Further Results reported by Field-Trial Participants

Experience report from the dtms ENUM Gateway project (Michael Volpert, dtms AG)

In his presentation, Michael Volpert introduced the results of the "dtms ENUM Gateway" (http://www.denic.de/media/pdf/enum/veranstaltungen/volpert_20050928.pdf), a joint project involving dtms and Portunity GmbH. He reminded participants that he had already announced this project at DENIC's preceding (fourth) ENUM Day. What it had involved was the accessibility of VoIP subscribers who had delegated an assigned ENUM domain for calls from the PSTN, passing through a PSTN-IP gateway. Callers first dialled a free-phone 0800 number and then entered the telephone number of the subscriber they wished to contact. The gateway implemented the ENUM lookup and took charge of routing the call from the PSTN to the IP network. The results obtained during the project served to emphasize that such scenarios could be readily and quickly implemented with ENUM. Little use had, however, been made of this service up until then, which was not really surprising, since there had been no real marketing for it, and the administration of ENUM domains had so far only been practised on the scale of the field trial.

He believed that the system could be technically improved by the addition of an auto-attendant function, which would name all the possible destinations for the caller, and the caller would be able to make selections using a voice menu. This would mean that the identity of the dialled connection would no longer remain concealed from the caller and would make it possible to exploit another of ENUM's functions, namely the provision of various destinations.



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ENUM DNS NAPTR statistics (Peter Koch, DENIC eG)

RIPE's Hostcount had been in existence since 1992. It was a routine for counting the number of "hosts" in the European Internet and especially for monitoring the growth in their numbers. The necessary data was captured by means of a recursive run through the ccTLDs' zones. Peter Koch explained that comparable data would also be of interest for ENUM, for instance for obtaining more detailed figures regarding the number of users and the services used. On the procedural side, he explained that the simplest situation would have been to have had a complete zone file available for each zone. However, it seemed most unlikely that that was ever going to be the case, and so a more sophisticated procedure with an automated query capability had become necessary. It had then been decided not to perform a complete search, since that would have been too extensive. Instead of that, the search would stop whenever it ran into inexistent branches of the DNS tree. The search had also been limited to branches with the digits 0-9 and to domains not exceeding a particular length, reflecting the fact that ENUM domains represent E.164 telephone numbers. This made it necessary to be able to detect and bypass pitfalls such as "lame delegation" and software bugs. He went on to announce the results that had finally emerged.

Some 26 400 NAPTR records were in existence at that time under 9.4.e164.arpa, corresponding to around 13 600 users (including direct-dial extensions on exchange installations). Each user had at least one NAPTR record in use, while the maximum found was 13. It had also been detected that a total of twenty different ENUM services had been used. The service used most frequently was e2u+sip, although it also emerged that some of the ENUM services being used had not yet completed the standardization process. Peter Koch very much welcomed the fact that these new services were already being used, since that offered the opportunity to try out applications and to influence their development. He warned that some ENUM services were still using the old RFC2916 syntax. These ought to be converted as a matter of urgency to the syntax laid down in RFC3761, since there was no guarantee that, as new applications became available, they would also have been programmed to handle the obsolete representation correctly as well. The search had also found 50 DNS wildcards, and the nameservers to which queries had been submitted had returned a hundred 100 SERVFAIL responses. All of these results are to be found in the computer file of the presentation at:

http://www.denic.de/media/pdf/enum/veranstaltungen/koch_20050928.pdf. One of the participants wanted to know about the availability of the program for other registries, and Peter Koch replied that an improved version of the ENUM counting program (with enhanced efficiency and performance) was going to be used in cooperation with other ENUM registries to analyze other parts of the e164.arpa tree.

The fifth ENUM Day was attended by more than a hundred participants. Once again, it was rated as having been a successful information event. Many participants expressed the hope that DENIC would continue to demonstrate its commitment to ENUM by organizing information events even after the regular operation was underway.