ENUM Review

DE-NIC ENUM Day

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- The 350 Billion dollar question?
  - How do you route VoIP, MMS or any advanced service on the Internet if all you have is a phone number?

- Who controls phone numbers and why?

Resistance is futile … you <u>have</u> been assimilated.

VoIP has already won the battle for mind share and market share

There is zero new investment in TDM networks either on the carrier or enterprise side of the market

Especially no new investment in SS7 signaling

The

TIPPING POINT

How Little Things Can Make a Big Difference

MALCOLM

GLADWELL
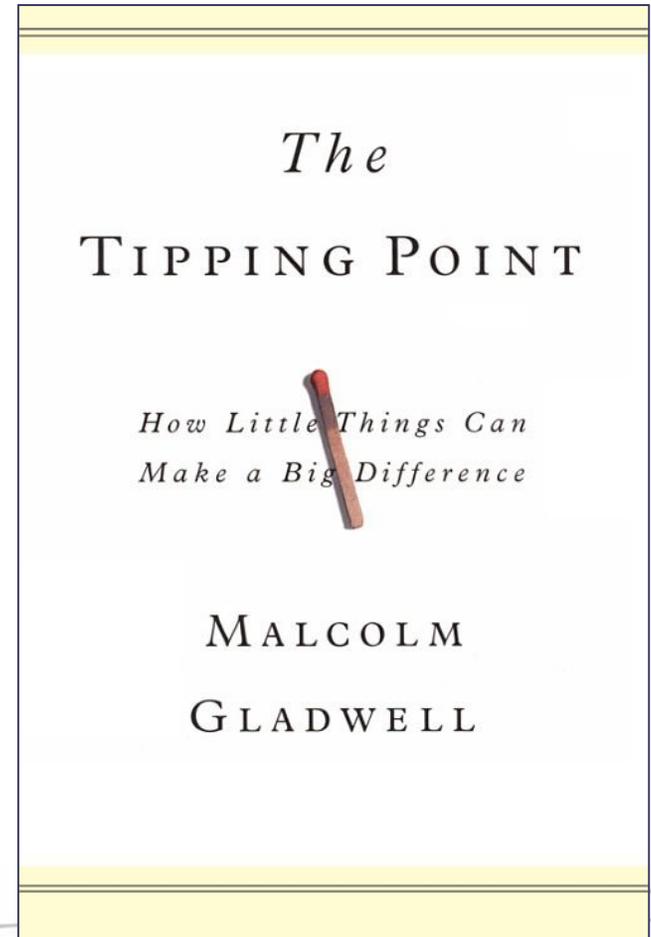
Market Realities

- Voice Service providers have completely lost control of pricing

- Flat Rate Pricing (all you can call) beginning to dominate

- Carriers beginning to demand bill and keep vs intercarrier compensation
  - Accounting costs outrageous

- The Internet model of Transit and Peering is about to be applied to Voice traffic as well

In the Fall of 1991, the *Andrea Gail* left Gloucester, Mass. and headed for the fishing grounds of the North Atlantic.

Two weeks later, an event took place that had never occurred in recorded history.

A WOLFGANG PETERSEN FILM

THE

PERFECT STORM

HITS JUNE 30TH

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US Cable VoIP Hits the Inflection point

Chart 1: Cable MSOs Telephony Subscribers (in thousands)
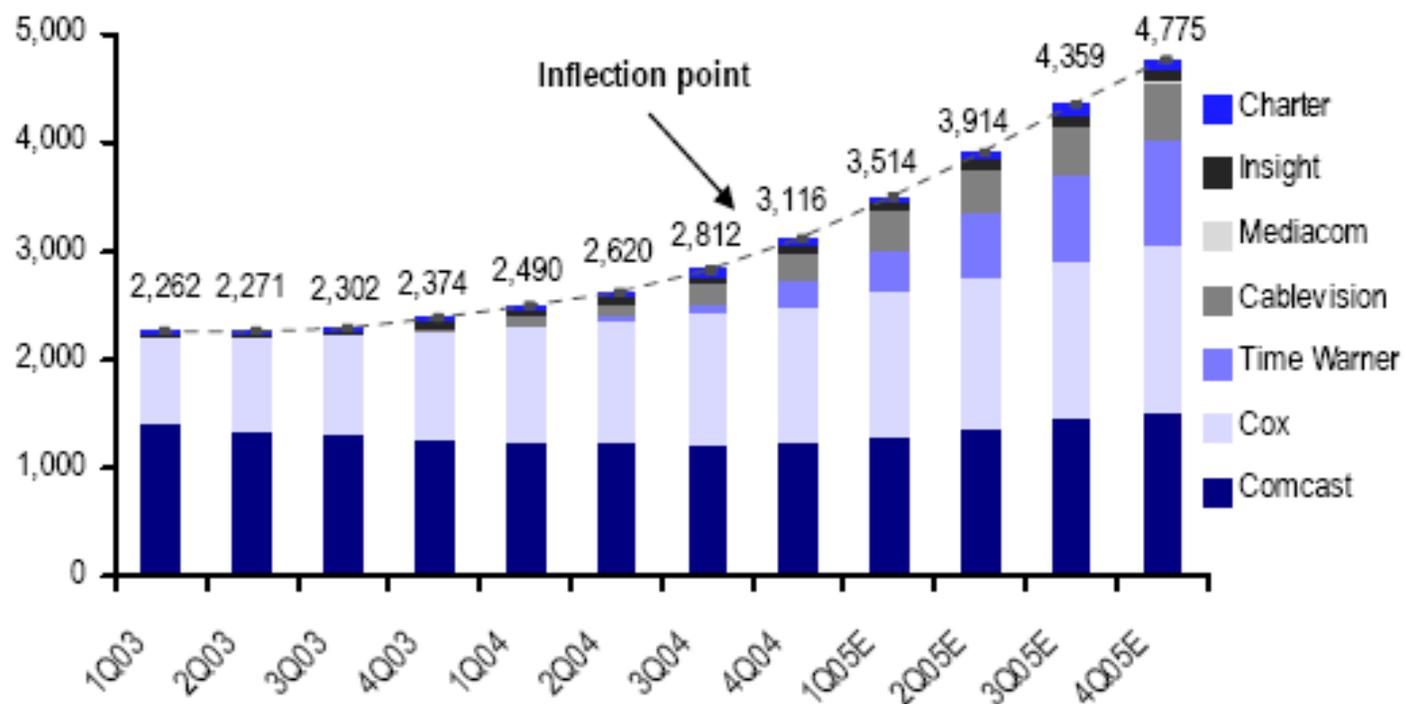
Source: Company reports and UBS estimates

US Enterprise IP-PBX's Hit the Inflection Point

IP-PBX revenues have now passed traditional TDM PBX revenues

U.S. PBX Revenue Forecast

CAGR = 65%
CAGR = -17%
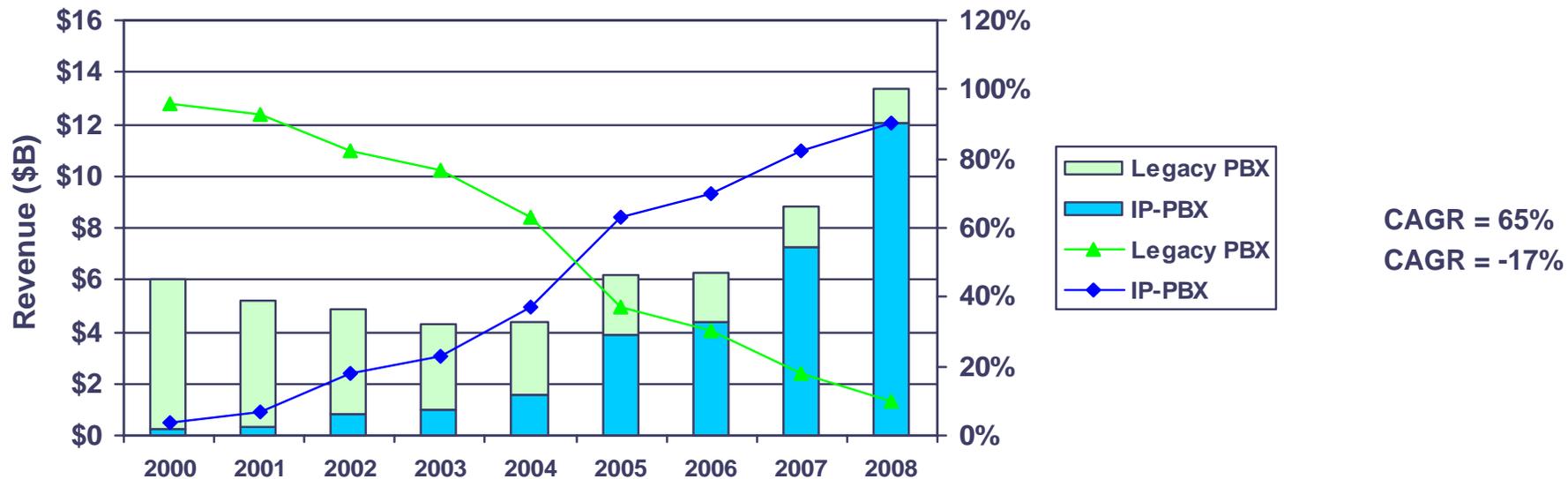
Sources: Synergy Research, Frost & Sullivan, CompTIA

…by 2008, 55% of all PBXs installed are expected be IP enabled.

Skype now Google next?

- The most successful software introduction in the History of the Internet

- Skype may account for 15 of global LD traffic

- Bigger in EU than in North America
  - Try to set up a 3 way conference call

- Vint Cerf goes to Google from MCI
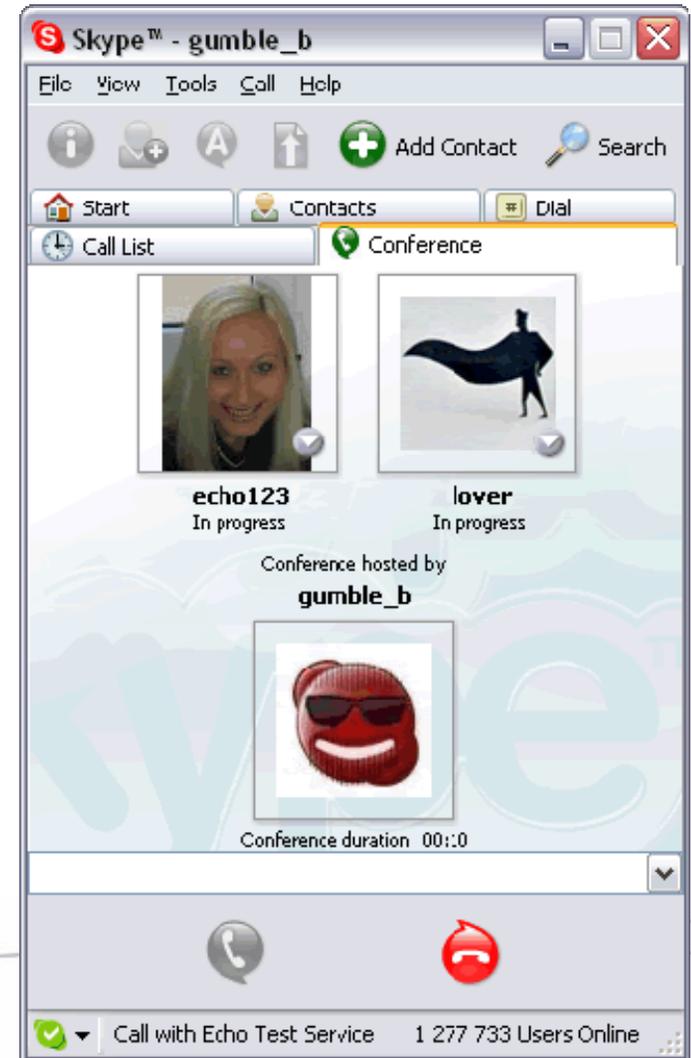
(Very short) ENUM History

- 1999 - IETF ENUM WG formed

- Sept. 2000 – IETF ENUM WG – RFC2916

- 2001 – Various Workshops (ITU-T, Europe, US, Asia, …)

- 2002 – ITU -T Interim Procedures (IAB, RIPE-NCC)
  - ITU -T generic TLD Investigation
  - ETSI TS 102 051 "ENUM Administration in Europe"

- 2003 – ETSI TS 102 172 "Minimum Requirements for Interoperability of European ENUM Trials"
  - IETF new ENUM revision, IANA registered enumservices
  - ITU-T final procedures ENUM domain
  - ETSI ENUM Workshop (Feb 2004) and Plugtest (2004)

- 2004 – IETF New RFC
  - Enumservices registration
  - 1st Commercialization Austria – Romania

- 2005 – ENUM WG Recharter APEET Coordination US Trials

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Reminder - ENUM in a nutshell

- Take E.164 phone number

  +1 571 434 5651

- Turn it into a FQDN
  - pick a domain

  1.5.6.5.4.3.4.1.7.5.1.e164.arpa.

- Ask the DNS

- Return list of URI's sip:richard.shockey@neustar.biz *Or Maybe*

  sip:+15714345651;rn=+12159816321;npdi@network.foo;user=phone

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Public ENUM RFC 3761
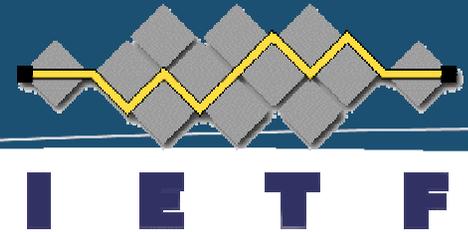
- Public ENUM is generally defined as the administrative policies and procedures surrounding the use of the e164.arpa domain for TN to URI resolution.
  - By ITU-IAB agreement all portions of the tree are nation state issues
  - All records are visible on the Internet

- US – Canadian Govt policy has been to encourage consumer OPT-IN. Which is generally assumed to be the _number holder_ as opposed to the _carrier of record_ is the only entity permitted to create records in e164.arpa.
- How do you register the Phone Number?
  - Registration Model much like Domain Names…

New Concept : Private ENUM

- Private ENUM is generally regarded as one or more technologies (including DNS) that permit service providers to exchange phone number to URI data in a _private secure manner_.

- May use any domain mutually agreed upon

- Private ENUM is to be assumed as authoritative for all endpoints service providers choose to exchange data for.
  - There is no need to OPT-OUT.

- Private ENUM actually means private .. Data is non accessible via general Internet
  - Typically over a VPN

- The technology by which this data is accessed is currently not fixed
  - PULL Model : DNS, SIP Redirect, LDAP
  - PUSH Model to SCP : NPAC/LSMS, CD-ROM, FTP

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Private ENUM : SP "Federation": Optimal Service Routing

- Carriers *could* optimize VoIP session termination strategies by routing directly from one SP to another
- Essentially "Friends and Family" routing plans within the "federation"
- Solves the Gulag Archipelago of VoIP Connectivity

Carrier 1
Carrier 2
Carrier 3
Carrier 4
Carrier 5
Carrier 6

ENUM DNS

SIP Location Server NTS

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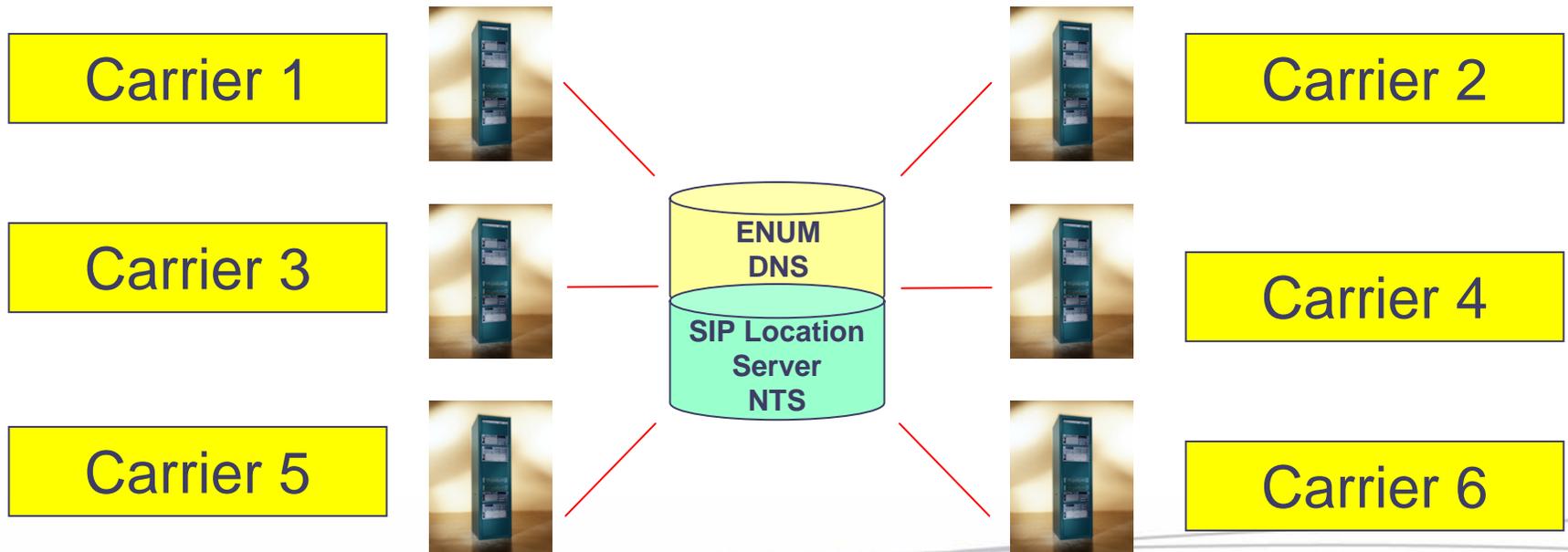
Private ENUM –in use by wireless industry today

How do your route a picture if all you have is a phone number?
Private ENUM with LNP Correction for MMS Routing

CO Code Assignments

NPAC

LSMS

Routing Database

Process turns CO Code and NPAC data into URIs, then loads the mapping into the Routing DB

202 233 1234

MMS: 2022331234@carrierc.net

202 233 1234

Internet

MMSC Carrier A

MMSC Carrier B

MMSC Carrier C

MMSC Carrier D

LG

SAMSUNG

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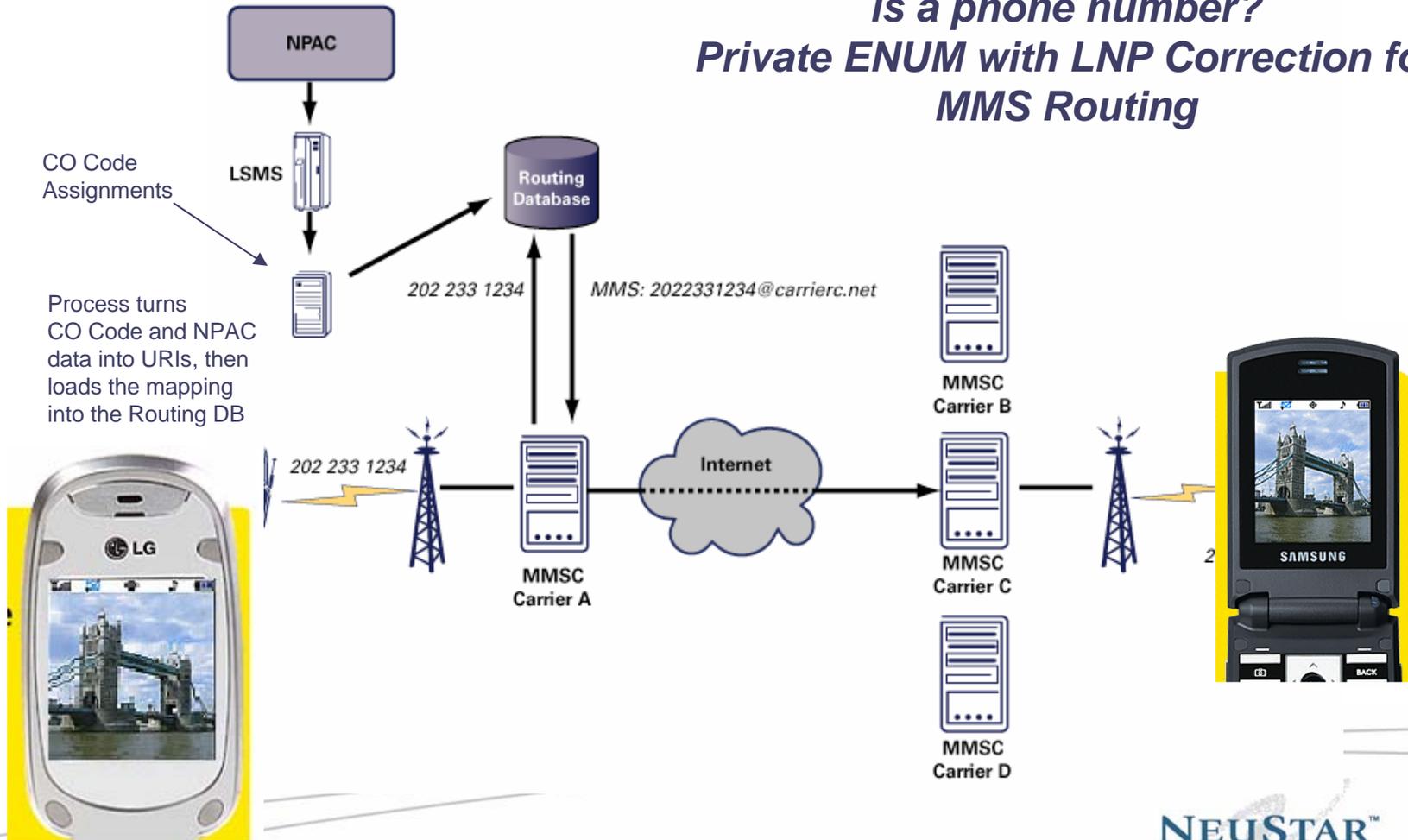
New Concept : Carrier/Infrastructure ENUM

- Carrier ENUM is generally regarded now as the use of e164.arpa to permit service providers to exchange phone number to URI data in order to find *points of interconnection*.
- Only the service provider of record for a particular TN is permitted to provision data for that FQDN.
- Service providers are looking for NGN signaling infrastructures
- Default PSTN termination no longer economically acceptable..
- Carrier ENUM is to be assumed as authoritative for all endpoints service providers choose to exchange data for.
- The delegation path within e164.arpa is under discussion at the IETF
  - 6.4.c.e164.arpa or
  - c.6.4.e164.arpa
    - Where "c" represents the carrier tree
  - Non-terminal NAPTR records

- *Private and Carrier ENUM are Orthogonal to each other, they serve different markets for different reasons.*

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Recharter-Reorg of the ENUM WG
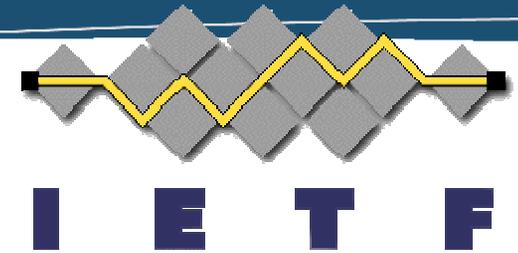
- Public ENUM has been slow to take off ..

- Carriers now understand the value of ENUM
  - Fear a better motivator than greed
  - End to End IP Service Delivery
  - Carriers collapsing their networks on to IP

- ENUM WG agreement to look at "Carrier ENUM" issues
- IETF looking into VoIP peering VOIPEER BOF
- IETF reorganizing working groups – New Directorate
  - Real-Time Applications and Infrastructure (RAI) Area
    - "The Real-Time Applications and Infrastructure Area develops protocols and architectures for delay-sensitive interpersonal communications."
    - SIP, SIPPING, XCON, SIMPLE, GEOPRIV, ECRIT, ENUM, IPTEL, MEGACO, MMUSIC, IEPREP, SPEECHSC, and SIGTRAN

Using ENUM for LNP

$ORIGIN 3.1.8.7.1.8.9.5.1.2.1.e164.arpa.

NAPTR 10 100 "u" "E2U+npd:tel"
"!^.*$!tel:+1-215-981-7813;rn=+1-215-981-7600;npdi!"   Or

NAPTR 10 100 "u" "E2U+npd:sip"
 "!^.*$!sip:+1-215-981-7813;rn=+1-215-981-7600;npdi@network.de;user=phone! "

In this example, a Routing Number (rn) and a Number Portability Dip indicator (npdi) are used as shown in draft-ietf-iptel-tel-np-06.txt. The 'npdi' field is included in order to prevent subsequent lookups in legacy-style PSTN databases.

See: IANA Registration for an Enumservice Containing Number Portability and PSTN Signaling Information
       Author(s)   : J. Livingood, R. Shockey
       Filename   : draft-livingood-shockey-enum-npd-00.txt

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ENUM and VoIP Peering

- VoIP Peering is IMPOSSIBLE without Telephone Number Translation .. aka ENUM in some form

- Bi-Lateral / multi-lateral, private trees will only scale so far before operational and management challenges present themselves.

- Thus, Public ENUM is a long-term goal.
  - What form will this take? (Carrier or User ENUM)
    - Without carriers in e164.arpa is the business model for "User" sustainable?
  - Will there be a mix of different peering types?
    - Private POPs, with committed capacity.
    - Public peering points.
    - Over the Internet generally, best effort (no QoS).

- *Industry's Conclusion* : Working towards public ENUM in the future (very important), while hedging the bets with work on private ENUM in the shorter term.

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Short term issues in VoIP Peering

- What is a Carrier ?
- Provisioning into / security for ENUM tree.
- How do you deal with different trees
- Normalization of different SIP profiles between providers.
- Trust at network edge
- Security / encryption at network edge.
- QoS at network edge / passing QoS between parties.
- Lawful intercept
- Selection of best IP routes & advertising routes as # POPs increases.
- Failover to PSTN routes in the event of IP route failure.
- Explore the role of SBCs
- Regulatory?

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IRIS for ENUM

- Do you need a Central Database of information about Telephone Numbers?
  - Technical information about who is running the DNS infrastructure for a TN.
  - Goes to the stability and security issue.
- Requirements of Law Enforcement Administrations
  - They are there they have legitimate needs IRIS could help
- IRIS is a requirement of US ENUM LLC
- IRIS Developed in IETF to replace WHOIS
  - XML based in use at both .COM and .NET
  - http://iris.verisignlabs.com/blojsom/blog/iris/

- IRIS EREG in IETF ENUM WG Last Call

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The Achilles Heel of ENUM : Provisioning

- Carrier - Service Management Systems will have to learn how to provision ENUM DNS systems.

- Work focused on use of EPP and or SOAP / XML interfaces
  - http://www.ietf.org/rfc/rfc4114.txt

- Active discussion in IETF on Voice Peering
  - http://www3.ietf.org/proceedings/05aug/minutes/voipeer.html

- Active discussion on adding Static SS7 - LNP data to ENUM
  - http://www.ietf.org/internet-drafts/draft-livingood-shockey-enum-npd-00.txt

- Some Carriers have indicated they want to maintain a full cache of ENUM data in their network -

The End of SS7 – The Emerging IP SCP
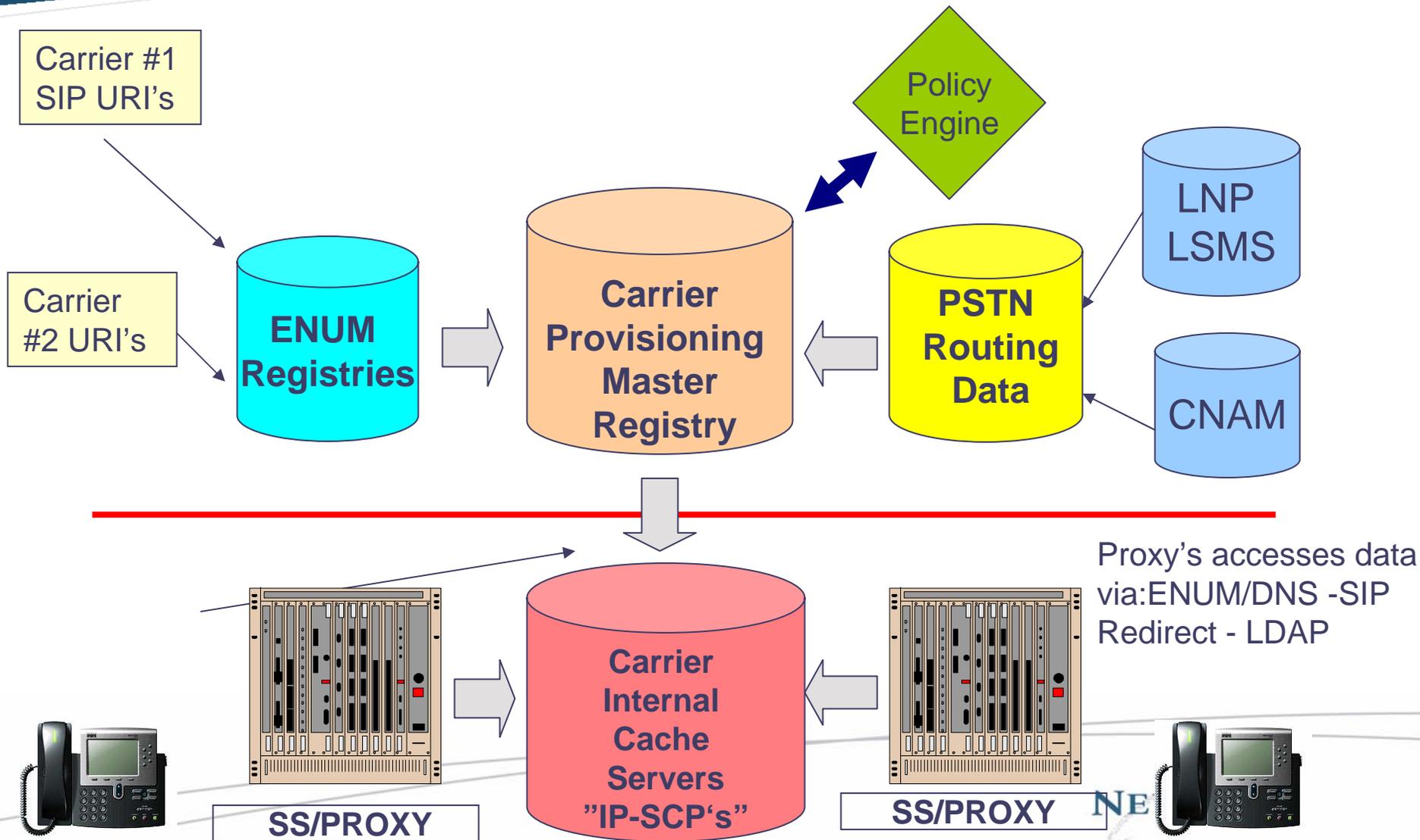
Why ENUM now after all this time?

- Value of Public ENUM not well understood..
  - Originally considered a threat to incumbents

- SS7 is economically unsustainable

- In an era of fixed priced services carriers cannot tolerate variable costs.

- Per dip charges for SS7 signalling cannot hold

- Internet model of per TN subscription of ENUM registration "predictable"
  - Pay once query forever.

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The PUSH Model of ENUM as Service Control Point

The Pull Model of ENUM

Service Control Registry
3rd Party External
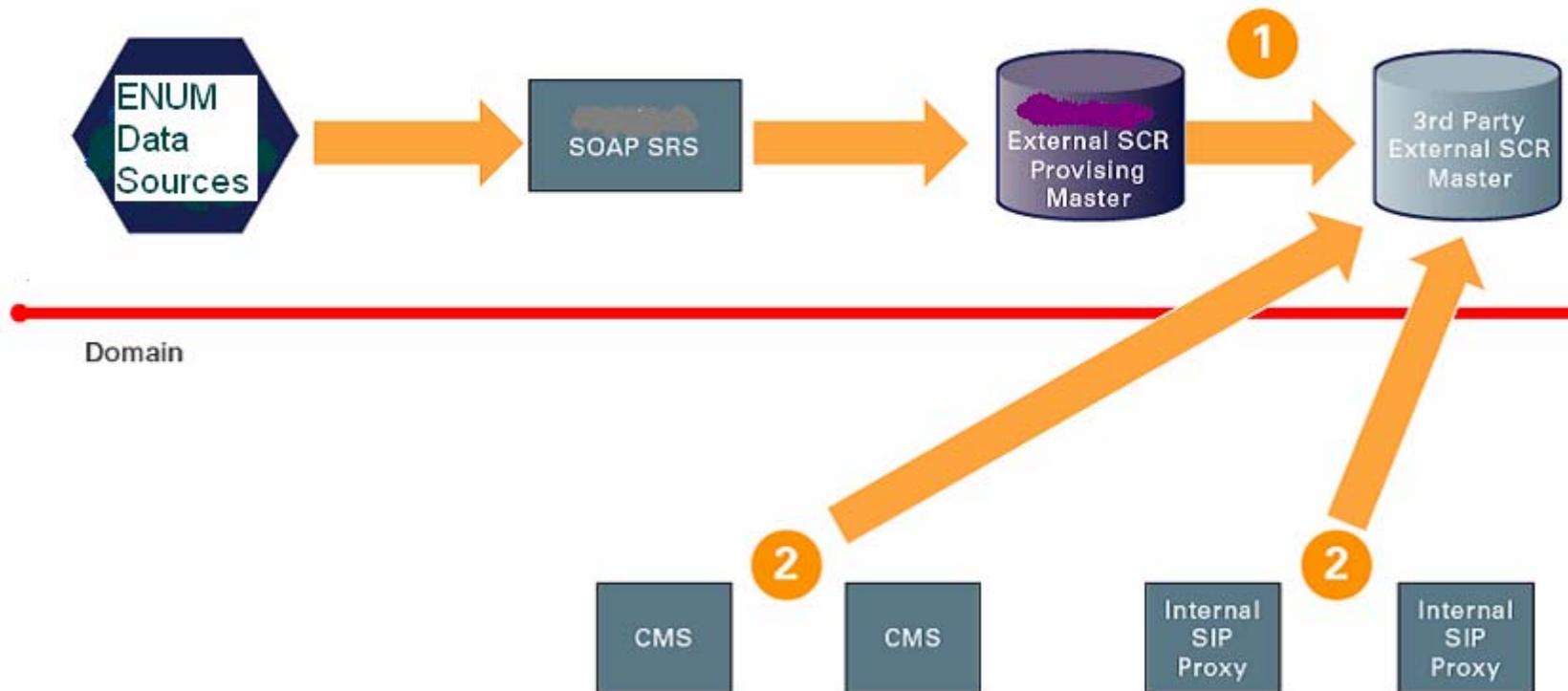
North American ENUM Status - What about .1?

US ENUM LLC will go to trials this year
final conditions approved by US Govt.

Delegation Request to be sent to RIPE/ITU

- United States Government has reiterates its support for RFC 3761 and endorses moving forward with ENUM based on the concept of a Industry Managed LLC – Aug 9, 2004

- United States ENUM Forum - http://www.enum-forum.org

- United States ENUM LLC – http://www.enumllc.com
  - Participants include MCI, ATT, Sprint, SBC, Verizon, NeuStar, Cox , Comcast, Cisco, Telcordia

- Canada too .. http://www.enumorg.ca

US Gov - Terms and Conditions for Trials in .1

- Communication Received 2 Sept 2005
    - http://www.enumllc.com/USGDelLetter.pdf
- Trial Plan must be in Place
    - US ENUM Forum has a trial plan document ready
- US ENUM LLC must apply to FCC for unused NPA for use of trial.
    - No active NANP numbers permitted
- No testing of Carrier/Infrastructure ENUM
- 1 year limitation

North America is different.

18 sovereign countries in the NANP

1 (NPA) NXX -XXXX

RIPE
e164.arpa

Tier 1a
.(NPA).1.e164.arpa

640 NS records – CIRA
aka CA/NIC to host

Tier 1b US
NXX-XXXX

Tier 1b CA
NXX-XXX

Tier 1b
NXX-XXXX

Tier 1b
NXX-XXXX

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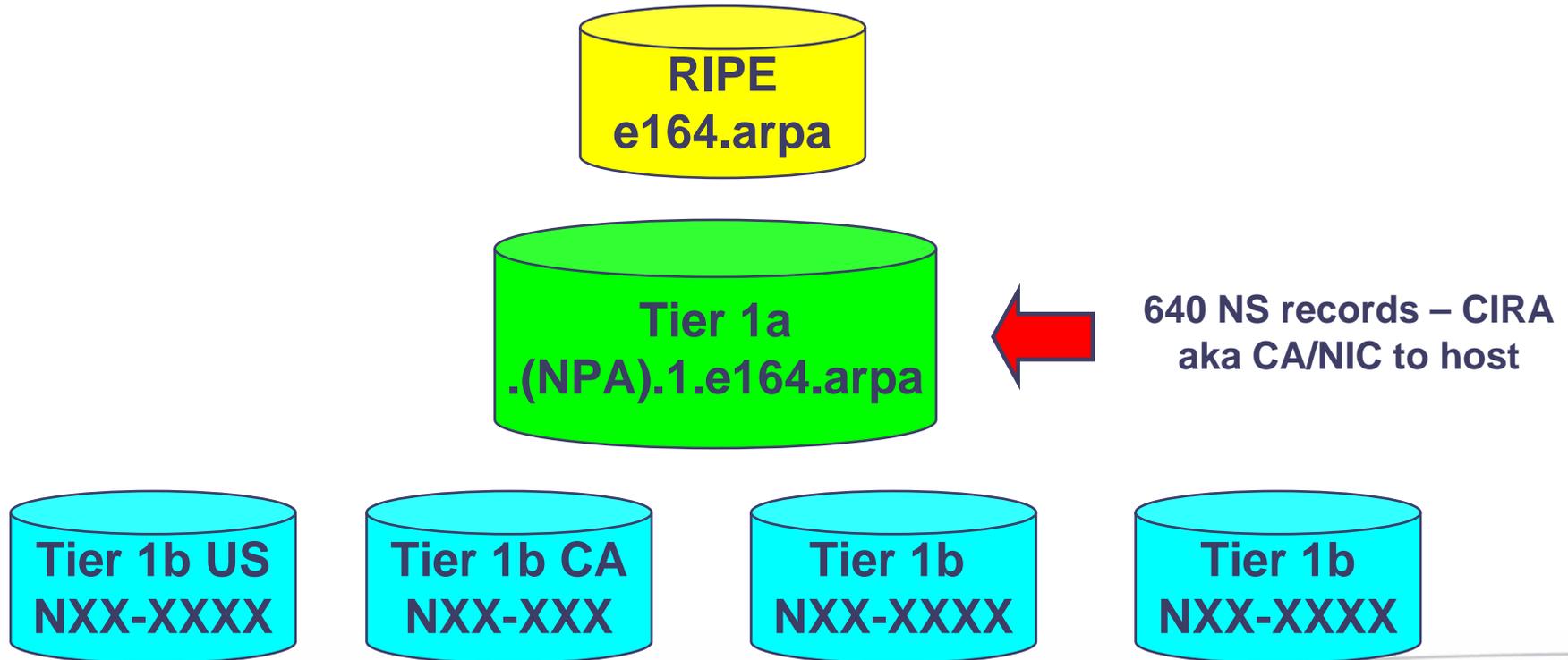
US Governments view of VoIP

- Don't kill the goose that lays the golden eggs
- The Internet has been of incalculable value to the global economy
- Despite the "irrational exuberance" there has been rational exuberance as well
- VoIP is the new new thing
- The incumbent carriers will try to regulate the goose to death if they can
- The Government will get its tax money one way or another

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So What's Next

ENUM is not just about TN to URI …

It is the core signaling technology for the NGN - Network to Network Interfaces

It's the **NGN IP-SCP**

ENUM is the fundamental technology enable VoIP Peering

Signaling becomes all Call Query - Query on Call Origination

All data (PSTN&IP) associated with a TN delivered at call set up (NAPTR)