



# ENUM Issues and Solutions

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## Why is this topic important for regulators?

- Mapping of telephone numbers onto Internet.
- Could allow conventional telephones to call IP terminals (PCs).
- Should telephone numbers used in this way be subject to government oversight and regulation?
- Who should exercise control over telephone numbers used in this way?



## Caveats

- Complex topic
- Focused on E.164 infrastructure and policy issues, not ENUM services
- Work in progress



## What is E.164?

- ITU-T Recommendation E.164: “The international public telecommunication numbering plan”
  - Linked to treaty obligations (specific roles and obligations defined for ITU Member States and TSB Director)
  - Defines number structure and functionality for three principal categories of numbers:
    - Geographic Areas (including country codes)
    - Global Services
    - Networks



# Types of E.164 Resources

- Geographic areas
  - ITU Member States, including integrated numbering plan involving more than one (e.g., +1)
- Global Services
  - e.g., UIFN Freephone Numbers (+800)
- Networks
  - Global Mobile Systems (+881 + 1 digit IC)
  - Shared code for Networks (+ 882 + 2 digit IC)
- Groups of Countries
  - e.g., ETNS



# Issues of Convergence

- Problems of addressing calls that pass from one network service to another:
  - Now widely possible to originate calls from IP address-based networks to other networks
  - But uncommon to terminate calls from other networks to IP address-based networks
  - To access a subscriber on an IP address-based network, some sort of global addressing scheme across PSTN and IP address-based networks needed
- ENUM may be solution...



## What is ENUM?

- IETF protocol defined in RFC 2916
- E.164 number can be used to look up a Uniform Resource Identifier (URI)
  - Web addresses most commonly known URIs
- Allows using E.164 number for combined PSTN & IP applications, such as email, fax, SIP, mobility, etc.
- Could be important integrator of telephony network, Internet, other IP-based networks



## What is ENUM?

- Protocol uses what are called Naming Authority Pointer (“NAPTR”) DNS resource records as defined in RFC 2915
- Identifies the available methods or services for contacting a specific node identified through an E.164 number and their order of priority/preference:
  - e.g., contact me first by email then voice mail...



## How would E.164 numbers be mapped into the DNS?

- Reverse map digits in an E.164 number into separate DNS “names”
- Concatenate with “ENUM root zone” (as an example, foo.tld)
- For example:
  - +33 1 40 20 51 51 =  
1.5.1.5.0.2.0.4.1.3.3.E164.TLD
- TLD stands for a domain name that has not yet been formally agreed (“arpa” has been suggested)



## Some Complexities

- In telecommunication numbering, regulatory tradition with strong government involvement (e.g., number portability, consumer protection)
- In the Internet, management of naming and addressing has been left to “industry self-regulation”
- National numbering/regulatory authorities involved in coordinating ENUM servers & services for their portion of E.164 resources in respective countries



## Roles and Responsibilities

- Most ENUM service and administrative decisions are national issues under purview of ITU Member States, since most E.164 resources are utilized nationally
- ITU will need to ensure that Member State has specifically authorized inclusion of geographic country code in the DNS
- In integrated numbering plan, each ITU Member State within plan may administer their portion of E.164 resources mapped into DNS as they see fit



## ITU Responsibilities

- Define and implement administrative procedures that coordinate delegations of E.164 numbering resources into the agreed DNS name servers
  - Draft Recommendation E.A-ENUM is being prepared by Study Group 2 for presentation to the May SG2 meeting



# Security Issues

- Almost no security in normal DNS
- Transaction Signatures (TSIG) provides simple form of DNS Security based on shared secret
- Ultimately DNSSEC needs to be deployed
  - uses public key encryption to generate digital signatures for every resource record in a zone
  - public keys are also signed and included in the zone, allowing the signatures to be validated



# National Consideration Issues

- Consultation process with interested communities
- National deployment Issues
  - How do you authenticate the identity of the subscriber for ENUM services?
  - Who are ENUM Registrars and what are they responsible for?
  - How do you validate ENUM data for potential users ( Add - Modify – Delete) NAPTR list of services and preferences?
  - How is data provisioned in the country code name servers?



# Privacy Issues

- Need to obtain end-user agreement to enter number in DNS, depending on national data-protection laws
- Hardening the ENUM zone data against data mining, especially for the purposes of spam?
- But hard to stop ENUM name servers being harvested for resources bound to an E.164 number



## ITU Past Activities

- Preparation of tutorial papers
- ITU-T SG 2 preparing supplement on issues that need to be addressed by national and international authorities
- ITU-T SG 2 Meeting in Sept 2001
- Discussion with IETF on roles and responsibilities



## ITU Future Activities

- ENUM Tutorial Workshop, 8 February, Geneva
- Wide circulation of tutorial material
- Cooperate with IAB/IETF to make final choice of TLD, registry, requirements for registry operations
- Rapporteur meeting 4-8 February 2002
- Determine ENUM Supplement in May 2002
- Determine E.A-ENUM, May 2002?