Page: 1 of 9

Version	Date	Remarks	Author
1.0	29.06.2007		Volker Messemer

Minutes on the ENUM Day held on 27 February 2007 in Frankfurt am Main

Agenda:

1. Welcome
2. VoIP Solutions for Network Operators
3. Infrastructure ENUM with SURPASS VoIP Solutions
4. Intelligent Communication via IP
5. The VoIP Peering Strategy of Dutch Cable Network Operators
6. Update on ENUM in Irland
7. Update on ENUM in the Czech Republic
8. Implementation of ENUM at Ulm University
9. Considerations on the Final Report of the Advisory Project Group "Framework Conditions for the Interconnection of IP-Based Networks" of the Federal Network Agency

1. Welcome (Sabine Dolderer, DENIC eG; Matthias Maier, DENIC eG)

Sabine Dolderer welcomed the participants of the ENUM Day, which took place in the congress centre of the IG Metall headquarters for the first time. She then introduced Matthias Maier, the new member of DENIC's Public Relations Department, who guided through the program. Matthias Maier announced Edwin Ronacher from the Austrian Kapsch CarrierCom AG as the first speaker.

2. VoIP Solutions for Network Operators (Edwin Ronacher, Kapsch CarrierCom AG)

Edwin Ronacher started his presentation with an introduction of Kapsch CarrierCom AG, a worldwide provider of communication solutions for carrier and service providers with a focus on central and eastern European countries.

Edwin Ronacher saw the market trends for communication networks in the migration to VoIP networks as well as in the trend towards converged networks that offer various communication services like voice, SMS, instant messaging, video etc. New services would be integrated into existing networks to make full use of their potentials. Moreover, a unification of services regardless of the transport technology they were based on could be observed.

According to Edwin Ronacher, the future-proof telephony solution for companies were IP-based private branch exchange systems within the company, private branch exchange systems located at the network operator (Hosted PBX), and IP Centrex installations serving several companies via a centralized IP PBX (Private Branch Exchange) of the network operator. The current standard solution was a combination of the various communication services, i.e. of the fixed-line service (ISDN), mobile service (GSM or UMTS)

and broadband service (IP) with three separate invoices. One possibility to achieve unified communication was IP Centrex., which supports the unification of voice and data as well as of the various components (mobile and fixed-line services). Broadband as well as mobile service providers could offer these outsourcing services. According to Edwin Ronacher this presented a very good opportunity for network operators to extend their fields of business. In particular alternative network operators and mobile service providers might benefit from that trend.

He presented the VoIP platform MississSIPpi as the solution of Kapsch CarrierCom AG. With this system, service providers can offer a centralized hosting of private branch exchange services via IP networks and can provide services like mobile PBX, IP Centrex and VoIP routing. He said that the VoIP platform included various software components with different tasks like call control, storage of voicemail, client configurations, installation platforms, billing mediation, etc. If such services were outsourced, the end user no longer had to control certain telephony components but could rely on the operator for these services, who was to guarantee their operationability. So responsibility was shifted from the final customer to the operator. Additionally, Kapsch CarrierCom AG offered network components for carriers like gateways to PSTN, media servers and session border controllers of other manufacturers. The clients were SIP hard- or software phones. CTI clients, for example, were offered instant dialling from Lotus Notes or MS-Outlook.

Responsibility for central information and functions, like company directory, presence information, transfer of calls, call recording, etc., rested with the SIP call operator. The target was to transfer the intelligence of the final devices into the network so that a plug-and-play configuration of the final devices via corresponding servers would become available with the help of device profiles.

Edwin Ronacher came to the conclusion that the solution of Kapsch was attractive for providers of the fixed-line services as well as for mobile service providers who wanted to offer their customers outsourcing solutions.

For the complete presentation of Edwin Ronacher, please refer to our website under:

http://www.denic.de/media/pdf/enum/veranstaltungen/Ronacher_20070227.pdf

3. Infrastructure ENUM with SURPASS VoIP Solutions (Patrick Kleiner, Siemens Networks GmbH & Co. KG)

Patrick Kleiner started his presentation with a description of the current state of the art in the field of the fixed-line services and of the resulting difficulties: Routing was performed on the basis of the SS7 protocol taking into consideration the portability of telephone numbers within geographic areas. Additional functions were implemented via so-called Service Control Points (SCP) in the Intelligent Network. Particularly for smaller newcomers in the market this presented a real challenge. Every element in the network had to know all routes. This required complex transaction systems for synchronization. Here, ENUM was a possible solution.

At that time, various changes could be observed to take place: Communication via the Internet was increasing and VoIP was replacing TDM (Time Division Multiplex) ever more often. New multi-medial services like IPTV were being offered and the traditional infrastructure was being replaced by a new one. Patrick Kleiner saw the potential of ENUM, among other things, in the global visibility of routing information, simplified administration and unification of various communication services like telephony, SMS, e-mail, etc. In addition to that, ENUM supported the introduction of new services into the Intelligent Network and local number portability.

Providers of telecommunication components could pave the way for ENUM by delivering routing elements like softswitch, application servers, routing proxy and CSCFs (Call Session Control Function) that supported ENUM. Providers could benefit by cooperating with each other, thus addressing a larger user base and increasing their visibility on the market. This would save costs since interconnection fees would become superfluous and resources could be used jointly.

Patrick Kleiner said that Siemens used ENUM for the peering with VoIP networks and the routing to ported telephone numbers. ENUM was also used for new services and for the translation of telephone numbers into toll-free lines. The softswitches were equipped with an ENUM client resolver. Siemens' ENUM solutions were implemented according to the IMS standard (IP Multimedia Subsystem) for FMC networks (Fixed Mobile Convergence). They provided interfaces for local number portability and for provisioning and administration of ENUM domains. He explained the role of ENUM with regard to the routing and peering of SURPASS-VoIP solutions on the example of network diagrams and developed a fictive example scenario, in which a provider interconnected various sub-networks of different locations via IP by means of products from Siemens that supported ENUM. He then showed that the same scenario could be transferred to a group of "friendly" providers who formed a virtual company. For those providers representing a peering federation, the ENUM service could be provided by an independent partner like DENIC, for example.

Replacement of SS7-based transactions by DNS would save costs for the providers. They would need less devices and the system would be less complex.

For the complete presentation of Patrick Kleiner, please refer to our website under:

http://www.denic.de/media/pdf/enum/veranstaltungen/Kleiner_20070227.pdf

4. Intelligent Communication with IP (Clemens Matern, Avaya GmbH & Co. KG)

Following the introduction of the Avaya company, Clemens Matern gave a presentation of the development of communication technology.

He said that, starting from the traditional PBX, IP-based communication and business applications were increasingly being integrated into the system. In a first step, which had already been implemented by numerous companies, networks were combined. SIP (Session Initiation Protocol) had established itself as the standard signalling protocol for this. The next step consisted in the integration of business applications and communication solutions. Here, SOA (Service Oriented Architecture) would play an important role.

Today, corporate communication included many different aspects ranging from fixed-line telephony, mobile phones, e-mail, instant messaging, collaboration, etc. The target was to combine all these aspects of communication. According to Clemens Matern an intelligent communication involved an intelligent interconnection of employees, customers and a uniform user experience across the variety of end devices and networks.

Avaya GmbH & Co. KG distinguished four fields of application:

The field of "Converged Communication" dealt with platforms and networks. Its target was a reliable multi-modal communication taking into consideration the aspects of management, scalability and security.

For the end user, the field of "Unified Communication" was of special interest. It included unified access, mobility, unified messaging, conferences, video and presence. Clemens Matern pointed out the particular importance of ENUM for this field. Uniform user experience across different end devices and networks played an essential role in "Unified Communication". It was achieved by means of VPNphones

for teleworkers, SIP clients for PCs and dual-mode mobile phones, for example. For all end devices, the same service features should be available.

The field of "Customer Contact" was meant to optimize customer service. For call centres, not only the available technology but also the correct configuration and the planning of the processes and procedures was crucial in this respect. Customer requests via different channels could be assigned to the correct resources of the call centre via a universal queue and intelligent routing. The customer service of international companies could be made available around the clock by distributing the requests to their offices in different countries.

The central tasks of "Communication Enabled Business Processes" was the integration of communication and business processes. The target was to develop an intelligent, event-based communication framework on the basis of SIP and SOA. Clemens Matern mentioned the automatic notification of parents when the school bus was late in Norway as a practical example.

Clemens Matern said that Avaya relied on SIP as an important component for future communication applications and on SOA for the integration of applications. He assumed that SIP will replace other protocols in the long run.

For the complete presentation of Clemens Matern, please refer to our website under:

http://www.denic.de/media/pdf/enum/veranstaltungen/Matern_20070227.pdf

5. The VoIP Peering Strategy of Dutch Cable Network Operators (Sikko de Graaf, CAIW Holding)

Sikko de Graaf reported in his presentation about the experience with establishing the SIP exchange system for cable network operators in The Netherlands. He said that the Dutch cable network operators with its 6 million cable TV subscribers covered about 90% of all Dutch households. 1.7 million customers were provided with cable broadband connections. The broadband market of The Netherlands was characterized by the highest market penetration of Europe. Besides the DSL providers, the cable network providers also made up for a considerable share of this. Competition was fierce, which led to a high level of innovation. VoIP was very attractive for the cable network operators because it was a fast growing market. In January 2007 the threshold of one million VoIP cable network customers had been passed. An immediate competitor of the cable network operators was the Dutch Telecom (KPN).

The five major cable network operators of The Netherlands, UPC, Essent, Casema, Multikabel and CAIW, decided already in 2005 to establish an SIP exchange that would allow them toll-free interconnection between each other without the necessity to fall back on the conventional telephone network. Among other things, the specification for the joint initiative had included carrier ENUM for the translation of telephone numbers, the support of SIP in connections working with the common codecs (including video), the decentralized exchange of media data, secure and redundant services, QoS (Quality of Service) and scalability as essential requirements.

The SIP exchanges had been stationed at the AMS-IX. This was the central Internet exchange point in The Netherlands, to which the cable network operators had been connected before. The project was implemented in cooperation with XConnect and Kayote Networks. The SIP exchange always included a provisioning interface, via which the participating carriers were able to enter all telephone numbers. This information was placed at disposal within the networks of the carriers via local DNS servers. The SIP redirect servers, which are the interface for SIP signalling, called on the DNS servers via ENUM queries. Further features of the SIP exchange were registration and reporting.

Distribution of the data of the SIP exchange was effected in accordance with the bilateral agreements between the carriers. The architecture of the system should support peering (exchange of traffic free of charge) as well as roaming (exchange of traffic against fees).

The SIP signalling between users of different carriers was routed via a central SIP server. The concept also allowed for the media data to take another path than that of signalling, i.e. either via the public Internet or via closed systems, which would guaranty QoS. This provided for the possibility of agreements for different grades of service. At that time, a private VLAN, i.e. a closed system, had been established at the AMS-IX for the SIP exchange of the cable network operators that was also used for media data.

The establishment of the SIP exchange had been rendered difficult for the parties involved by the success of VoIP, which had been reflected in a monthly growth of more than 50,000 new subscribers, thus binding quite a lot or resources. Since the softswitches of Siemens and Nortel currently used by the cable networt operators did not yet support ENUM queries, an alternative solution with SIP redirects had been developed. This, however, consumed much more resources than ENUM queries would.

At that point of time some legal, technical and economic questions had to be answered according to the proof of concept. Commissioning of all the features of the SIP exchange was planned for the current year. Plans for the future scheduled new and extended services, e.g. like presence, FMC and video telephony, also between subscribers of various network operators. Moreover, the SIP exchange was principally an open system. An operator of a DSL network had already signalled its interest in participating in the project.

For the complete presentation of Sikko de Graaf, please refer to our website under:

http://www.denic.de/media/pdf/enum/veranstaltungen/Sikko_de_Graaf_20070227.pdf

6. Update on ENUM in Irland (David Curtin, IEDR Ltd.)

David Curtin from the Irish domain registry IEDR reported on the ENUM process in Ireland, which differs from that in other countries in a few points. First of all, a public invitation to tender was issued for the operation of the Irish ENUM registry at the end of 2005 by the Irish regulator Comreg. The contract was won by IENUM Limited, a joint venture of IEDR (70%) and IPA (Internet Privatstiftung Austria, 30%). Among the subsidiaries of IPA are enum.at and nic.at. Both IEDR as well as IPA were not-for-profit registries and had experience with the operation of ccTLDs. The executive board of IENUM was advised by various bodies on technical and policy matters. It had been planned to take over the user ENUM system and the software from Austria for the registry. The infrastructure and the staff were based in Ireland. Besides the Tier 1 registry, a Tier 2 registrar and a service company for validation were to be provided.

There was an agreement between Comreg and the Tier 1 registry for the operation of the Tier 1 registry. In Ireland, not only the regulatory authority but also representatives from the economy, i.e. the Policy Advisory Board (PAB), played an important role with regard to the development of guidelines for ENUM (coregulation). The rights and responsibilities of the PAB as well as its relation to the other parties involved (Comreg, Tier-1-Registry, Tier-2-Registrars …) were defined in the PAB charter. The matters to be dealt with by PAB included, among other things, validation and authorization procedures, data protection and domain transfer.

In the meantime, the physical infrastructure had been established and the contracts for the Tier 2 registrars were being worked out. Approval of the policies by PAB was imminent. At that time, the

customization of the software from .at to the Irish conditions was being planned. The commercial operation was to start before May 2007.

David Curtain considered the market development as a great challenge for ENUM. In this context, he briefly referred to the telecommunication and broadband market in Ireland, which is characterized by a pronounced dominance of the incumbent Eircom and by the lack of serious competitors. Compared to other industrial countries, Ireland occupies one of the last ranks with a broadband market penetration rate of less than 10%. But a strong growth was observed in this field. Further progress was to be expected from the imminent amendment of the Telecommunications (Regulation) Act, which was assumed to grant excessive rights to the regulator in order to promote competition. This might well accelerate the move to Next Generation Network (NGN).

For the complete presentation of David Curtin, please refer to our website under:

http://www.denic.de/media/pdf/enum/veranstaltungen/curtin_20070228.pdf

7. Update on ENUM in the Czech Republic (Pavel Tuma, CZ.NIC z. s. p. o.)

Pavel Tuma from the Czech domain registry CZ.NIC reported on the current state of ENUM in the Czech Republic. In January 2007, commercial ENUM operation had been started following a four-month trial phase with a newly developed registry system. It had been preceded by a three-year pre-trial phase, during which registrations had been processed manually. The numbers that could be registered as ENUM domains included geographical, VoIP, cellular and toll-free numbers as well as numbers for premium rate services. Registration was to extend over a period ranging from one to ten years, with a validation being required every six months. As in Germany, final users had the possibility to register single telephone numbers or whole number blocks. The promotion price for a Czech ENUM domain was one Czech crown (0.03 €) for 2007 and 2008. The annual rate planned for the future was 120 crowns (4 €). ENUM domains could be registered via nine different registrars. Pavel Tuma said that five small telecommunication companies, all of them offering VoIP, supported ENUM lookups for outgoing calls. One VoIP operator even offered the registration of ENUM domains. Through this company, most of the just under 2,200 domains had been registered. Due to the registration of large number blocks, theoretically more than 500,000 telephone numbers were accessible through the registered ENUM domains.

Communication and media coverage were essential for increasing the growth rate of ENUM domains. The Czech media, in particular the Internet and the print media, reported regularly on ENUM. There had even been a report on the radio and on TV.

CZ.NIC's concept for the future included a continued dialogue with the telecommunication companies and planned to support them in particular by practical instructions (HOWTOs) for the use of ENUM. The target end users to be addressed were companies and individuals. According to a market research as of January 2007 80% of the companies were interested in ENUM applications. The presence of ENUM in the media was to be maintained. The advertising for ENUM was to be increased in cooperation with the VoIP telecommuniction companies. Another idea was to contact companies with offices in the Czech Republic, Germany, Austria and Poland, who would be able to save telecommunication costs by using ENUM. In addition to that, CZ.NIC intended to establish a working group for Infrastructure ENUM.

For the complete presentation of Pavel Tuma, please refer to our website under:

http://www.denic.de/media/pdf/enum/veranstaltungen/Tuma_20070227.pdf

8. Implementation of ENUM at ULM University (Markus Klenk, Ulm University)

Markus Klenk presentation dealt with the call for proposals, the establishment and the operation of a telephone exchange for the University and four other state institutions in Ulm.

The exchange installations distributed across the city were to be connected via IP. A total of 14,000 extension lines were planned, 2,500 of them DECT telephones (Digital Enhanced Cordless Telecommunications). One condition stated in the call for proposals was that the installation had to support ENUM. The University had decided in favour of an Alcatel OmniPCX Enterprise installation with Crystal hardware. The share of VoIP phones had been very low with under 10%, which had been due to the fact that VoIP was required for new buildings only. After the change-over to the new installation, IP-based services like fax server, CTI and ENUM had been implemented. Basically it had been provided for reachability of all extension lines via ENUM/SIP, including the possibility to exclude some extension lines from e164.arpa. Another requirement had been that calls from the Internet were to be identified. As regards outgoing calls, the use of ENUM was to be made possible from every extension line, whereby calls via ENUM to PSTN numbers that were subject to charges were to be impeded.

Within the scope of the implementation the entire number block of the University had been registered under 9.4.e164.arpa via the German Research Network DFN. A corresponding NAPTR-RR (Naming Authority Pointer Ressource Record) had been entered for the block in order to guarantee that all extension lines could be reached via ENUM. It was planned to have the zone administered by the University itself in the future, so that extensions could be entered individually. This would provide for the possibility of explicitly excluding specific extension lines like fax and modem lines. Since the Alcatel installation did not support ENUM queries, that function was implemented through an Asterisk-PBX installation, which was connected with the Alcatel exchange installation via a S_2M interface. To use ENUM for outgoing calls, a tie-line number had to be dialled, so that the call was routed from the telephone installation to the Asterisk server, which in turn carried out the ENUM query. This feature did not only call on e164.arpa but also on e164.org. In addition to that, the Asterisk PBX was registered with Sipgate, thus enabling toll-free calls to customers of this VoIP provider and its peering partners. Chargeable connections, in contrast, were not supported by this configuration.

During trial operation, Ulm University invited its students to bring along private GAP-compatible (Generic Access Profile) DECT telephones and to have these registered in the DECT network of the University. This enabled the students to access internal extension lines and toll-free 0800 and 00800 numbers and to make VoIP calls via SIP/ENUM. In addition to that, the students were reachable via the public network and via SIP/ENUM.

Markus Klenk presented a configuration example that showed how the students could also be reached under their private telephone numbers free of charge by call forwarding via SIP/ENUM. That feature was available, for example, with ISDN/DSL connection and DSL flat rate, a GAP-compatible DECT telephone and an AVM Fritzbox (alternative solution: Linux PC equipped with 2 ISDN cards and Asterisk). With the appropriate configuration, students who had their private telephone number registered as an ENUM domain were thus reachable under their private number at the University as well as at home both via VoIP and via PSTN.

For the complete presentation of Markus Klenk, please refer to our website under:

http://www.denic.de/media/pdf/enum/veranstaltungen/Klenk_20070227.pdf

9. Considerations on the Final Report of the Advisory Project Group "Framework Conditions for the Interconnection of IP-Based Networks" of the Federal Network Agency

Klaus Landefeld gave a brief critical review in his presentation on the final report of the project group "Framework conditions for the interconnection of IP-based networks", which was published in December 2006.

The project group had been established by the Federal Network Agency in August 2005 with the task to investigate the framework conditions for IP-based networks on the basis of a list of questions and to develop possible scenarios. A core task had been to develop a new interconnection regime for voice telephony with the migration phase of the current to a future regime being the central item. The criteria applicable to the investigation had included the intensification of a sustainable competition, incentives for efficient investment and efficient utilization of the network, minimization of transaction costs, avoidance of arbitrage potentials induced by regulations, and the internalization of network externalities. The basis from which the project group started its work had been a list of questions, dealing, among other things, with the cost structure in IP networks and possible billing systems.

The network models discussed in the report involved the traditional connection-oriented network model PSTN and the NGN (Next Generation Network) and NGI (Next Generation Internet) models. NGN meant an IP-based network offering a measurable "per session" control with QoS as an integral component and corresponded to the specifications of ETSI (European Telecommunications Standards Institute) und ITU (International Telecommunication Union). NGI in contrast designated an IP network following the specifications of IETF (Internet Engineering Task Force) that was going to gradually integrate QoS for multi-medial connections.

Applicable billing models were CPP (Calling Party Pays) or CPNP (Calling Party´s Network Pays) on the one hand and Bill & Keep on the other hand. CPP/CPNP was the model used for PSTN: The caller or network operator bore the costs of the connection. Bill & Keep was the model used for the Internet. Here, every participant paid the costs of his/her connection. For the transition phase, a mixed model could be used.

One of the conclusions of the working group was that one should clearly distinguish between connections with and without guaranteed QoS. The working group determined NGN as the very model for telephony via IP. NGI was not investigated in detail. The report stated the avoidance of inefficient arbitrage in the meaning of free-riders, who obtained considerable profit without rendering additional services or their own infrastructure, as an important aspect. Even if the market was not yet ready for the Bill & Keep billing model, this was still considered the "target regime". The report did not state a period for the transition to "all IP".

In the further course of his report, Klaus Landefeld explicated his points of criticism with regard to the project group's report. He criticized that no representatives of IP-based or infrastructure-less providers had been invited to participate in the group. No specialists for the open Internet had been interrogated. Klaus Landefeld considered the abstract technical concepts on which the network models were based (NGN) a problem. Currently there was no perfect equivalent to them in actually existing networks and network components. Moreover, there were far too many exchange points from the IP point of view. Due to the different cost levels incurred by the different technologies it would not be possible to avoid arbitrage. The question rather was who would earn the profit. Further points of criticism included the proposed billing model, which planned to use Bill & Keep only for "large" participants who were present at all planned exchange points. Other participants should continue to use the old EBC model (Element Based Cost). All in all, the report did not make any attempt to coordinate the results on an international level. The differentiation between "Voice over NGN" and "Voice over Internet" without having developed any means for a possible integration of the two also had to be seen as a problematic approach.

For the complete presentation of Klaus Landefeld, please refer to our website under:
http://www.denic.de/media/pdf/enum/veranstaltungen/Landefeld_20070227.pdf