

Introduction to ENUM

Domain Pulse
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* The opinions expressed here may or may not be that of my company

- Introduction
 - What is ENUM?
 - Why the DNS and why E.164 numbers?
- How can ENUM be used
 - What are the major benefits?
 - Two examples
 - The business cases
- International activities
 - (Very) Short ENUM history
 - Who is using it?
- Summary

- Addressing (numbering) on the PSTN:
 - E.164 “phone” numbers: +43 664 420 4100
- Addressing (naming) on the Internet:
 - IP addresses: 62.47.121.6
 - domain names: www.enum.at
 - Uniform Resource Identifiers (URIs):
 - mailto:richard.stastny@oefeg.at
 - http://62.47.121.6
 - http://www.oefeg.at
 - sip:richard.stastny@iphone.at
- the DNS is used to map domain names to IP addresses, it can also be used to map phone numbers to URIs

- Electronic or E.164 NUMBER mapping is defined by the Internet Engineering Task Force (IETF) in RFC3761
- **The mapping of „Telephone Numbers“ to Uniform Resource Identifiers (URIs) using the Domain Name System (DNS) in the domain e164.arpa**
 - URIs are used to identify resources on the Internet (e.g. <http://enum.nic.at>)
- The purpose of ENUM is to enable the convergence between the PSTN and the Internet

- take an E.164 phone number

+43 1 7972840 32

- turn it into a FQDN

2.3.0.4.8.2.7.9.7.1.3.4.e164.arpa.

- query the DNS (for NAPTR)

- returns list of URIs

sip:richard.stastny@iphone.at
mailto:richard.stastny@oefeg.at
sms tel:+436644204100

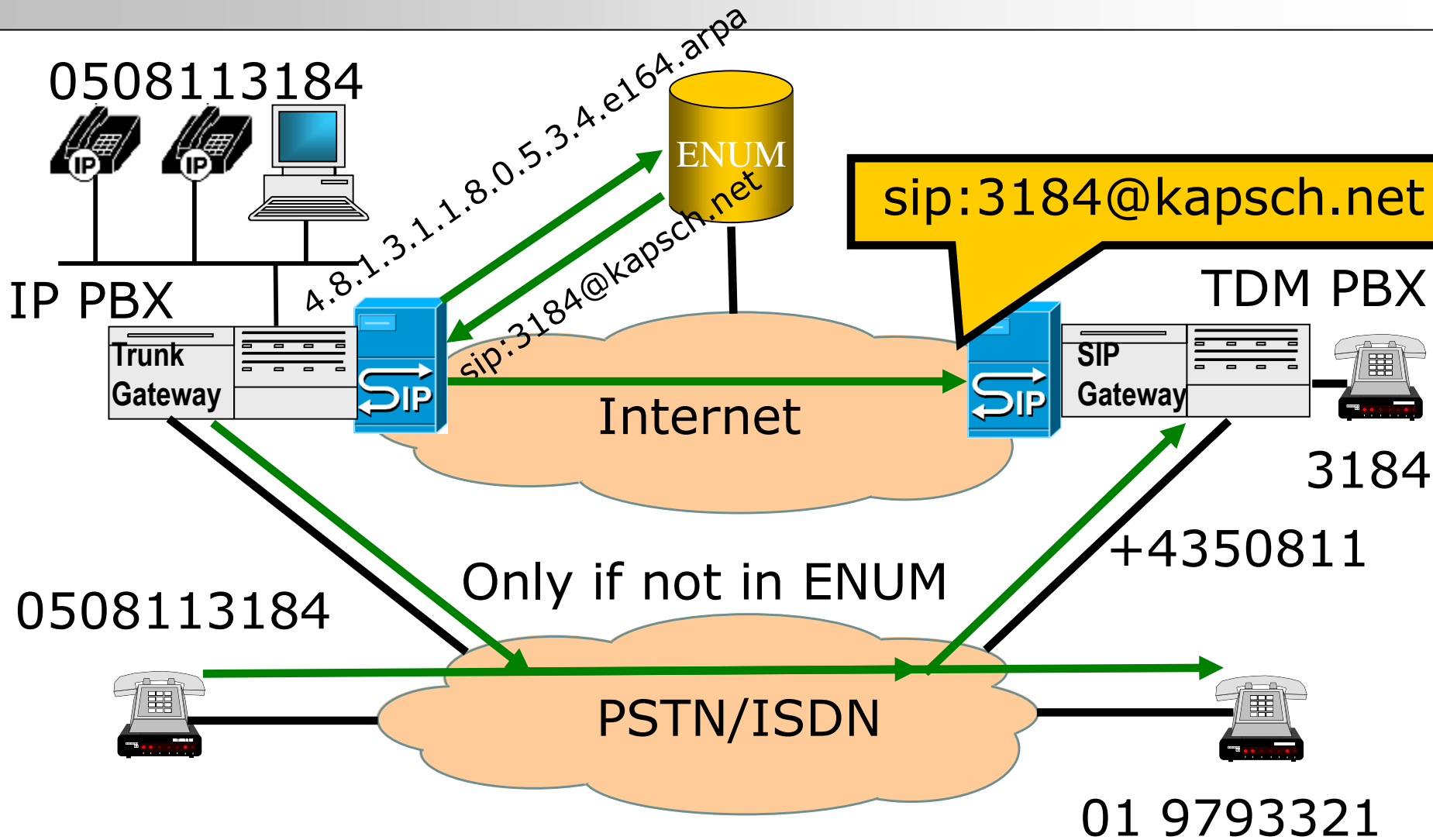
- It's there ...
- It works...
- It's global...
- It scales...
- It's open...
- Anyone can use it...

- People know how to use phone numbers
- Billions of devices only use numeric key pads, especially wireless devices
- Many VoIP customers use normal phones with terminal adapters or IP phones with numeric keypads
- URIs like sip:user@domain have advantages and disadvantages
 - biggest problem: they cannot be dialed on the PSTN
- Phone numbers may be used for other services on the Internet (Instant Messaging, Video, ...)
- URI's and telephone numbers will co-exist for the indefinite future
 - approx. 10 years? ;-)

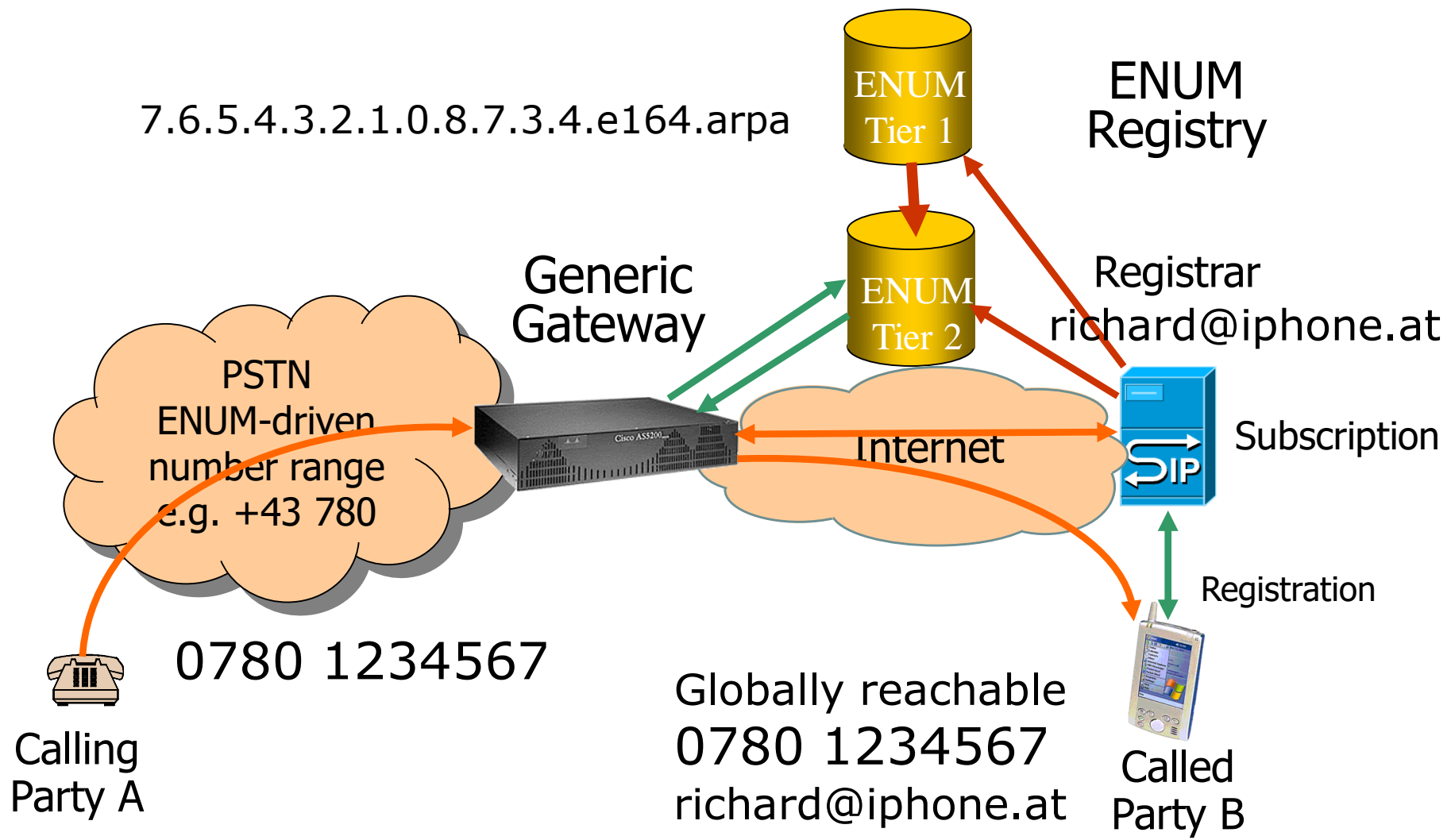
- A real-time call forwarding service
 - ENUM should not be used to implement a follow-me service, modifying ENUM entries in real-time depending on location, time-of-day, etc.
 - This should be done as a SIP service at the SIP proxy
- A „presence“ service
 - Presence should also be implemented at the SIP proxy (e.g. with SIMPLE)
 - ENUM does not provide NOTIFY and also no policies
- But ENUM may point to a presence service or to a geo location
 - e.g. for a company or a hotel

- Linking to together VoIP islands on the Internet, enabling all Internet services
 - VoIP PBX and also „Carrier“ networks
- Allowing terminals on the Internet to be reached from the PSTN
 - Terminals on the PSTN may dial only numbers and not URIs
- ENUM can be used for any URI = any service
 - mailto, fax, video, ...
 - sms, mms, ...
 - h323, pres, im, ...
 - http, ft,
 - certificates, locations, ...

One example: ENUM for companies



Example: +43780 and the Generic Gateway



- For companies and call centers (0800)
 - the company PBX can be reached from PSTN and from Internet
 - calls to other ENUM-enabled numbers are routed via VoIP and the Internet
 - improved functionality (IM, Video, Conferencing, presence, ...)
 - better quality for native VoIP calls
- For residential users with +43 780 numbers
 - same as above
 - reachable via any broadband connection globally
- Possible also for residential local and mobile numbers

- First: get yourself a VoIP account and a SIP URI
 - (e.g. from fwd.pulver.com, iptel.org, sipgate.at, ...)
 - see references at www.my-enum.at
- Send a SMS from any Austrian mobile phone with text ENUM to **0900 401011** (2€), confirm with JA
- You get back a SMS containing Userid and PW
- Your mobile number is now validated and registered in ENUM (for 2 month)
- Login at www.my-enum.at
- Enter the sip URI for your mobile number
- Done

- 1999 – IETF ENUM WG formed
- 2000 – IETF ENUM WG – RFC2916
- 2001 – Int. and nat. workshops (ITU-T, Europe, US, Asia, ...)
- 2002 – ITU -T Interim Procedures (IAB, RIPE-NCC)
 - ETSI TS 102 051 "ENUM Administration in Europe"
 - National Consultations and ENUM–Trials started (Austria)
- 2003 – ETSI TS 102 172 "Minimum Requirements for Interoperability of European ENUM Trials"
 - more national ENUM–Trials joined
- 2004 – ETSI ENUM Workshop (Feb 2004)
 - IETF new RFC3761
 - Enumservices registration at IANA ongoing
 - US LLC for CC 1 formed
 - 1st commercial ENUM service worldwide in Austria
- 2005 – ETSI TS 102 172 V2 "Minimum Requirements for Interoperability of ENUM Implementations" approved
 - ETSI TR 102 055 "Infrastructure ENUM" approved

Delegations in e164.arpa as of Dec. 31st, 2004

- 31 Netherlands
- 33 France
- 353 Ireland
- 358 Finland
- 36 Hungary
- 374 Armenia
- 40 Romania
- 41 Switzerland
- 420 Czech Republic
- 421 Slovakia
- 423 Liechtenstein
- 43 Austria
- 44 UK
- 46 Sweden
- 48 Poland
- 49 Germany
- 246 Diego Garcia
- 247 Ascension
- 290 Saint Helena
- 55 Brazil
- 61 Australia
- 65 Singapore
- 86 China
- 88234 Global Networks
- 87810 VISIONng UPT
- 971 UAE
- 1 North America soon to come
- additional Asian countries (Korea, Japan, ...) trials, but not in arpa

<http://www.ripe.net/enum/request-archives/>
<http://www.centri.org/kim/enum/index.html>

- ENUM is available now
- It works - technically and administrative
- It is based on the reliable, scalable, globally available DNS infrastructure
- It is simple to use (just dial a phone number as usual)
- Enables all additional features provided on the Internet
 - lower cost, more functionality, better quality
- without losing the connectivity with the PSTN and the familiar phone numbers

Contact (not Content) is King

Douglas Rushkoff

Thank you

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Backup slides

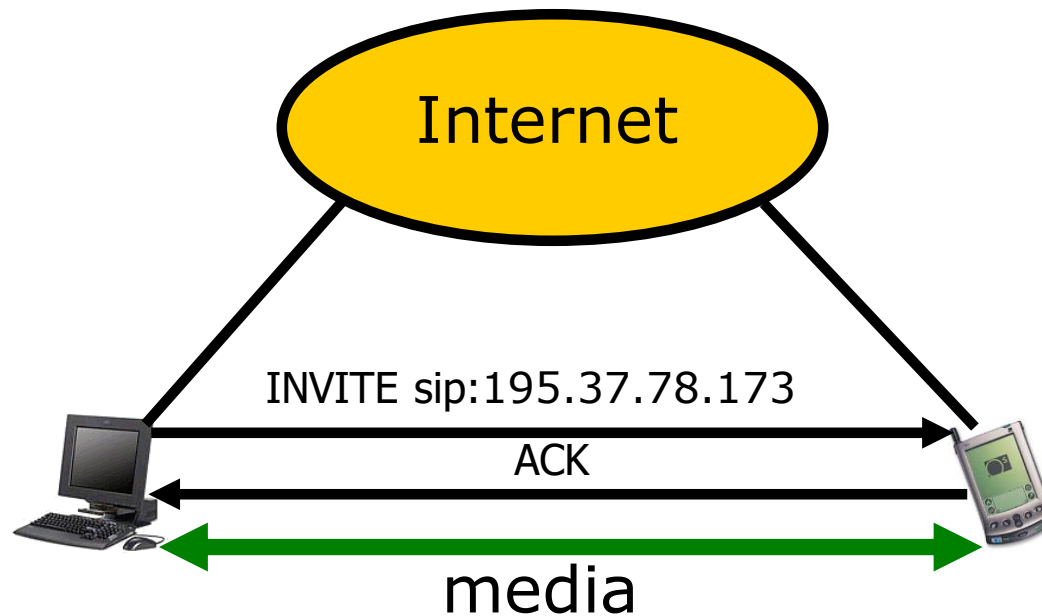
- The Domain Name System is not only used to map domain names to IP addresses:
 - nic.at A 193.170.120.100
- but also to map to other types of resource records:
 - nic.at MX 200 mx2.univie.ac.at
- so it can also be used to map phone numbers to NAPTR resource records

```
IN NAPTR 10 10 "u" "E2U+sip" !^.*$!SIP:richard@iphone.at"! .
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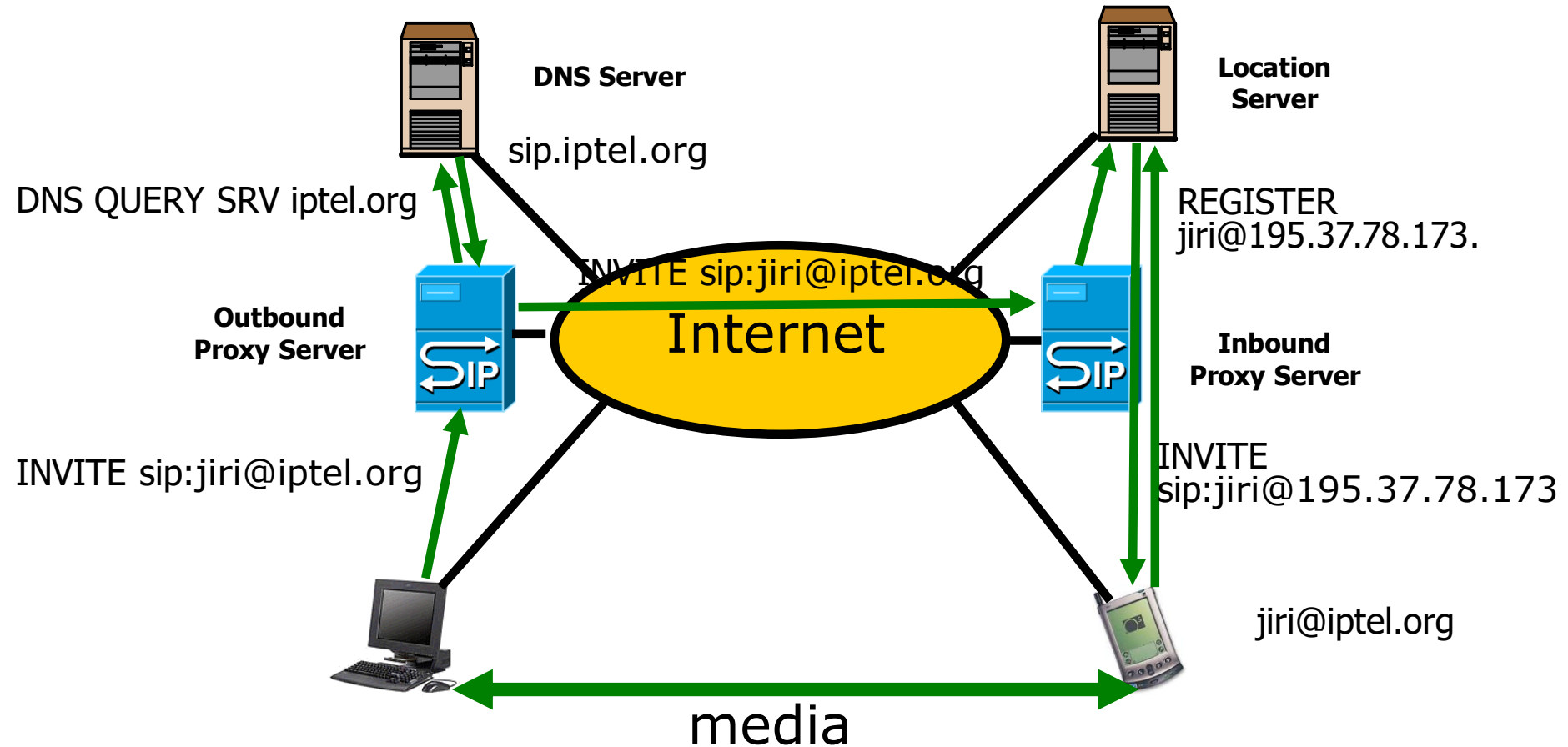
- Since ENUM is used to map E.164 phone numbers to URIs,
- one main application will be Internet Telephony or VoIP
- a popular protocol for VoIP is the Session Initiation Protocol (SIP)
- So we have to make a short deviation to explain how SIP works

- A public SIP URI on the Internet
- Any „IP Telephony or VOIP service“ not providing a SIP URI cannot be reached via the public Internet and cannot be used in ENUM
- Vonage, Skype cannot be considered as VoIP

SIP allows direct communication between clients using only IP addresses (peer-to-peer P2P)

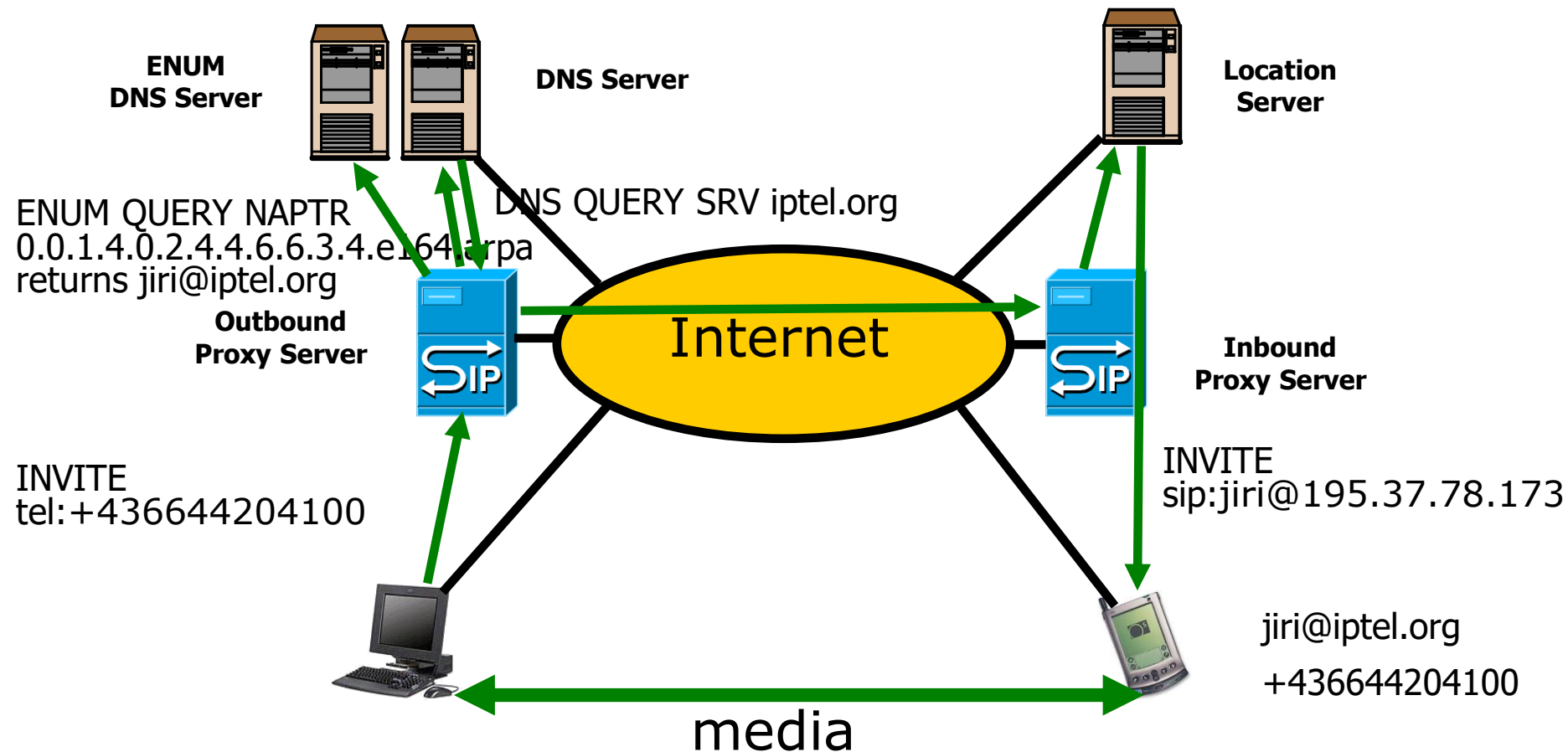


But in most cases SIP proxies, the DNS and Address-of-Records are used



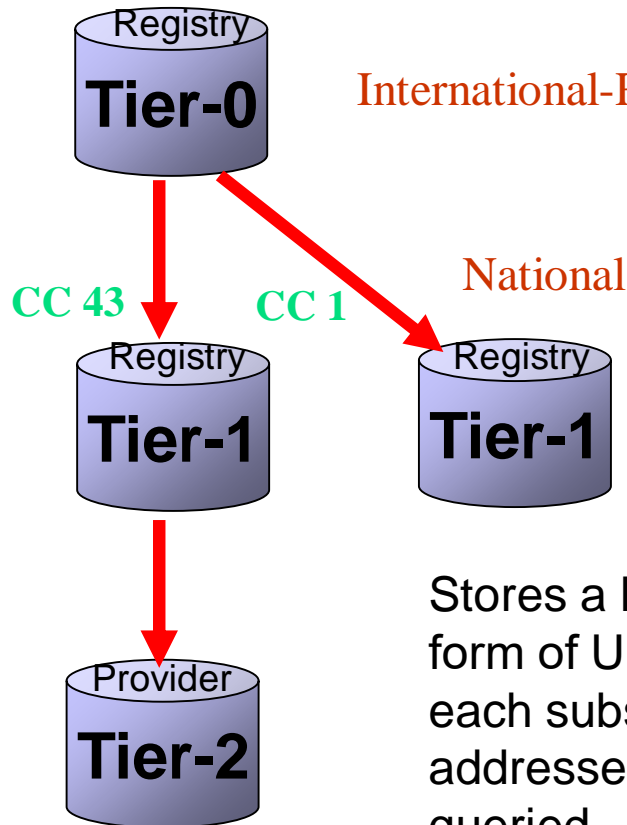
So what is ENUM adding?

The originating user may also enter a phone number instead of an URI



1. Business: „IP PBX“ and „IP Centrex“
 - with geographic and/or corporate numbers
 - linking VoIP islands together globally via the Internet
 - will be reached from the PSTN via private or public gateways
2. Residential and Business: ENUM-driven numbers (+43780)
 - IP device can be reached from IP and PSTN (via generic gateways)
 - calls may be routed to IP directly from the originating PSTN network
3. Residential: mobile numbers
 - terminate IP originated calls on IP, plus eventually forwarding or forking to the mobile phone
 - PSTN operators may provide forced ENUM access from the PSTN via GG
4. Residential: geographic numbers
 - secondary line (separate termination on PSTN and IP)
 - primary line attached via terminal adapter or SIP-server with FXO port
 - **primary line (ported out to VoIP),
reached from PSTN via a Point-of Interconnect (PoI)**

The ENUM "Tiers"



International-RIPE-NCC and ITU-TSB

According to the interim procedures agreed between IAB and ITU-T TSB

National

Directs the DNS query to the customer's Tier-2 providers. An NS* record is provided for each subscriber's telephone number

Stores a list of service specific internet addresses in the form of URI's in a DNS resource record called NAPTR for each subscriber. Returns the full list of Internet addresses associated with the E.164 number being queried.

*An NS record is an authoritative Name Server DNS record used to delegate to subordinates

- First ENUM Consultation by RTR (Aug. 2001)
- Delegation of 3.4.164.arpa via RTR to nic.at (May 2002)
- Austrian ENUM (Trial) Platform (Sept. 2002) established
- Austrian ENUM Trial in full operation (Oct. 2004)
- New Austrian Telecommunication Law (TKG 2003)
 - based on the New European Regulatory Framework (NRF)
- New Numbering Ordinance in Austria (May 2004)
 - taking VoIP and ENUM already into account
 - +43 720 for national portable numbers and VoIP
 - +43 780 for VoIP and ENUM (nomadic)
- Contract between NRA (RTR) and Tier1 Registry (nic.at)
 - contains the policy framework for ENUM
 - the charter for the 3.4.e164.arpa domain
 - the validation guidelines for the Registrars
 - framework for contracts with registrars and validation entities
 - not defining validation procedures (only examples), but the margins for error
 - basic technical, operational and administrative requirements
- Commercial service launched by enum.at (Dec. 2004)

- Start commercial deployment of ENUM 4Q2004
 - Residential customers
 - ENUM-driven number range +43780
 - Mobile numbers (opt-in)
 - geographic numbers (terminating on IP) (opt-in)
 - geographic numbers primary line on PSTN (opt-in)
 - Corporate Customers (IP PBX and IP Centrex)
 - Geographic/network numbers (opt-in, IP PBX)
 - Geographic/network numbers (opt-in, ported out, IP Centrex)
- Deploy Generic Gateways (GG) and ENUM access codes from PSTN
- Planned:
 - Make numbers in ENUM SMS- and MMS-enabled
 - Provide trusted identification on SIP for CLI (emergency service)
 - Provide certificates for E.164 numbers
 - to be used in signaling and validation
 - Usage of SIM-Cards and IMSI for mobile IP Communications
 - Provide location information and emergency service routing proxies

ENUM Myths

- DNS is not fast enough..

- no appreciable effect on call setup times (400ms).

- DNS won't scale?!?!

- 10 billion data items already
- More data in intranets than outside
- Over 100,000,000 delegations already
- Every E-Mail including spam has to query DNS

