



ENUM

Driving Convergence

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NeuStar: Trusted To Bring Networks Together

NeuStar Inc., is the leading provider of database, clearinghouse, and registry services that enable communications networks to interoperate.

Since its founding in 1996, originally as an independent business unit within Lockheed Martin, NeuStar has been selected time and time again by the industry in open competitive procurements to provide first-of-a-kind mission critical services.

The integrity and accuracy of NeuStar services are essential for virtually every call placed within North America.

Who is NeuStar?

‘Trusted To Bring Networks Together’

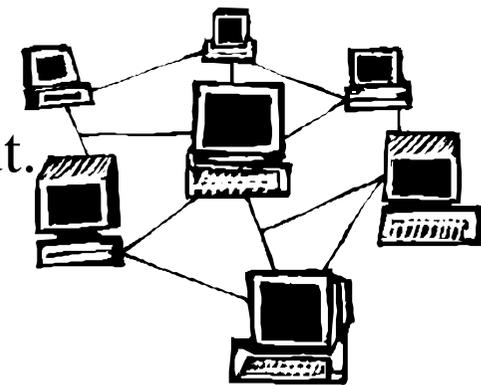
- **World-wide numbering experts**
 - North American Numbering Plan Administrator (NANPA)
 - US Number Portability Administration (NPAC)
 - Number Pooling Administration Services
 - European Telephone Numbering System Administrator (ETNS)
 - .biz Domain Name Registry
- **Trusted, Neutral, Third-Party**
 - All contracts awarded through competitive bidding process
 - Quarterly neutrality, code of conduct, and data security audits
 - Standards based
 - Privately held organization
- **Experienced infrastructure operator**
 - Expertise in internet and telecom industry standards, OSS systems, database management & operations, IP and IN networking, industry relations
 - Telco-Grade Database Service Provided over a NeuStar-owned and operated Infrastructure
 - Over 250 employees in 5 offices worldwide (Washington D.C. HQ)

Problem Statement

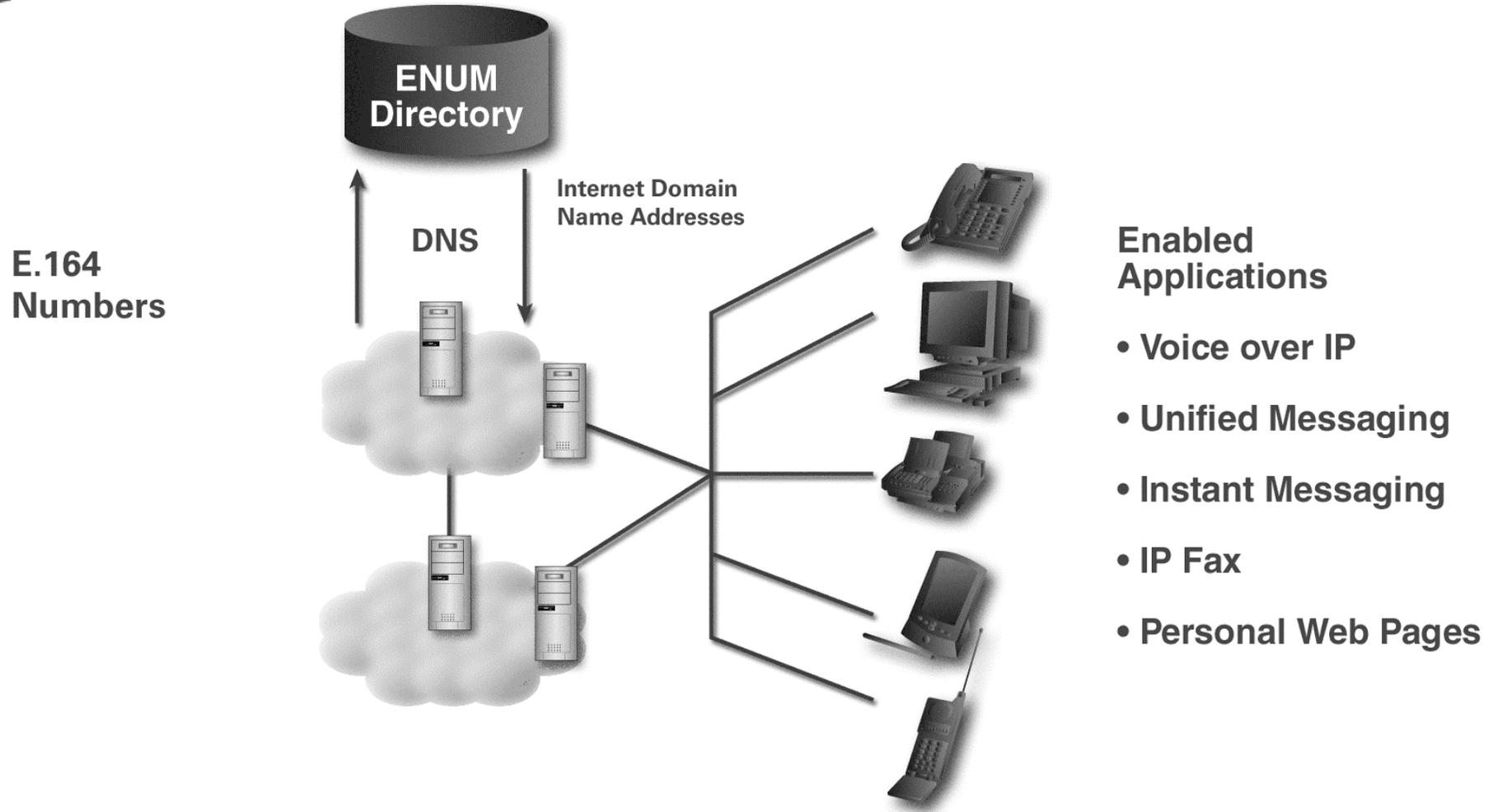
- How do you find services on the Internet if you only have a telephone number (TN)?
- How can we enable new IP communications services while creating new competitive markets and protecting consumer rights, consumer choice, and network stability?
- How can consumers and carriers have equal access to these new opportunities?
- How do we create a *trusted* TN based resource for information about those services?
- How do you make this simple and easy to use without “reinventing the wheel”?

ENUM / DNS Directory Service

- ENUM is the protocol developed by the Internet Engineering Task Force (IETF) to facilitate access to Internet services and applications (Internet Telephony, e-mail, Internet voice mail, web pages, etc.) using standard telephone numbers rather than Internet addresses.
- The protocol is described in detail in IETF document RFC 2916.
- Simply put: Telephone Number in, URLs out.



ENUM Enabled Applications



How Does ENUM Work?

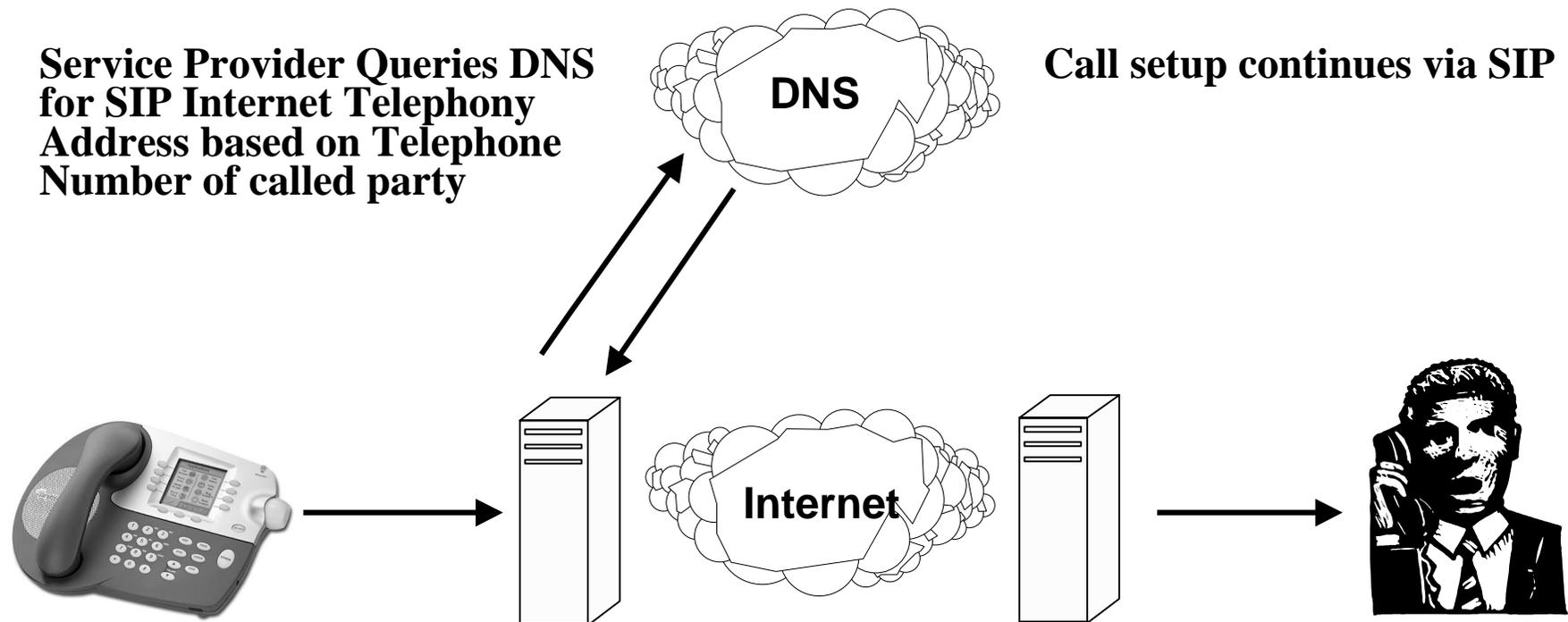
- For a normal call, take a fully qualified E.164 telephone number and create a DNS query in a single highly defined and structured domain.
- The search for resources on the internet associated with + 1 202-533-2811 becomes a FQDN - DNS look up to:
1.1.8.2.3.3.5.2.0.2.1.e164.[tld]



Sample ENUM Flow Chart

Global ENUM (DNS)

Maps 1(202) 533-2734 to sip:jim.casey@carrier.net to enable Internet Telephony



ENUM for Developers .. NAPTR

➤ Process NAPTR Resource Records [RFC 2915]

■ Input:

\$ORIGIN. 1.1.8.2.3.3.5.2.0.2.1.e164.[tld]

■ Output: All NAPTR RRs will be returned to resolver

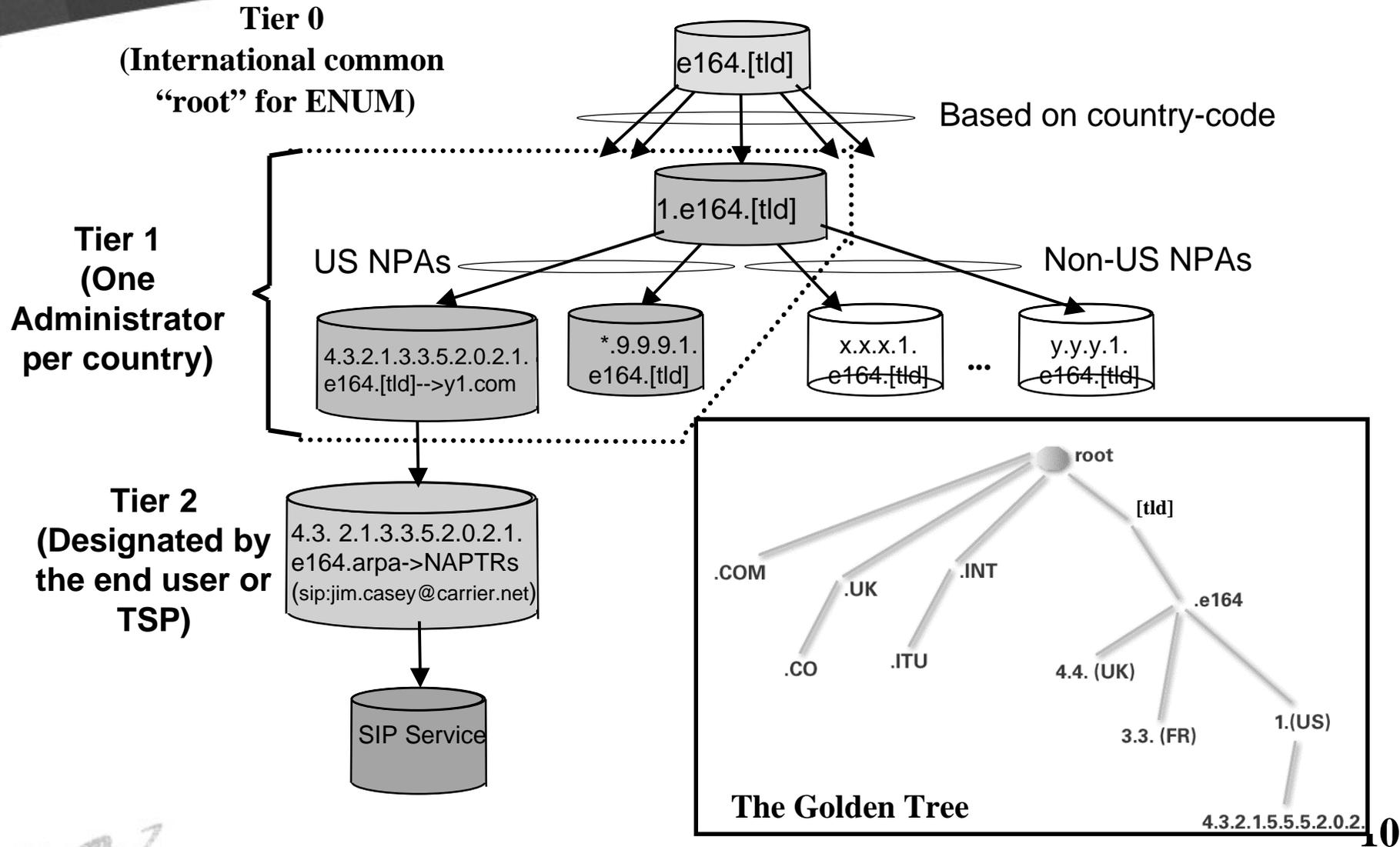
In this response the preferred contact method is SIP

```
ord pr fl service re replacement
IN NAPTR 10 10 "u" "sip+E2U" "!^.*$!sip:rich.shockey@carrier.net!" .
IN NAPTR 102 10 "u" "mailto+E2U" "!^.*$!mailto:rich.shockey@neustar.com!" .
IN NAPTR 102 10 "u" "fax-t37+E2U" "!^.*$!mailto:faxmachine4@neustar.com!" .
IN NAPTR 102 10 "u" "tel+E2U" "!^.*$!tel:+12025332811!" .
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➤ Based on service requirements, translate replacement field into URL and execute as required

Note: Consumers do not see this process !

ENUM DNS Hierarchy



ENUM Definitions

- **Tier 0 Entity:** Entity that maintains the name server(s) for the e164.[tld] zone containing the authoritative NS records for domain names corresponding to Rec. E.164 Country Codes or portions thereof as designated by countries.
- **Tier 1 Entity:** The entity that operates the Tier-1 ENUM service within a country or Region and has a pointer to the Tier 2 Entity for each served TN (telephone number). The Tier 1 entity acts as the "ENUM service registry" and plays a role similar to the "registry" in existing domain name registration procedures.
- **Tier 2 Entity:** The entity that provides the registration of URIs in DNS NAPTR resource records associated with each served TN. The Tier 2 entity acts as the "ENUM service registrar."

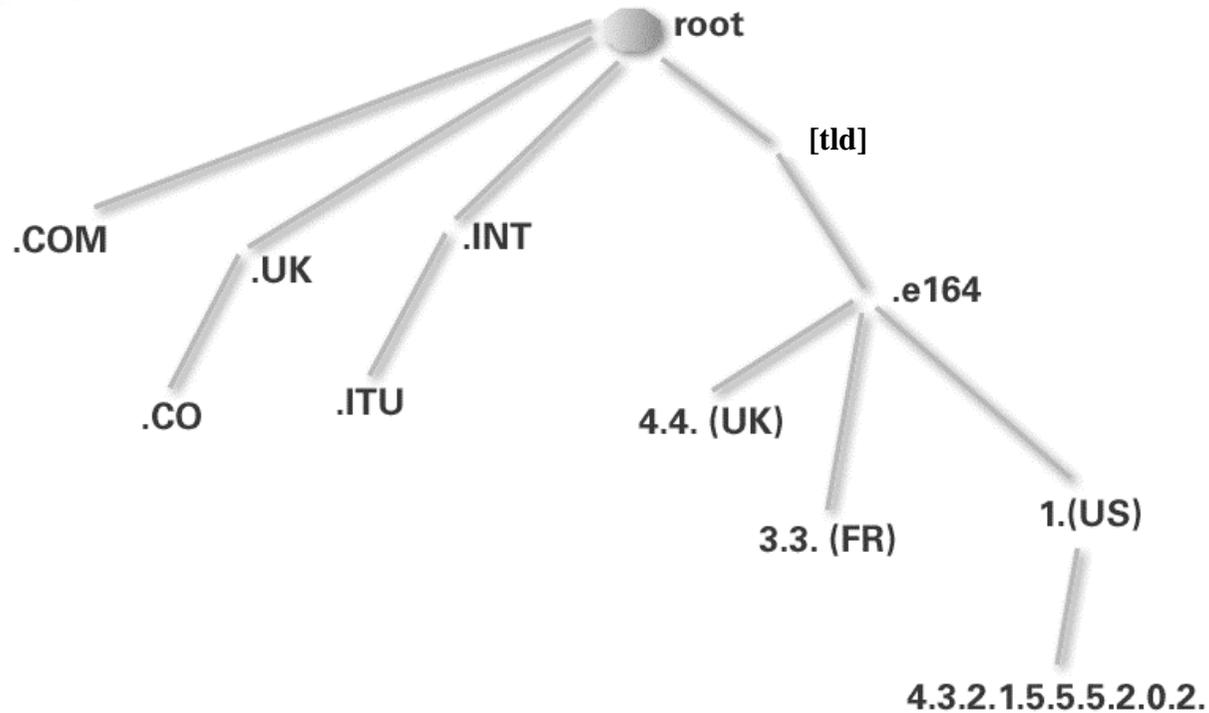
Global ENUM

- In January 2000, the ITU and the IETF began collaborative efforts on the advancement of ENUM.
- The ITU currently is exploring a global ENUM implementation.
- Formal action by the ITU SG-2 in this regard could happen as early as September 2001.
- Several countries are evaluating the potential deployment of ENUM on a national level consistent with ITU efforts.

A Single Authoritative ENUM Domain

- Nations should participate in a single common global approach for the implementation of ENUM.
- Coordination is critical to ensuring the continuing integrity and uniqueness of both ENUM and the international telephone numbering plan.
- Moreover, a coordinated international implementation will ensure that domestic companies are able to develop global market strategies for ENUM.
- Participation in a common global structure ensures that each nation controls population of the ENUM “tree” with its E.164 resources.

The “Golden Tree”



- If DNS begins to search under [tld], it can then search under .e164, followed by the country code and reversed telephone number. DNS cannot, however, look under another TLD once it has begun to look in the [tld] tree.

Domestic Implementation

- The proposed structure for a global ENUM system recognizes that national control over the the domestic implementation of ENUM and the services that it facilitates is paramount.
- A Nation's implementation of ENUM, which might include the decision not to implement ENUM, must ensure the integrity, reliability, and stability not only of the developing ENUM infrastructure, but also the existing global telephone numbering system.
- The majority of policy and legal issues with respect to ENUM will relate to domestic policy associated with the services facilitated by ENUM, rather than the ENUM implementation itself.

Potential ENUM Policy Issues

- The primary policy issue for the ENUM implementation itself will be the selection and regulation (or non-regulation) of the various ENUM entities. Issues include: selection and roles, equal access to NAPTR records, TN validation, and system, content and process security.
- Other policy issues relate to the services facilitated by ENUM, including:
 - Privacy – Information collected from ENUM subscribers may be subject to privacy regulation. The NAPTR records themselves are public in nature for viewing purposes.
 - Access to emergency services.
 - Law enforcement.
 - Number usage and allocation.
 - Treatment of facilitated services.

The Time is Now

- ENUM's time has come.
 - The Internet is maturing to the point where true Internet Telephony is commercially feasible.
 - Numerous conferences and meetings of industry and standards organizations have been held to begin the process of defining ENUM its benefits and uses.
 - Equipment manufacturers are committed to the development of Internet-enabled equipment for use with ENUM and public tests of ENUM are beginning or are already underway.
 - Companies experienced in administering telephony and IP systems are prepared to take leadership positions in the administration of ENUM.
- ENUM has the potential to facilitate perhaps the greatest changes to the Internet and Telephony that we have yet seen. To ensure that these changes serve the public interest, governments must play an active role in the rapid implementation of ENUM.

ENUM Resources

ENUM Core Protocol

<ftp://ftp.isi.edu/in-notes/rfc2916.txt>

ENUM Charter

<http://www.ietf.org/html.charters/enum-charter.html>

ENUM WG Requirements

<http://www.ietf.org/internet-drafts/draft-ietf-enum-rqmts-01.txt>

ENUM Call Flows

<http://www.ietf.org/internet-drafts/draft-lind-enum-callflows-01.txt>

ENUM Operations Issues

<http://www.ietf.org/internet-drafts/draft-ietf-enum-operation-01.txt>

ENUM Administration in the United States

<http://www.ietf.org/internet-drafts/draft-pfautz-yu-enum-adm-00.txt>

Voice Profile for Internet Mail

<ftp://ftp.isi.edu/in-notes/rfc2421.txt>

ENUM Resources

IETF-ITU Liaison Statement

<ftp://ftp.isi.edu/in-notes/rfc3026.txt>

ENUM Activities at the ITU

http://www.itu.int/itudoc/itu-t/circ/01-04_1/026_ww9.doc

ITU World Telecommunications Policy Forum. ENUM and ITU involvement in ENUM is discussed in the document.

<http://www.itu.int/wtpf/sgreport/finalreport31Jan.doc>

ENUM Web Sites

International Telecommunications Union

<http://www.itu.int/infocom/enum/>

CyberTelecom

<http://www.cyberte telecom.org/teleph.htm>

NeuStar ENUM Resources

NeuStar ENUM Information and Trial Website

<http://www.enum.org>