



ENUM in Germany –
9.4.e164.arpa becoming commercial

ENUM Day Australia
November 15th, 2006 – Carsten Schiefner, DENIC eG



Mission and Organizational Form

DENIC has been founded to act as a neutral and independent service provider for the German Internet community in the form of a cooperative.

DENIC's Mission

- To act as a neutral and independent service provider for the German Internet community
- To operate in a not-for-profit model
- To guarantee the highest possible level of technical stability and security

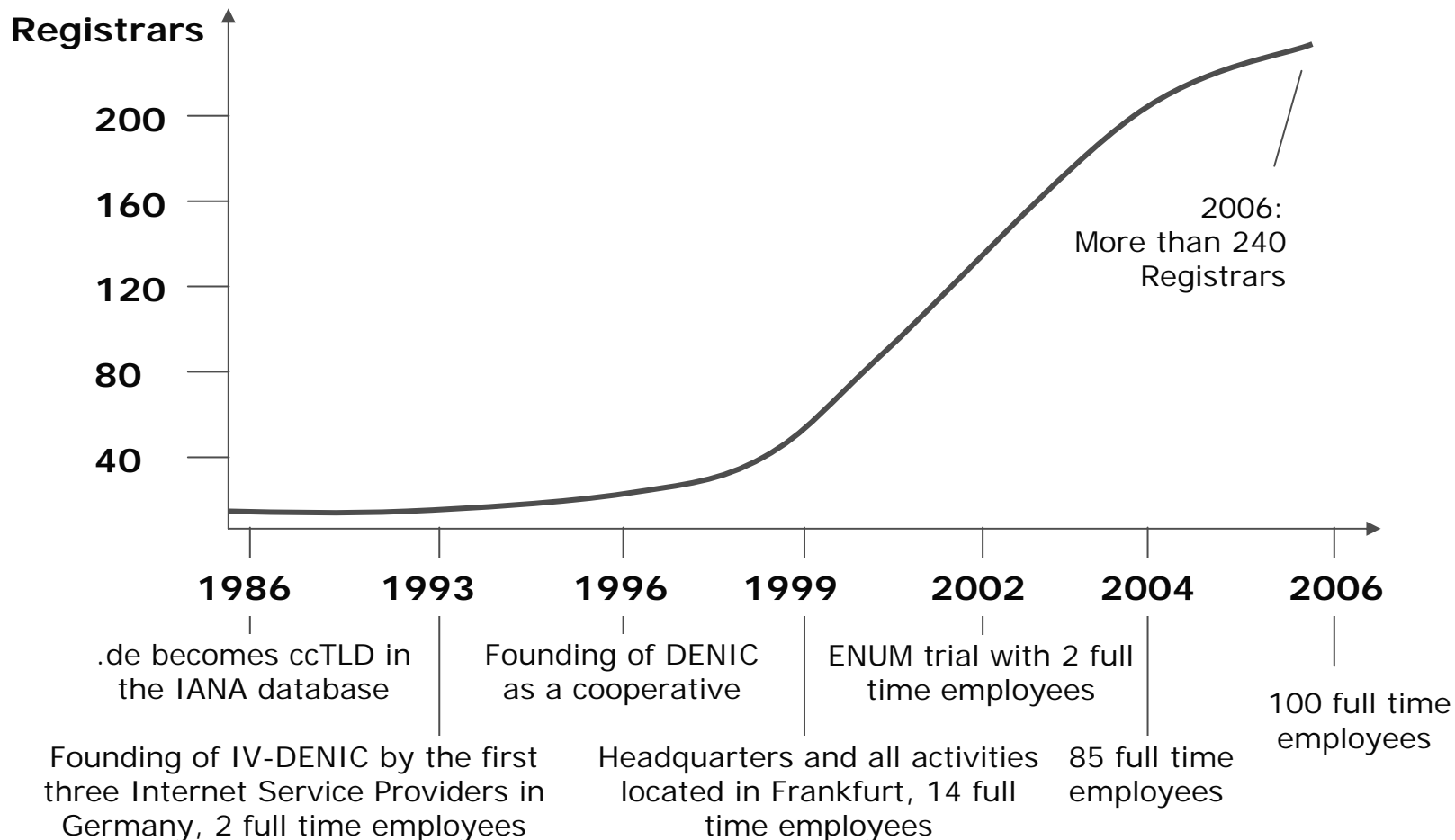
Organizational Form

- Founded in the form of a cooperative – ideal for not-for-profit businesses
- Open structure which allows fast and easy admission of new members
- Far reaching influence of members on the grounds of the statute, in the technical advisory council, and in working groups
- Every member can only acquire one share – hence all decisions are on a „heads“ basis



Historical Development of Self Organization

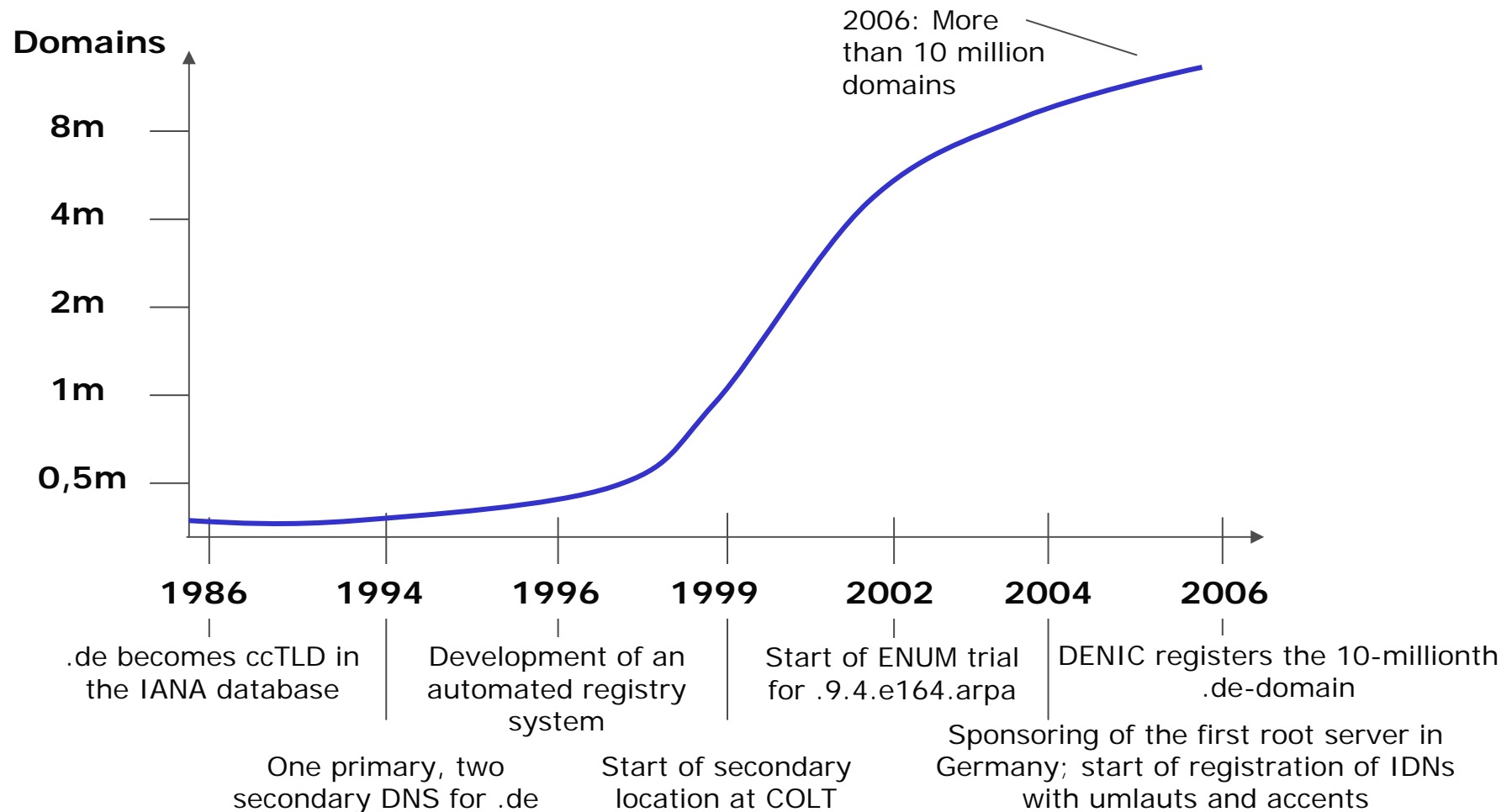
DENIC has been founded in a bottom-up self organizational process of the Internet industry and the interested community in Germany.





DENIC's Registry Experience

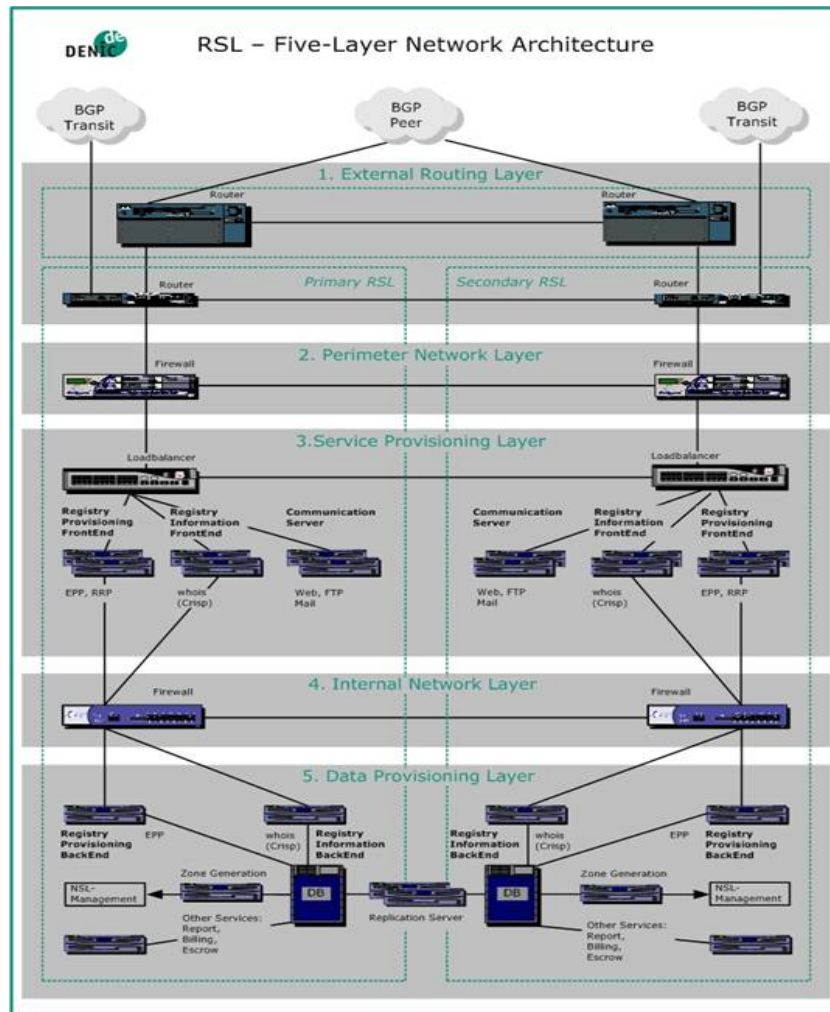
DENIC has more than ten years experience of managing the second largest registry in the world.





RSL Five-Layer Network Architecture

DENIC has built a sophisticated network architecture in two data centers, called "Registry Service Location"



- Highly stable, secure and scalable network and server architecture with five distinct layers at both RSLs
- Highly reliable and available registry solution through redundancy of all systems
- Installation of systems in a redundant, load-balancing fashion facilitates the deployment of additional machines to scale performance
- Hosting of all RSLs in state-of-the-art registry facilities



DENIC's main functions

Operation of the name server service for the .de and 9.4.e164.arpa zone

- Operation of the automatic electronic registration system
- Operation of the domain databases for the Top Level Domain .de and the German ENUM domain 9.4.e164.arpa
- Performing the DNS Service for .de and 9.4.e164.arpa
- Supporting secondary service for .aero, .il, .at, .na, .pr, .gr and others
- 24/7 availability
- DENIC performed the ENUM test operation for the German E.164 telephone number space
- Provision of a hotline to support domain holders who have questions and/or problems
- Involvement in shaping the organizational and technical development of the Internet in cooperation with international bodies (such as [ICANN](#), [CENTR](#), [IETF](#))



NSL Locations and Setup Worldwide

Furthermore, DENIC currently operates **14 Name Service Locations worldwide**



- Future NSL infrastructure ensures extensive geographic network coverage, also covering emerging markets
- Continued high-quality DNS resolution in Europe and North America
- Significantly improved DNS services to Asia and South America recently deployed, plans for other currently underrepresented markets
- Diverse architecture between name server locations to increase reliability, to reduce risk of attacks and to reduce vendor dependency
- All NSLs are hosted in state-of-the-art name server facilities



Current DENIC .de Nameserver Locations

Name Server Location

f.nic.de	DE – Frankfurt	
s.de.net	DE – Stuttgart	
c.de.net	US – Santa Clara	
a.nic.de	NL – Amsterdam	
l.de.net	UK – London	
z.nic.de	AT – Vienna	DE – Berlin
	SE – Stockholm	DE – Frankfurt
	JP – Tokyo	KR – Seoul
	BR – Sao Paulo	US – Miami
	US – Elmsford	

z.nic.de – Anycast Name Server

Three additional locations have just been established:
Sao Paulo, Seoul and Miami.



ENUM@DENIC



The German ENUM Trial

- December 2001: First discussions within the German Community
- Mai 2002: Delegation of 9.4.e164.arpa
- June 2002: Setup of a public mailing list
- September 2002: Official start of the German ENUM Trial
- August 2003: Contract between DENIC and the regulator RegTP (now BNetzA) was signed
- since March 2004: Public ENUM days regularly held (each 6 month)

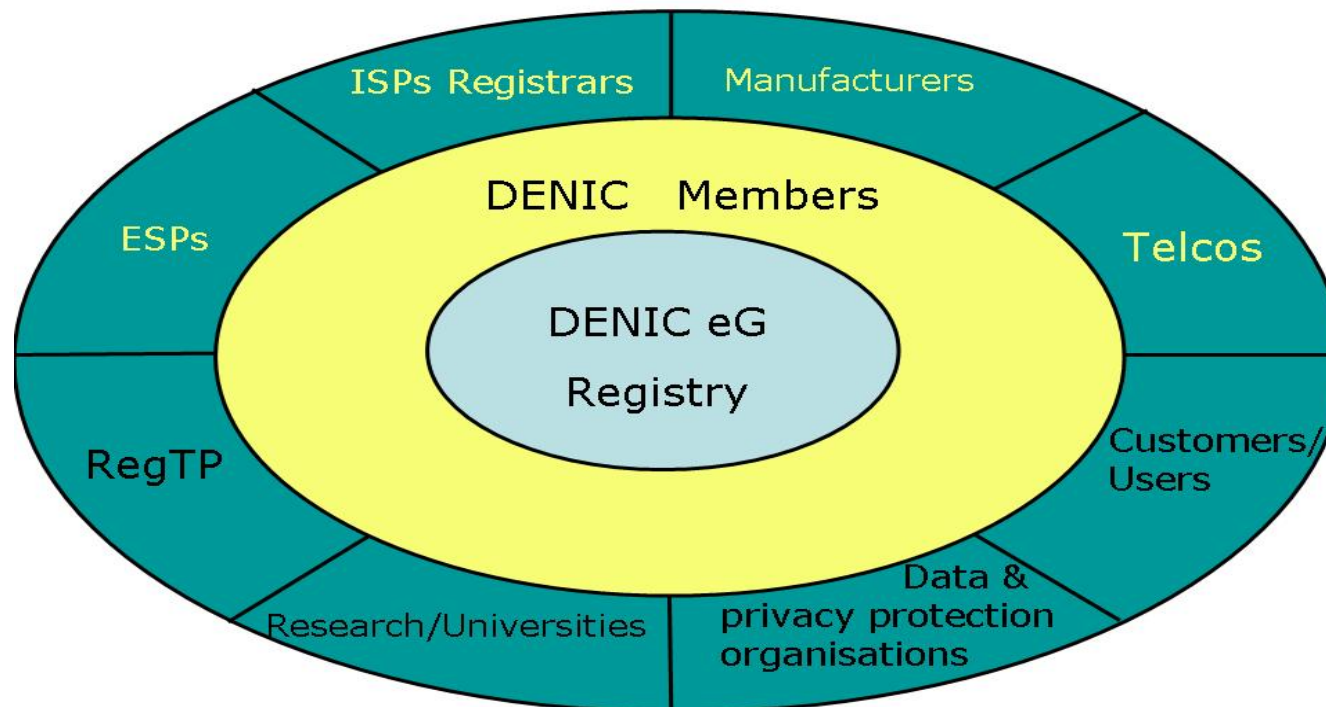
Principles for operating the 9.4.e164.arpa zone

- Highly available and efficient operation
- Consideration of and compliance with all relevant national and international standards, laws and ordinances
- Open, non-discriminating and equal access to ENUM domain registration
- Involvement of stakeholders at all levels
- Keeping E.164 and DNS in sync
- Data protection
- Create and conserve a competitive environment

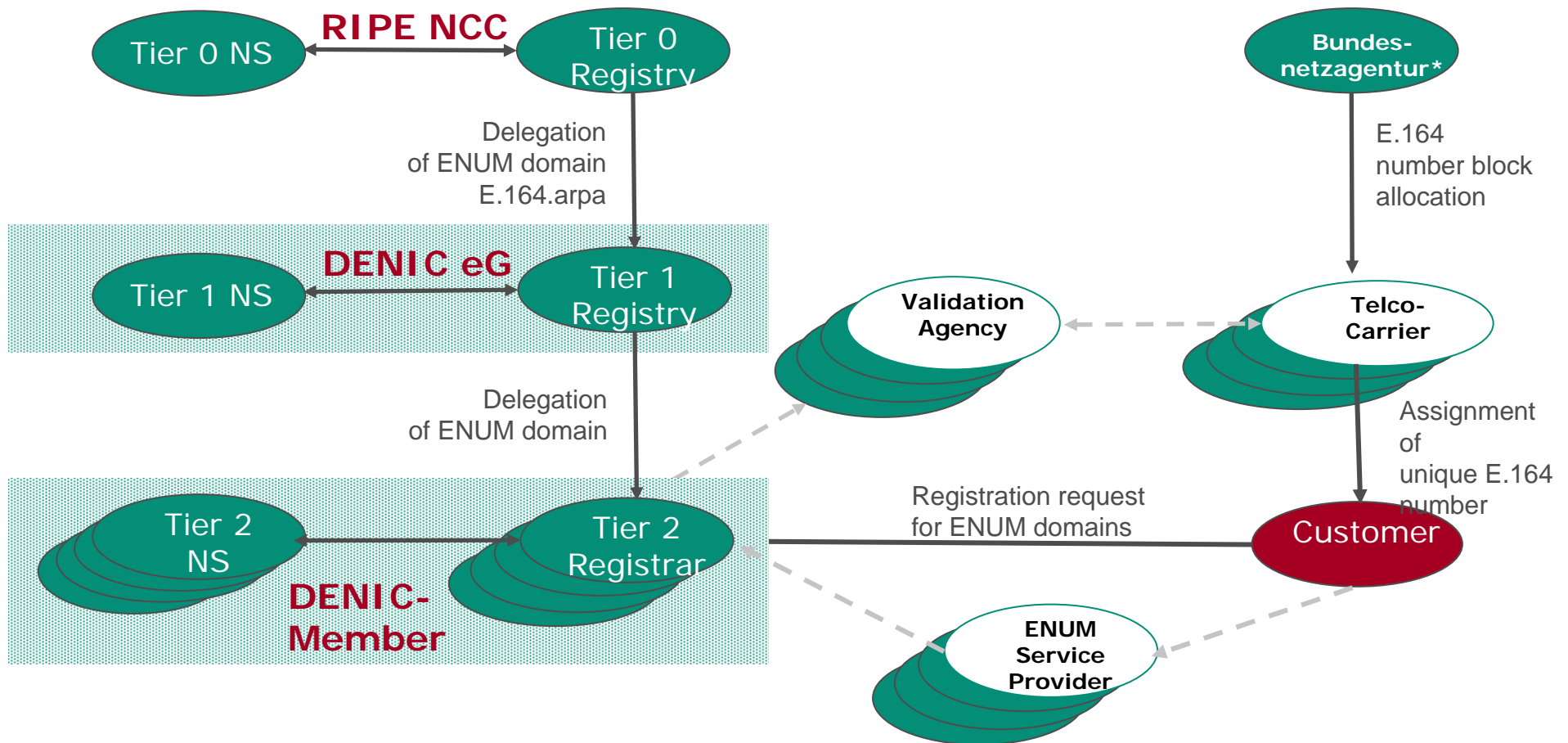


The German ENUM Trial

All potential stakeholders were participating in the Trial..



... and functionally knitted together



* Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway



The German ENUM Trial

- Information platform for various ENUM related issues
- Registration of ENUM domains under 9.4.e164.arpa
- Development of automated online registration system in cooperation with the affected community
- Operation of central name service for 9.4.e164.arpa and performing tests according the ENUM related DNS requirements
- Operation of DNS integrated in central monitoring and security system
- Documentation and testing of technical requirements relating the operation of ENUM

- Hosting regular open meetings for information exchange
Last ENUM day took place on 26 September 2006

- Information about technical implementations
- Reporting about the progress of the ENUM projects
- Presenting and demonstrating the development work
- Describing future trends
- Experiences with ENUM

More information about these events

<http://www.denic.de/en/enum/allgemeines/veranstaltung/ENUM-Tag.html>

- Promotion and information about ENUM in the press and media, events and exhibits, such as at VON Europe recently in Berlin

Results

- Final operation model for ENUM was developed and presented in September 2005
- Legal framework was designed
- Recommendation of the trial was to start commercial operation as soon as possible
- Regulator performs open consultations in November 2005
- Regulator recommends to Ministry of Economics to start production of ENUM with the proposed model and with DENIC as the operator
- Ministry of Economic follows recommendation and official ENUM production started on 1 April 2006

Operational Concept

- Registration only through registrars
- Validation by registrar
- Contract between DENIC and registrant
- Registration initially for one year
- Registration for non residents possible but admin-c in Germany has to be provided
- Technical setup will be tested and must be functional
- Renewal after one year possible but revalidation through registrar required
- Change holder and registrar transfer includes a renewal for one year and requires validation
- COMPLAINT process available for checking and problematic cases

Validation

- Examination of the initial and ongoing right to use a dedicated telephone number
 - Evaluation of different methods during the trial
 - Intense discussions the pro's and con's of different methods
 - Two independent validation agencies using different validation methods were setup:
<http://www.enum-validierung.de>
<http://www.validierung-enum.de>
- ➔ Primary responsibility for validation– initially (CREATE) and repeatedly (RENEW) – is with the registrar, potentially by using an independent validation agency



The German ENUM Model

COMPLAINT process

- In order to clarify potential errors in ENUM domain delegations, eg. the domain name holder is different from the E.164 number holder
- Entitled to start an ENUM COMPLAINT are:
 - the holder of the E.164 number herself
 - a registrar aka. DENIC member
 - the Telco Carrier
 - other third parties with justification



The German ENUM Model

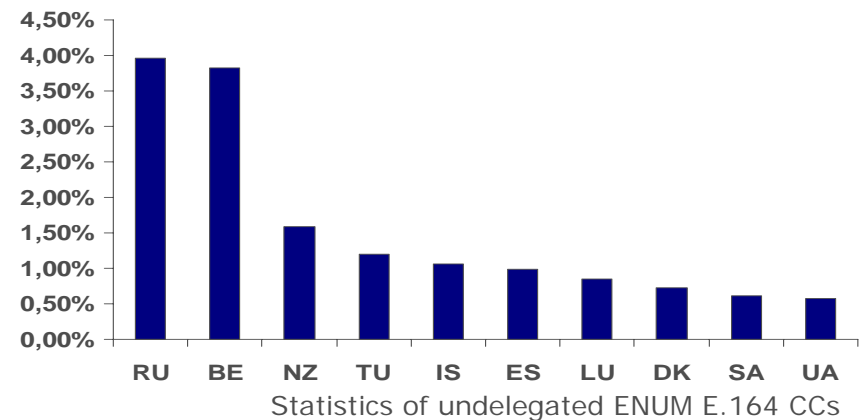
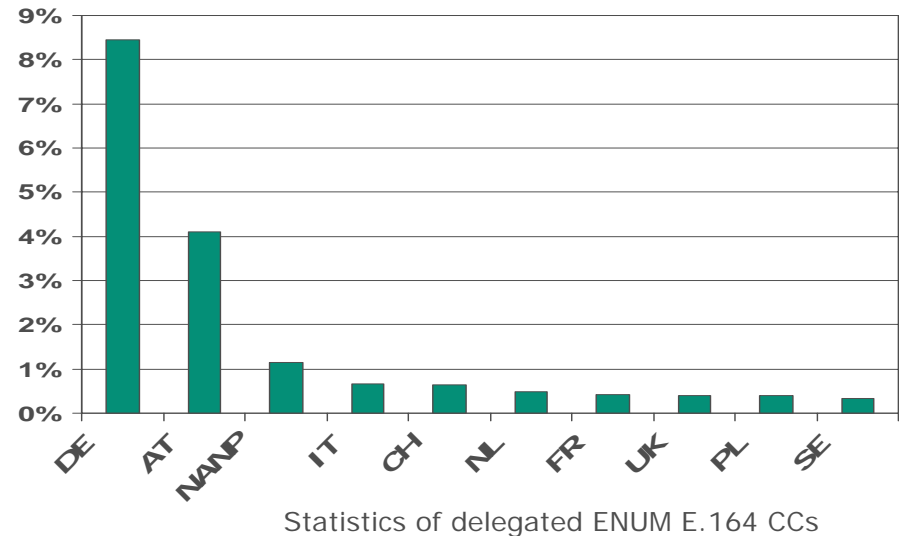
Launching Concept

- Extension of DENIC Member Terms and Conditions for ENUM
- ENUM Terms and Conditions and ENUM Guidelines similar to DE-Terms and Conditions
- Transfer of all ENUM-domains from the trial
- 1 April – 30 September 2006 launching phase, extended to 31 March 2007
- During the launching: no charge for initial registration (CREATE) and first renewal (RENEW) of already registered ENUM domains

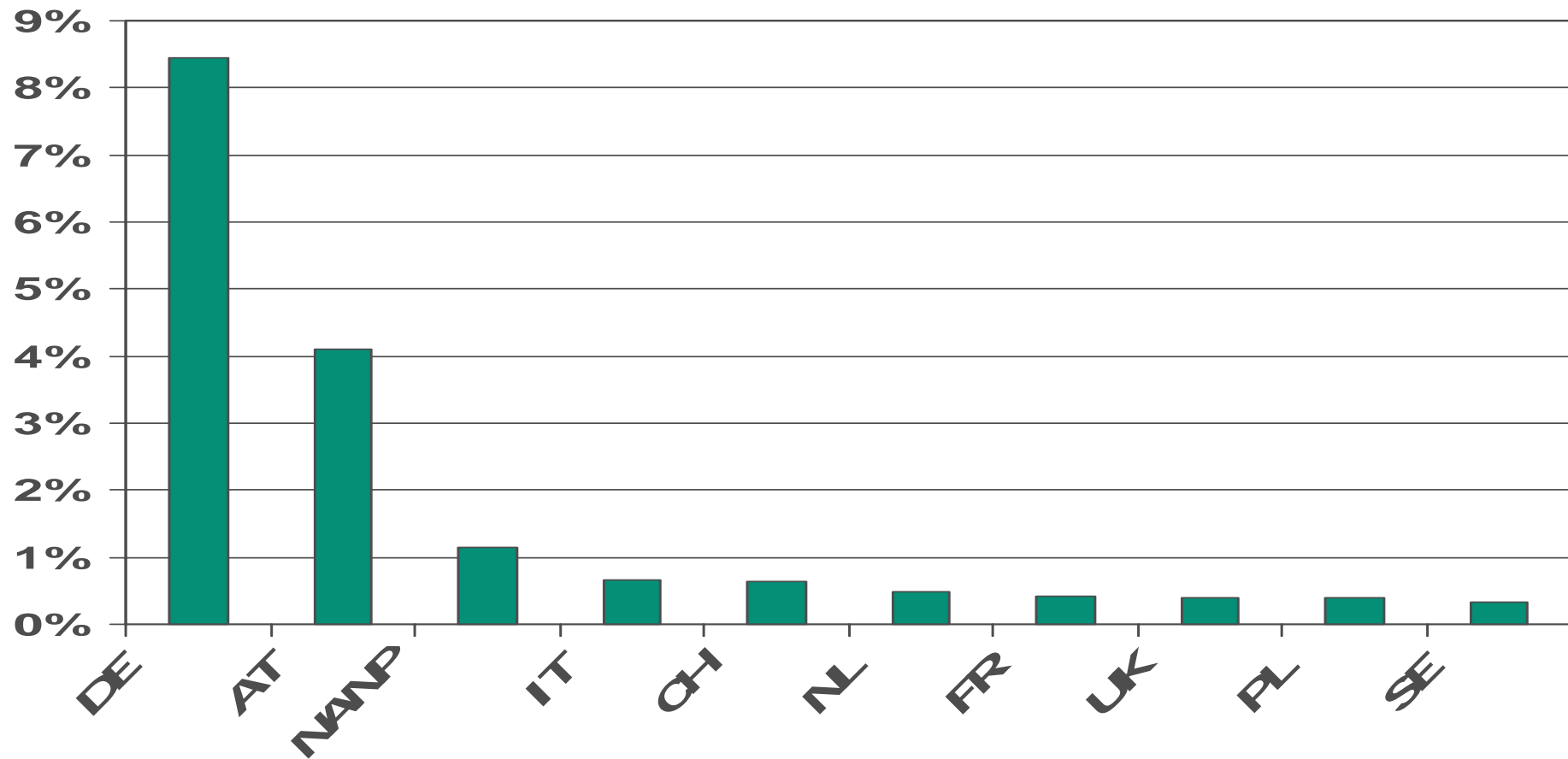
E.164 number ranges entitled to register their ENUM equivalent

- Geographic Numbers
- Mobile Numbers (i.e. 015..., 016..., 017...)
- Free Phone Service Numbers (i.e. 0800...)
- Service Numbers (i.e. 018...)
- Personal Numbers (i.e. 0700...)
- Non Geographic National Numbers (i.e. 032...)

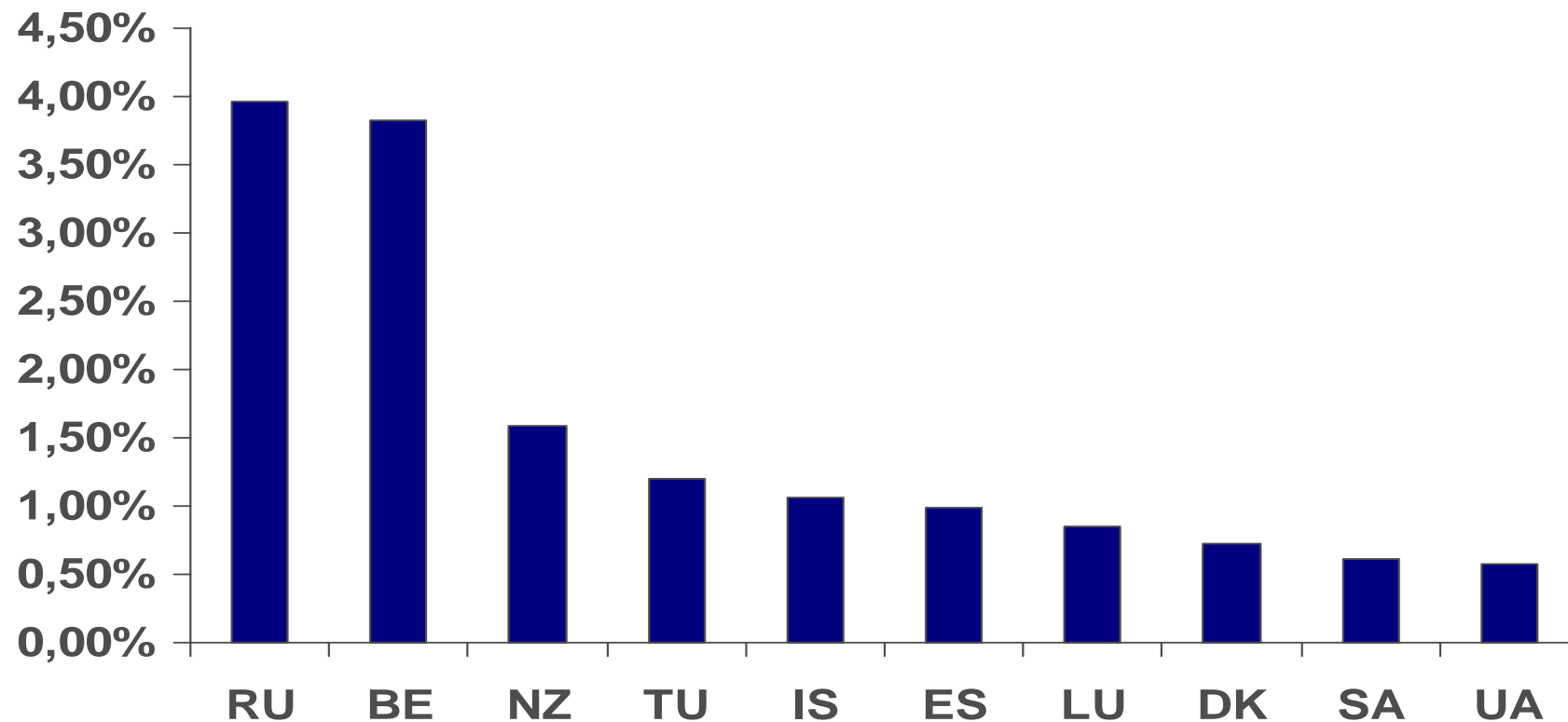
- Raw data from August 2006, chart only shows the Top 10
- 8.76 queries/min in average at one Tier 0 name server (ns-pri.ripe.net), all name servers together get roughly 42 queries/min
- 0.74 queries/min in average for 9.4.e164.arpa at ns-pri.ripe.net
- In future aggregated statistics available for all Tier 0 name servers (hopefully!)
- **No consideration of caching and other effects!**



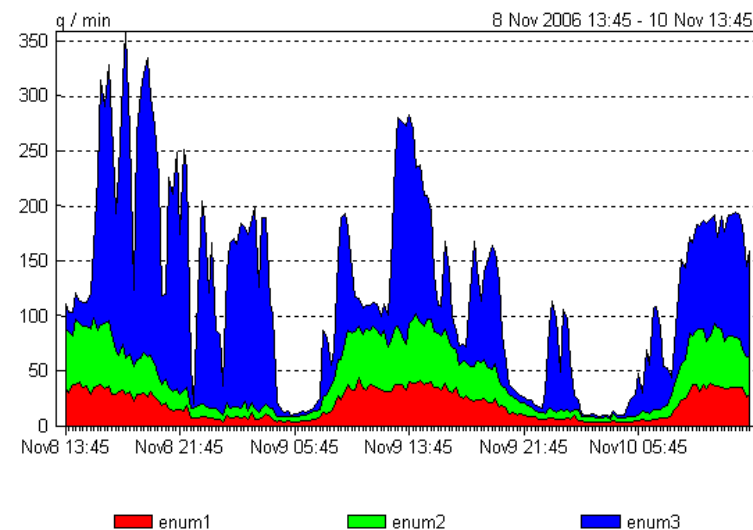
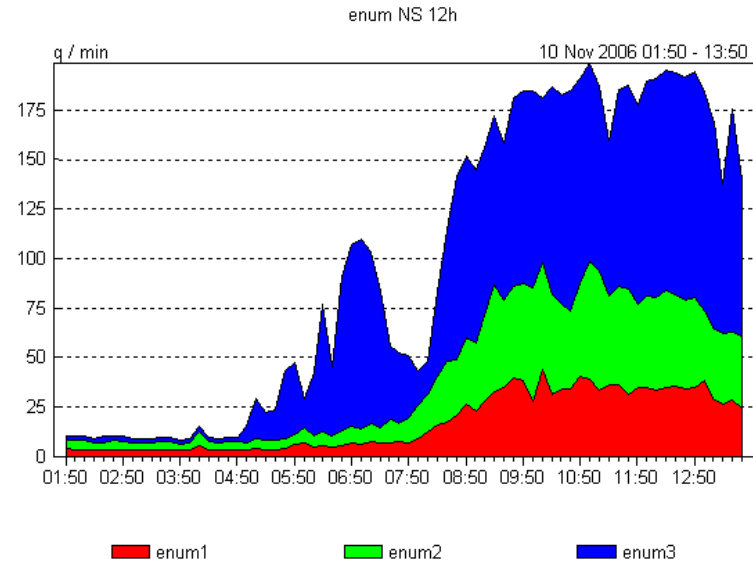
Statistics of delegated ENUM E.164 CCs



Statistics of undelegated ENUM E.164 CCs



- Up to 350 queries/min on all servers
- Mainly during the week on business hours
- **No consideration of caching and other effects here either!**





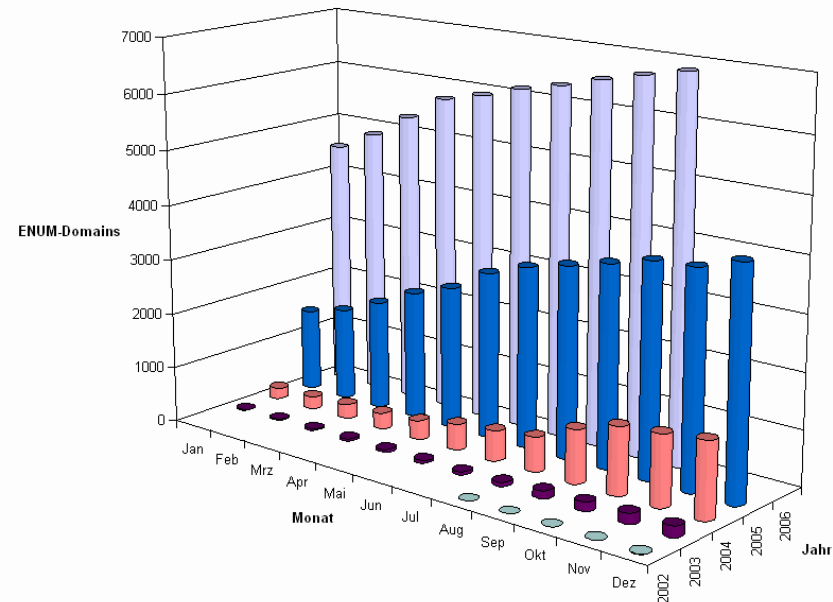
ENUM's Future

DENIC's plans to develop ENUM in the future

- Long-term establishment of the service
- Provide more detailed information about ENUM services and functions
- Evaluation of additional and/or complementary ENUM services like Infrastructure ENUM
- Cooperation with major stakeholders in improving ENUM services

- ENUM mailing list for discussion and information ~ 530 (participants)
- Number of registrars registering ENUM-Domains: 68
<http://www.denic.de/en/enum/mitgliederliste-enum/enum.jsp>
- Number of ENUM Domains: ~ 6.900

⇒ The number of ENUM-Domains is steadily growing





German ENUM – Further Information

- ENUM Domain Guidelines
<http://www.denic.de/en/enum-domainrichtlinien.html>
- ENUM Terms and Conditions
<http://www.denic.de/en/enum-domainbedingungen.html>
- Registrars that register ENUM domains
<http://www.denic.de/en/enum/mitgliederliste-enum/enum.jsp>
- <http://www.denic.de/en/enum> or enum@denic.de



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