Overview – July 2003
The ENUM Objective

- Mapping PSTN addresses into the IP world
- ENUM allow any IP device to establish whether an E.164 telephone address is described by an Internet Service Point address
  - And ... what the preferred Internet Service Point actually is
  - And ... what IP address, protocol address, port address and application address should be used to contact the preferred Service Point
What is ENUM?

- ENUM is part of the extension of the PSTN into the Internet
  - ENUM is defined by the Internet Engineering Task Force (IETF) and translates an E164 number into Internet Service Points; [RFC 2916, September 2000]

- Defines the use of Domain Name System (DNS) resource records to map a telephone number into a collection of service addresses, including:
  - SIP / H.323 VOIP addresses
  - IP FAX servers
  - Voice Mail servers
  - PSTN services (redirect)
Why ENUM?

- Each VOIP-based PABX is a stub network hanging off the PSTN
- Each VOIP PABX gateway must use the PSTN to reach all other VOIP PABX extensions
  
  = continued toll revenue for the telco

ENUM is a way to link up ‘islands of VoIP in the PSTN sea’

- ENUM allows each VOIP PABX gateway to discover all other gateways, as required
- VOIP gateways can pass calls to other VOIP extensions via VOIP, bypassing the PSTN completely

  = declining toll revenue impact for the telco

- ENUM capability for PSTN originated calls are unclear
The multi-Gateway VOIP World

- The PSTN is used as the inter-VOIP network
  - Obvious implications of revenue protection for PSTN operators
  - More subtle implications for extended private VOIP networks
VOIP + ENUM = PSTN Bypass

How can a VOIP gateway find out dynamically:
- If a telephone number is reachable as an Internet device?
- And if so, what’s its Internet service address?
How does ENUM Work?

- A ENUM VOIP Gateway first uses a ENUM DNS call to see if the dialled number is reachable via an IP service.
- The DNS response is an ordered collection of Service URIs (NAPTR records).
- If there is a response, the Gateway selects the most preferred matching service to complete the call request.

1. **Dial**: +61212345678
2. **Gateway DNS Query**
   - 8.7.6.5.4.3.2.1.2.1.6.e164.arpa
3. **DNS URI response**
   - 1. sip: gih@sip.telstra.net
   - 2. tel: 61412356780
   - 3. tel: 61212345678
4. **SIP call** to sip: gih@sip.telstra.net

My preference for incoming voice calls is: try to set up a VOIP call to my sip server, then fall back to a mobile telephone then fall back to a desk phone.
What is the Potential with ENUM?

- ENUM can also map a phone number to an email address, a web address, or any other form of service address, specified by a URL.

- ENUM is about the potential to recycle phone numbers as Internet service identifiers.
  - Allows the use of a traditional telephone number in the context of different communication media, e.g., e-mail addresses, instant messaging, personal web pages, and therefore could facilitate the penetration of new applications into the mass market easily.
  - One person, One number, multiple services.
E.164 as a common identity substrate?

fax:+61 2 62486000
mailto:gih@telstra.net
http://www.jd.com
tel:+61 2 12345678
sip:jd@sip.telstra.net

Use this number for any service:
+61 2 12345678
Opinions about ENUM

- ENUM itself has no value. It’s how you use it!
- ENUM represents a potential revenue threat to established PSTN operators.
- Some promote it for user simplicity: “One number addressing eliminates need to remember multiple, complex, provider-based addresses”
- Some promote it as a means for ISPs to enter into the PSTN market as a VOIP-only provider
- Revenues may be driven by new value-added services and applications enabled by using phone numbers as a ubiquitous digital identity token
  - Although this revenue may not necessarily head towards the telco
- Some believe there will be new services revenues from PSTN-IP Telephony and expanded reach into the Internet
How ENUM is Organized

- The IETF and the ITU have agreed on, and implemented, an ENUM mapping of PSTN numbers into the DNS.
- It uses a unique top level domain (e164.arpa), populated with E.164 country codes as the first point of delegation.
- ITU Member States have the choice as to the delegation of their E.164 country code into the ENUM DNS hierarchy.
- Each ITU Member State (ACA in Oz) may administer their DNS mapped E.164 resources as they see fit.
ENUM Privacy Considerations

- Registrant Choice (opt-in/out)
- Privacy Analysis
- Open Disclosure of Registrant Information in DNS
- Information Handling During Registration and Provisioning
- ContactInfo
- Fair Information Practices
ENUM in Australia (1)

- ACA wishes to complete their part of requirements
  - Public Discussion Paper - Jan 2003
  - Information workshop, I’nat speakers – March 2003
  - National Discussion Group Mtg1 – April 2003 (monthly)
  - Pushing hard... seem to think it ends with Tier-1 Registry

- PSTN carriers are evaluating the idea
  - Busy evaluating NGN and VoIP implementation
  - What are the new customer valued applications?
  - How to handle transition and maintain the revenue stream?

- VoIP carriers are probably supportive
Strongly supported by potential Registry/Registrar operators (CSIRO/AARNet, Melbourne-IT etc)

Strongly opposed by privacy advocates, some consumer representatives, and conspiracy theorists

Other Groups (eg disabilities) want ENUM to address their agendas
Regulatory considerations of ENUM

ENUM will take time as it raises many regulatory issues:

- Which phone numbers can be used in this way?
  - New ‘personal’ numbers?
  - Existing ‘geo’ numbers?
  - Existing mobile numbers?
  - Can the Numbering Plan regulate “number-only” services?

- Who gets to put an entry into the DNS to map a phone number to a set of URLs?
  - The telco? (like in-addr.arpa)
  - A nominated monopoly tier 1 registry that uses multiple tier 2 registrars (like .com, etc)

- Privacy, Emergency, Legal interception, etc

- Who owns the base number?
  - The customer? The Application provider? A Registrar? The Registry? The Access provider?

- How can an individual assert exclusive interest in a phone number?
  - Are phone numbers independent of a PSTN service?

- Will private n/w operators be ‘caught’ by CSP regulation? If not who is responsible for the Telco obligations?