

ENUM

Where are we at?

Internet Society Netherlands

2007

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Agenda....

- How we got here
- Where are we at ..
- Where are we going

State of the Industry

- **Rational Exuberance ..**

- The IP model has proven better, cheaper and faster for most applications and has been universally embraced
- Services and applications are being dis-intermediated from network ownership and management
- Global carriers have made the strategic decision to go to a single IP based transport model for all service offerings.



**“IP on Everything”
Vint Cerf - Google**

Bye Bye PSTN. Well, eventually.

- Money is the answer
what is the question?
- Deutsche Telecom said it will shut down the PSTN in 2019
- British Telecom said it will have the 21CN fully in place 2015
- KPN talks about 2010
- GSM-A ongoing discussion about IPX
- North American Cable Operators are already there.
 - They WILL optimize VoIP session termination strategies by routing directly from one SP to another in 20078
- SIP will be the intercarrier transport mechanism



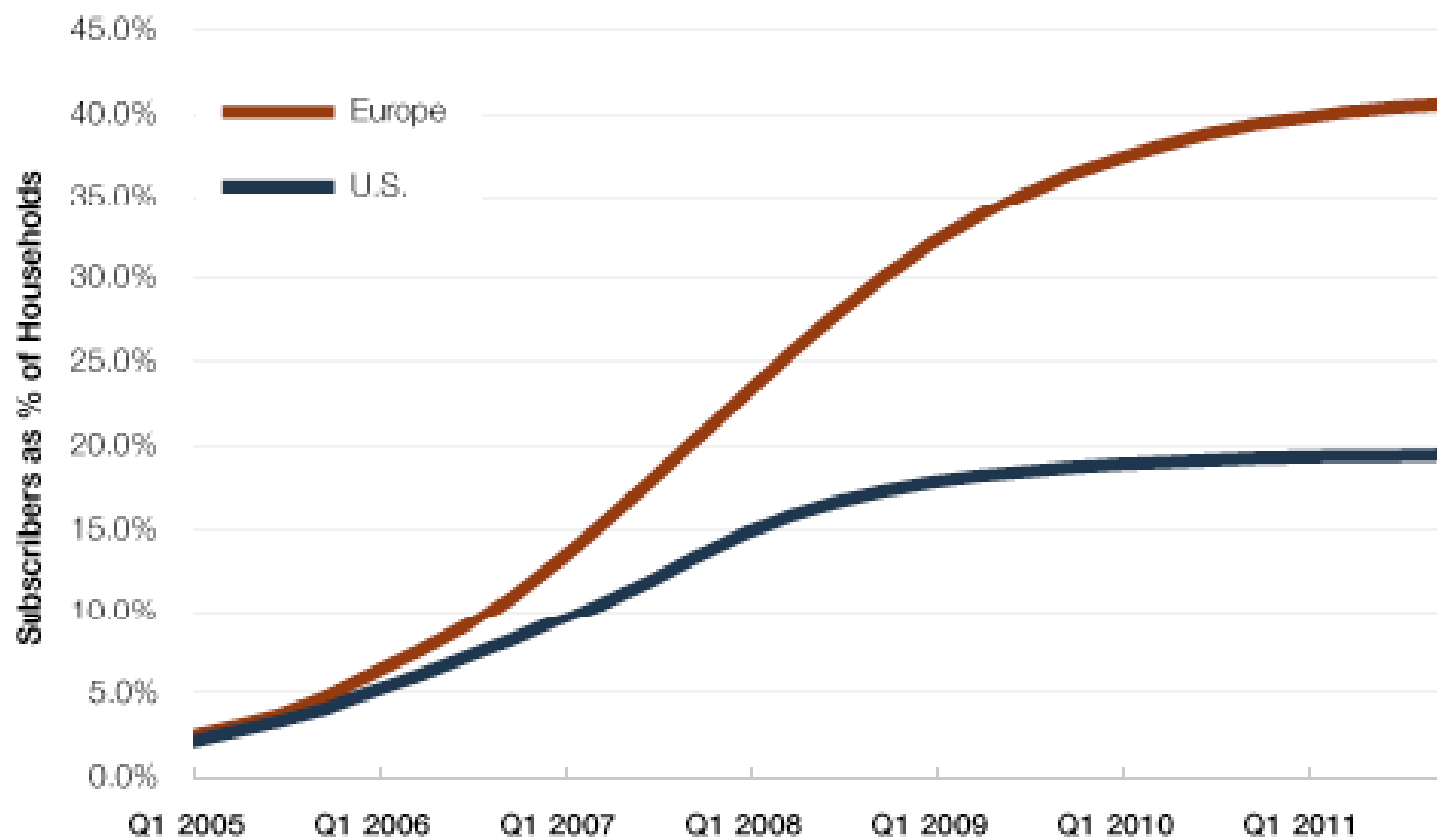
Is there a DMS / 5ESS bone yard ready?

Money is the answer what is the question?

- **\$1 trillion** spent on telecom transport last year
- **Mobile transport growing 15% in 2007 to \$650B**
- **Wireline transport flat in 2007 at \$550B**
- An average SMS is 140 bytes and costs 10 cents, or \$750/MB
- Video recording of a rock concert is 5 gigabytes and would cost \$3.85M to upload at the same price
-

VoIP Penetration

TeleGeography projects that the number of US VoIP subscribers will rise to 23.3 million by 2011, driven chiefly by the strong growth of cable providers' IP telephony offerings.

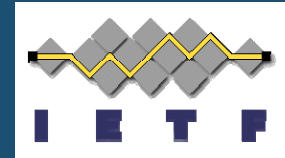


http://www.telegeography.com/products/euro_voip/index.php

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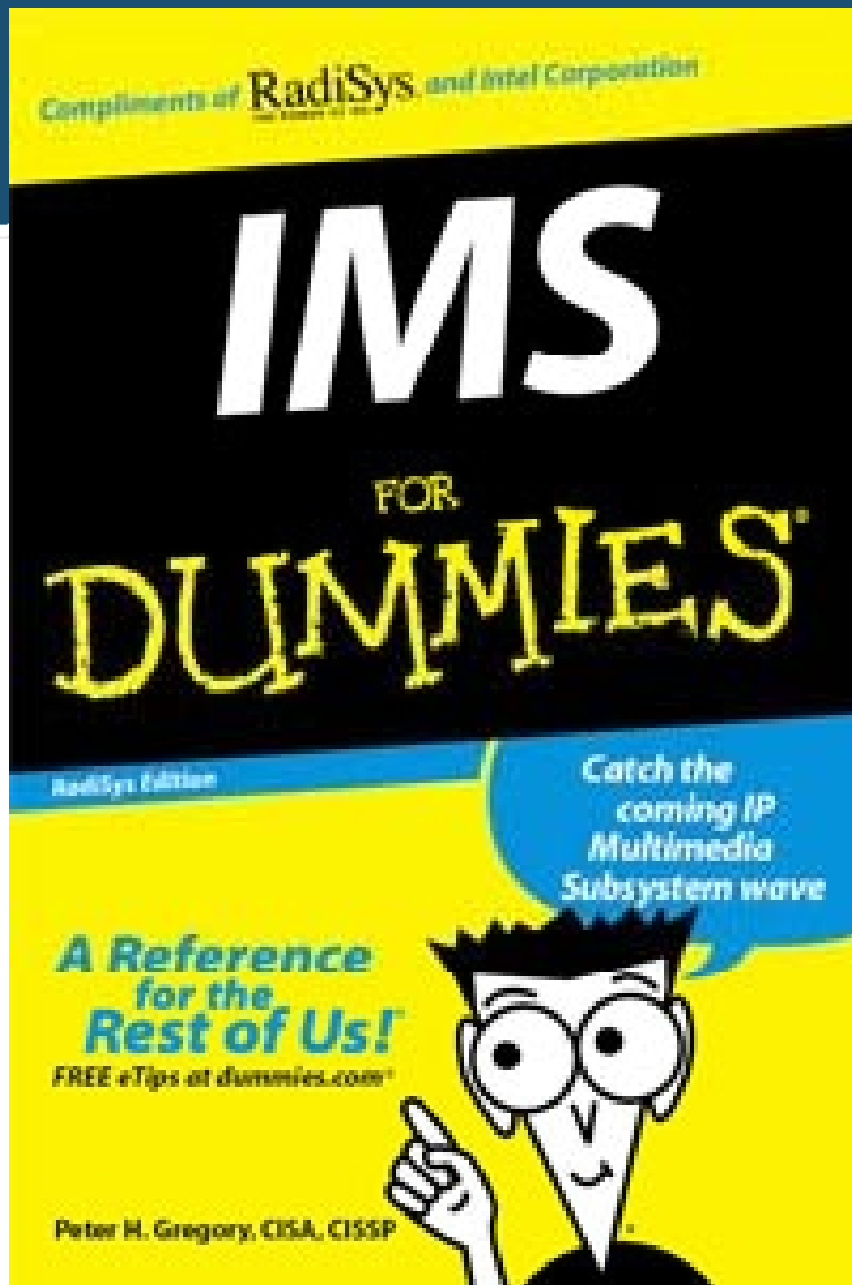


ENUM query *technology* is winning the NNI Interconnection Signaling Protocol argument



- DNS based ENUM is faster than SIP Redirect by a factor of 10
- DNS Queries integrates neatly with SIP URI resolution
- Commercial - Private ENUM services have exploded
- RFC 3761 is central to all NGN architectures
 - IMS – 3GPP
 - MMS/SMS on IP
 - PacketCable 1.5

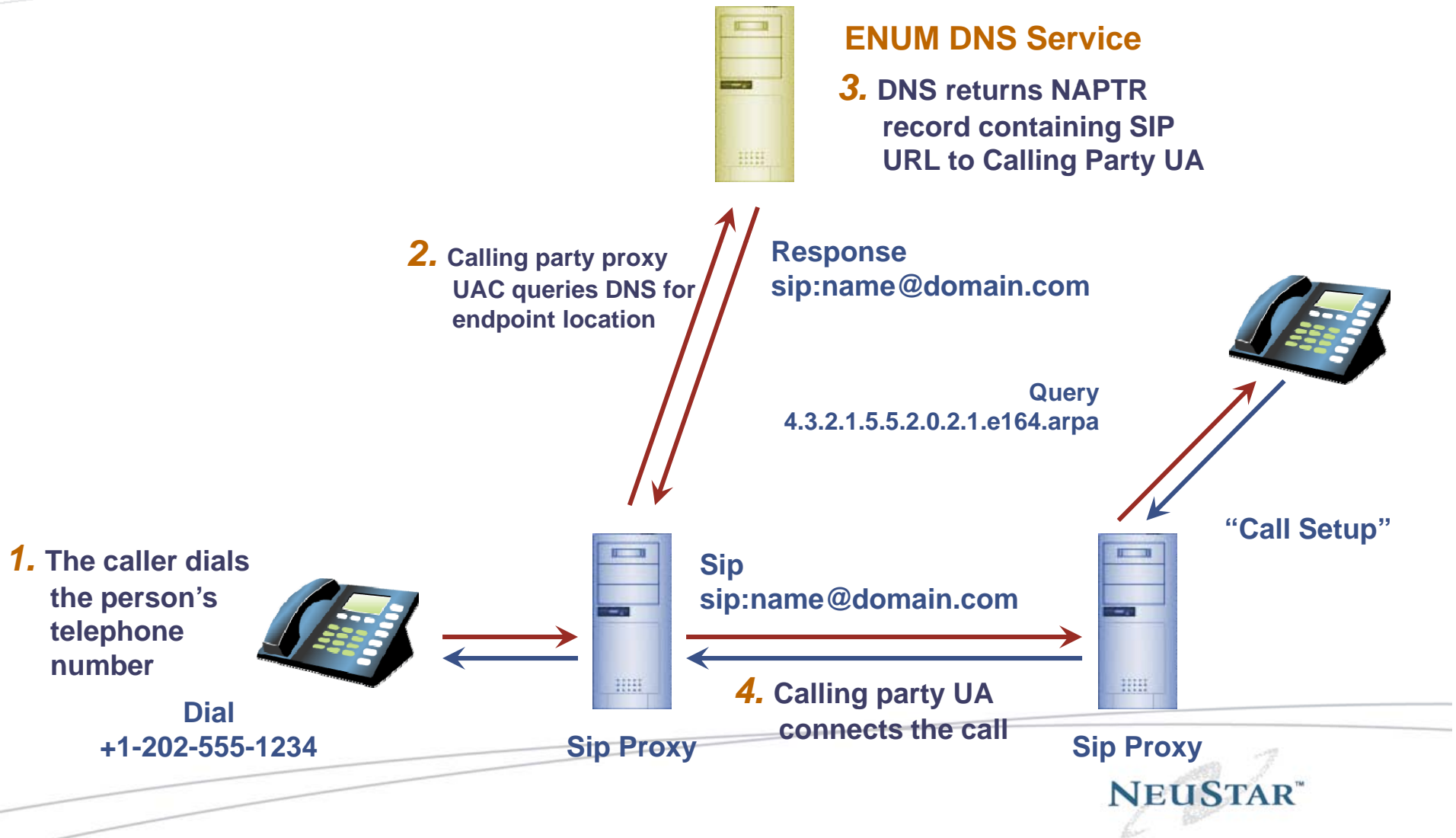




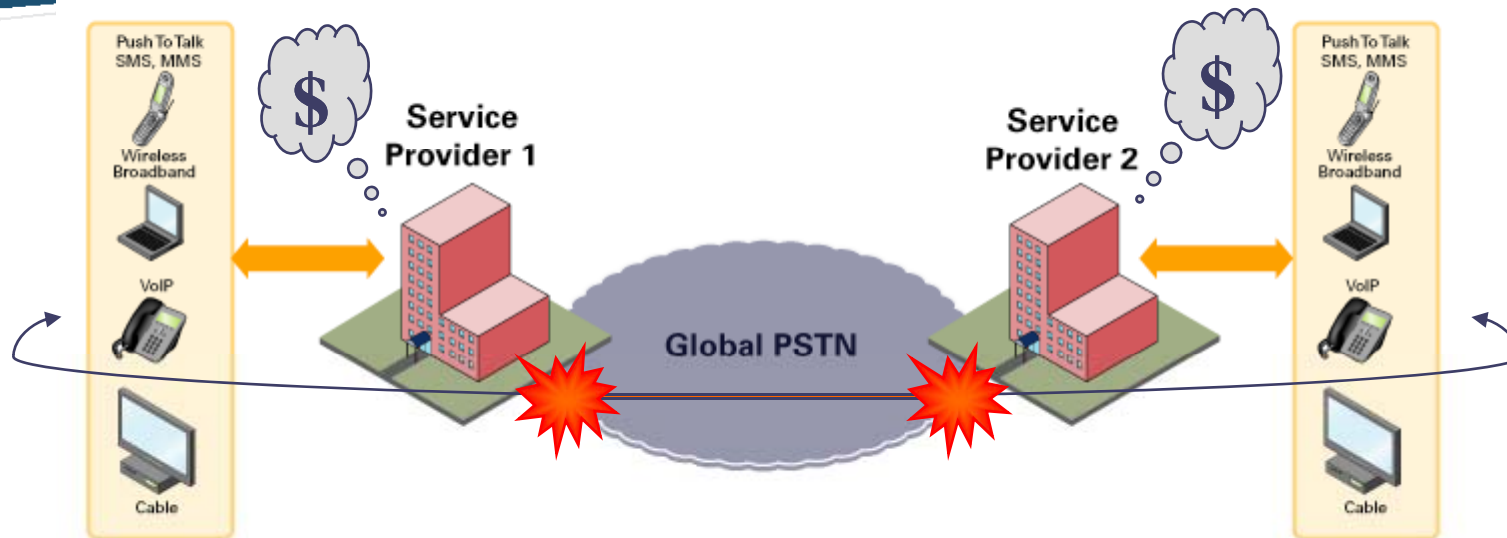
Need I say more ...

But the reality is that no one is proposing anything else.

For the 4,324 time - RFC 3761

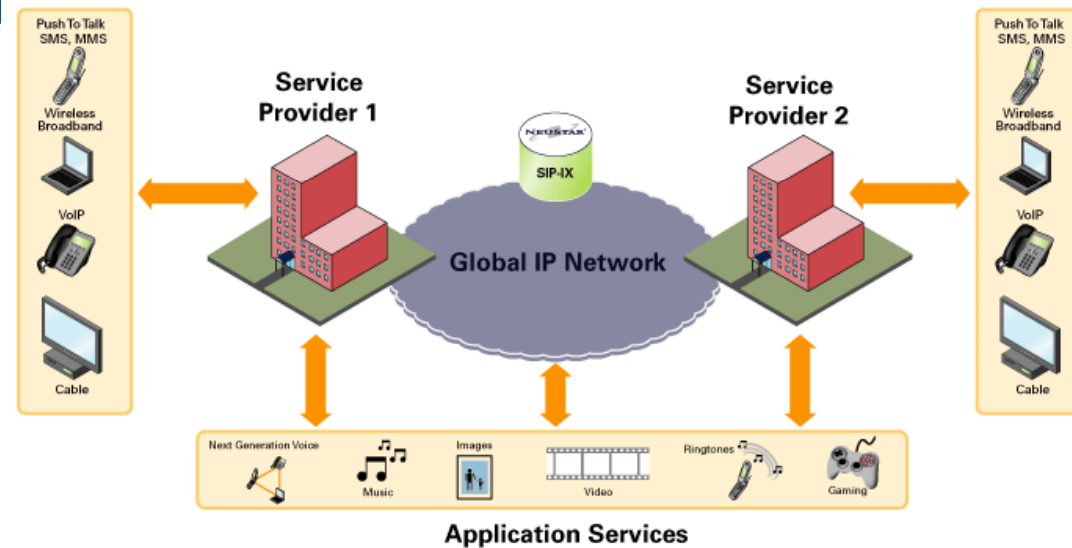


The “Islands of VoIP” problem



- **The PSTN is used as the inter-VOIP “default” network**
 - Service is degraded as it must transverse multiple networks
- Every VOIP network is an Island (apologies to John Donne!)
 - Enterprise or carrier VOIP dial plans cannot be remotely accessed by other VOIP gateways
- Clash between flat-rate calling and variable network costs
 - PSTN termination, settlement, and management
- Demand to differentiate services in market
 - Higher quality, presence, usage communities

VoIP Peering: It's not just VoIP and it's not just Peering



Cross platform Interoperability

Any IP session from any device on any network to any device on any network
NO Service degradation due to TDM to IP conversions

- Reduce complexity and costs
 - PSTN termination, settlement, and management
 - Efficient, scalable business and technology models
 - Secure, high performance infrastructure
- Drive higher-level feature sets
 - Presence, location, communities and quality
 - Seamless inter-working of SIP and IMS applications across domains
 - Reliable call setup and service delivery

The NGN Signaling Architecture is not fully in place

- You **HAVE** to translate phone numbers into routing information.
- IP formalized the abstraction between naming and addressing that LNP generally introduces.
- SS7/C7 Network cannot be sustained any more than service providers can continue to managing 2 networks TDM and IP
- There is no new service creation in TDM based networks. Period ...
- Confusion about the 3 flavors of ENUM RFC 3761
 - Public - e164.arp
 - Infrastructure – ie164.arp
 - Private – industry lead or private consortiums
- Confusion about the role of a root/apex
 - Who controls the apex
 - Is a APEX needed



All Call Query on Call Origination

- All PSTN and VoIP or advanced service data delivered in one query.
- New Service Delivery is just a URI away.
- **\$ORIGIN. 1.5.6.5.4.3.4.1.7.5.1.carrier.net**

Output

	ord	pr	fl	service	regexp
IN NAPTR	20	10	"u"	"E2U+sip"	"!^.*\$!sip:15714345651@proxy4.mso.net;user=phone!" .
and					
IN NAPTR	10	10	"u"	"E2U+sip:contact"	"!^.*\$!sip:15714345651@240.67.89.124!" .
and					
IN NAPTR	30	10	"u"	"E2U+pstn:tel"	"!^.*\$!tel:+15714345651;npdi;rn="+15712768933"
and					
IN NAPTR	40	10	"u"	"E2U+pstn:cnam"	"!^.*\$!data:application/cnam,Richard%Shockey!"
Plus					
IN NAPTR	100	10	"u"	"E2U+ical"	"!^.*\$!http://example.net/user21.ical!"
IN NAPTR	100	10	"u"	"E2U+sms"	"!^.*\$!mailto:15714345651@mmsc21@carrier.net!"
IN NAPTR	100	10	"u"	"E2U+pres"	"!^.*\$!pres:15714345651@mmsc21@carrier.net!"
IN NAPTR	100	10	"u"	"E2U+im"	"!^.*\$!im:username@carrier.net!"
IN NAPTR	100	10	"u"	"E2U+vcards"	"!^.*\$!http://example.net/vcard.vcf!"

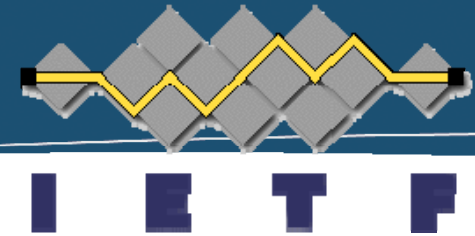


ECMA issues

- IMHO British Telecom 21 Century Network issues are a huge driver for Infrastructure ENUM issues.
 - They have no choice.
- OFCOM Study Review of General Condition 1- Number Portability
 - Concludes that “ present analysis appears to favor transition from current onward routing solution for routing of calls to ported numbers to an All-Call-Query of a common database of numbers (“ACQ/CDB”) aka I-ENUM
 - <http://www.ofcom.org.uk/consult/condocs/gc18/>
- AS EC moves to IMS/IP infrastructure ..there is no question carriers will have to go to all call query models.
- Onward Routing has become technically as well as economically untenable.
- SPID based routing ..(routing on carrier identification only) will not scale and is not oriented to multi service platforms (IM-Presence-Video calling)

The Three flavors of ENUM

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
- 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.
- Even though we have 32+ some registrations in e164.arpa none are known to be profitable.
- US and Canada are hopelessly bogged down in negotiations.
 - Death through apathy.

ENUM #2 Carrier/Infrastructure ENUM

- Carrier ENUM is generally regarded now as the use of a separate domain < ie164.arpa ??> to permit service providers to exchange phone number to URI data in order to find *points of interconnection*.
 - <http://www.ietf.org/internet-drafts/draft-ietf-enum-infrastructure-enum-reqs-0.txt>
 - <http://www.ietf.org/internet-drafts/draft-ietf-enum-infrastructure-06.txt>
- *Only the service provider of record for a particular TN is permitted to provision data for that FQDN.*
- IETF has determined it will punt this issue to ITU-T
- UK has a hybrid proposal called CRUE
 - https://www.centri.org/docs/2006/10/CRUE_v7.pdf
- Frankly it will never work ..

What's wrong with this picture?

- e164.arpa was hard
 - The split control between the ITU-T and the IETF was tough to set up and operate
 - The e164 number space is a political nightmare
 - The numbering data base is often in the hands of the ex-monopoly telco
- Telcos see Public ENUM as a “diabolical invention of a evil revenue-stripping devil (IETF) that must be resisted”
 - So why would i164.arpa be any easier to pull off or CRUE?
- **ENUM is not a product ..its not really even a service its a technology for enabling a SIP connection.**



Not to mention

- Why would any service provider place information into the global DNS that resolves to points of network interconnection?
 - Security implications staggering - DDOS
- Why would any service provider ASK for Government intervention and regulation in the critical signaling infrastructure?
 - Choice of ie164.arpa requires Govt approval and delegation
 - Isn't the telecom industry moving to deregulation?

ENUM #3 Private Infrastructure ENUM is the solution for VoIP Interconnection and Routing Data for Peering

- Private Infrastructure ENUM is generally regarded as one or more technologies that permit service providers, enterprises or other closed user groups to exchange phone number to URI data to find points of interconnection in private secure manner.
 - VPN
 - Subnets
 - Private Root or Subscription interface ... PUSH vs PULL model.
- Private ENUM is to be assumed as authoritative for all endpoints service providers choose to exchange data for.
 - Maintains essential bilateral agreement for interconnection
- Potential PSTN as well as IP data.
 - All Call query on call origination.
- **But that doesn't deal with the real issue ...**

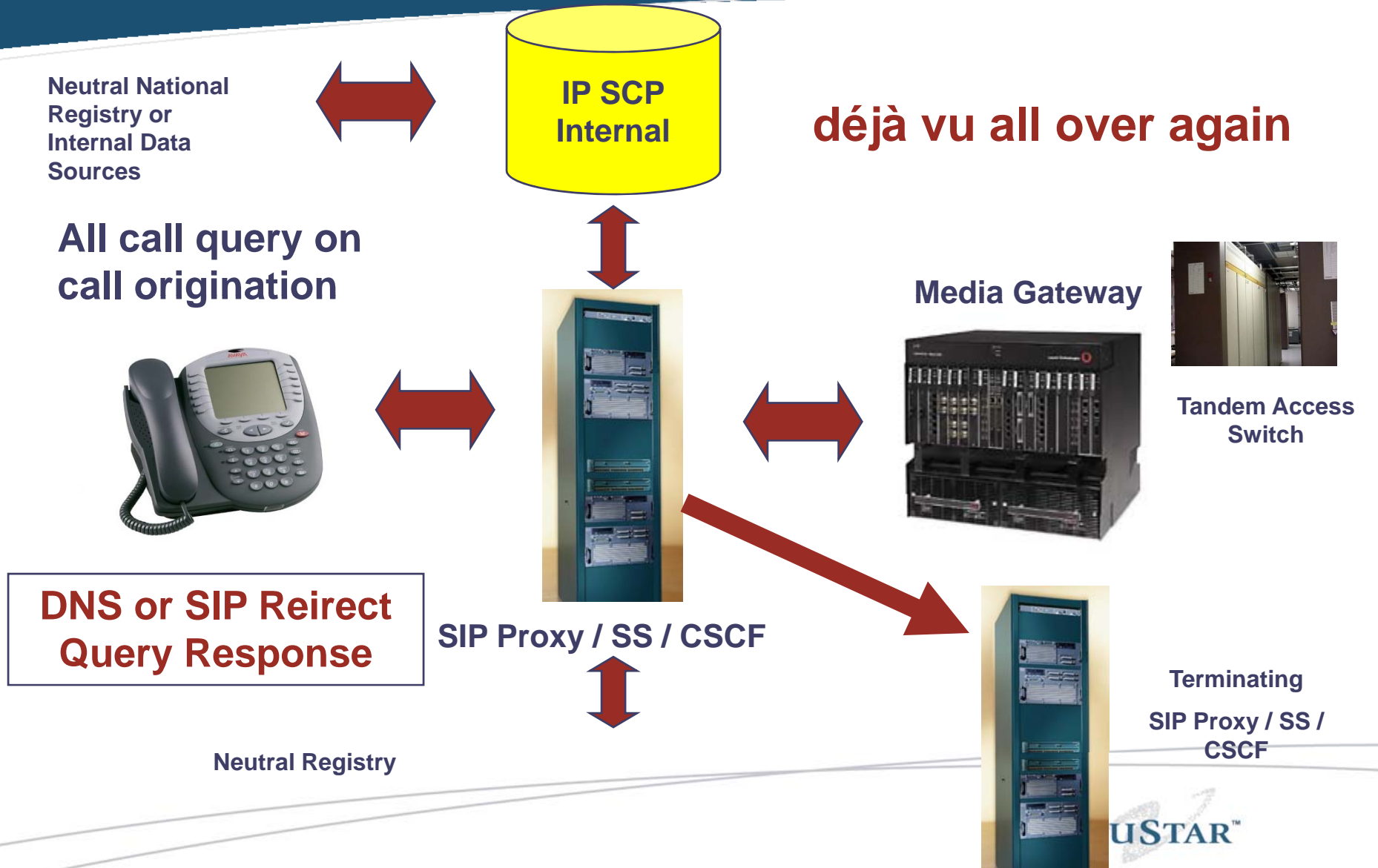
Its not about ENUM. Its about the end of SS7.

- **Its about National Telephone Number Registries.
It's about the data.**

- The existing SS7/C7 signaling networks cannot accommodate NGN IP services. *You have to use URI's.*
- LNP as well as VoIP Peering requires NN Registries (databases)
- The real issue is how (who) manages the National Numbering Registry.
- The business processes of how operators exchange data to enable interoperable services
 - How the data is queried is irrelevant
- The Registry must be able to process and distribute both IP as well as PSTN data such as LNP



The NGN Paradigm



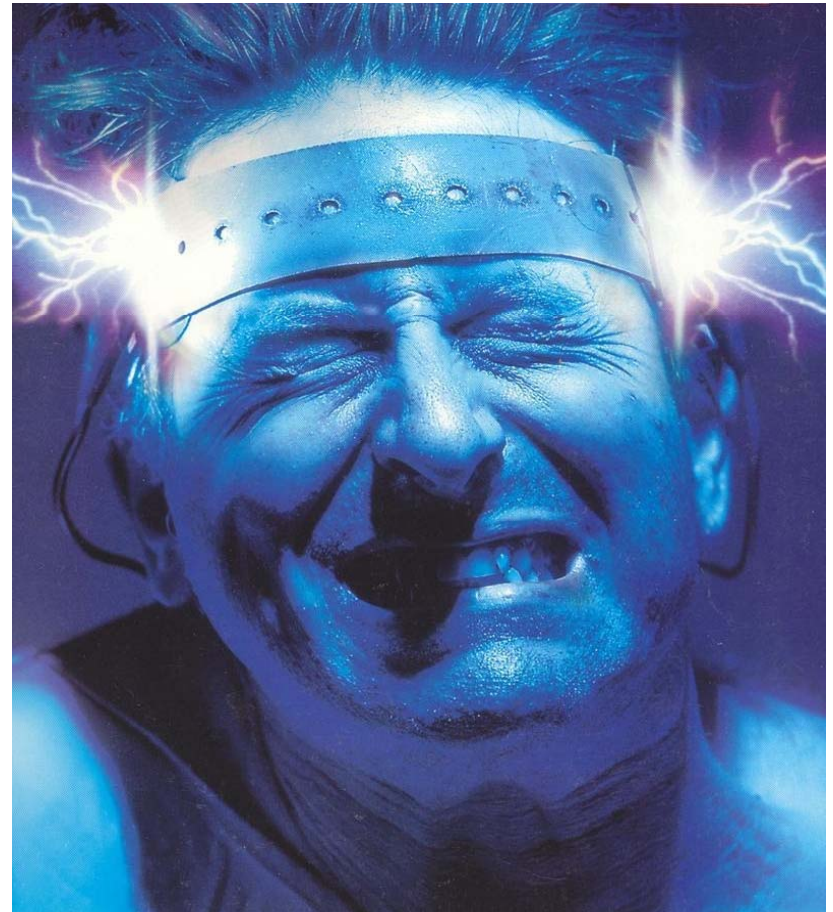
Why National Numbering Registries are the key

- National Numbering Registries maintain nation-state control and oversight.
 - Governments will not give up control of telephone numbers
 - Serious issues : Interconnection Policy and LEA
- A NN Registry means operators have a single “source of truth”
 - The Registry is not in the bearer path
- “All Call Query” at call origination could include TDM route discovery option
- A NN Registry can promote Open Competition
 - Open choice of Registrar for Provisioning
 - Open choice of Query Model [Hosted/Cached vs per dip]
 - Open choice of Query Type
 - DNS vs SIP Redirect vs ???

A single national numbering registry would mean that all URI data would Portability Corrected automatically!

The National TN Registry is the enabler of both LNP and Infrastructure ENUM

- **ENUM is only a query-response technology**
- **We've brainwashed ourselves into thinking this is about the DNS**
 - Delegation is not the issue
- Using ENUM Query technology does not mean you have to use the Global DNS
- The Neutral National Registry could populate ENUM services Public, Private or Infrastructure.
- The Registry only shows you where to go not how to get there.



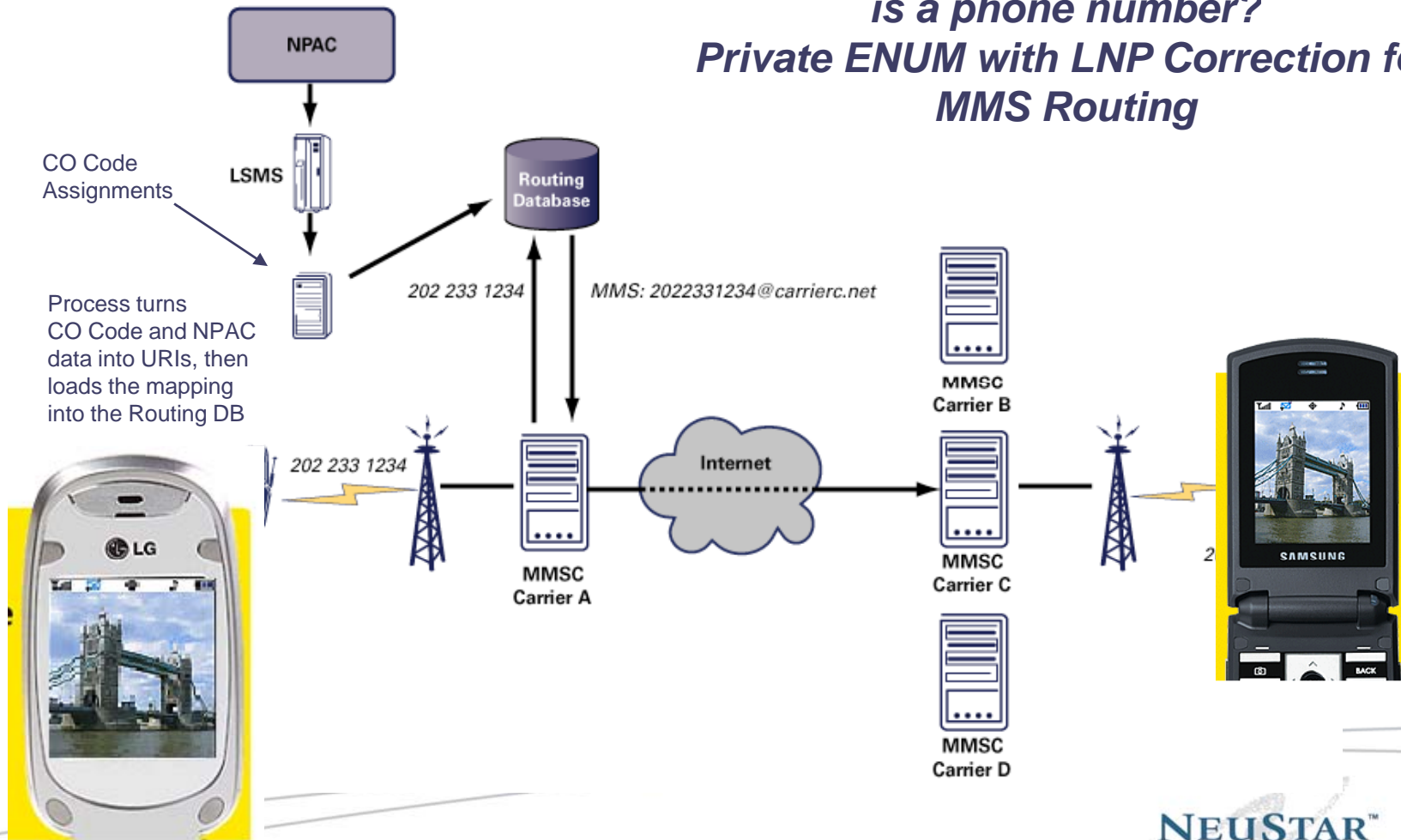
What examples exist ? (shameless plug)

- **North American Number Portability Administration Center -NPAC-[NeuStar] + LERG [Telcordia]**
 - In service since 1996 managed by NeuStar / LERG by Telcordia
 - Open Choice of Registrar's – Open Choice of Query Operator
 - NPAC NGN initiatives
 - NANC 399
 - Define 2 new Service Provider Identification fields (Service Type - ALT-SPID)
 - NANC 400
 - Put Service URI's in the NPAC
 - http://www.nanc-chair.org/docs/nowg/Apr05_NeuStar_Joint_FoN_LNPA_Presentation.ppt
- **COIN (Communications Infrastructure in The Netherlands)**
 - ADD URI data to COIN and Infrastructure ENUM would be in place.
 - <http://isoc.nl/files/ScriptieLennartMaris.pdf>
- **The real ENUM issues are Political not Technical**
 - Integration with LNP
 - Administrative polices and procedures carriers use to interact with each other
 - Cost recovery model for managing the NGN TN Registry.



NeuStar's SIP-IX – in use by wireless industry today

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



Public DNS for NGN Routing will be subject to DDoS attacks.

- The Root Servers have been attacked.
- There is no known cure.
- These documents describe both the 2006 and 2007 attacks.
 - <http://www.icann.org/committees/security/dns-ddos-advisory-31mar06.pdf>
 - <http://www.icann.org/announcements/factsheet-dns-attack-08mar07.pdf>
- The IAB has also looked at these issues with similar conclusions.
 - <http://www.ietf.org/internet-drafts/draft-iab-iwout-report-03.txt>
 - <http://www.iab.org/about/workshops/unwantedtraffic/iabsst.pdf>

The vital role of regulators

- Telephone Numbering has been and continues to be a state function.
 - I would have mandated LNP, however in the ECMA.
- The Universal Interconnection of the E.164 named endpoints is essential.
- Interconnection agreements need oversight.
- Regulator mandated access to UNE has been the key difference between US and EU access penetration.



- What about Public ENUM ????
- What's next ?

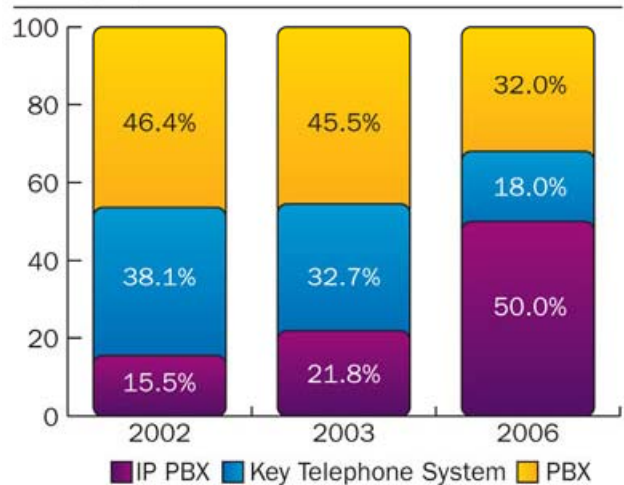
The Uncharted territory

- The Enterprise...
- The 40-40-20 rule...
- When will enterprises wake up to the potential for self routing of real time communications sessions.
- Its starting to happen in some cases
 - Airlines
 - Financial Services
- Issues of provisioning?



Why we are here...

Enterprise Telephony Shipments by Category - North American Market



Source: Frost & Sullivan

Business Lines Total Installed U.S. Base, in Millions of Lines

Year	Traditional PBX	IP/Converged	KTS	Centrex	Total
2000	48.4	0.5	39.6	17	105.5
2001	49.3	2	39.3	17	107.6
2002	50.1	4.1	38.9	16.5	109.6
2003	49.9	7.7	38.4	15.8	111.8
2004	49.1	13.2	37.8	14.9	115
2005	47	20.8	35.7	14.3	117.8
2006	44.6	29.6	33	13.7	120.9
2007	40.9	39.4	29.2	13.3	122.8
2008	36.5	49.9	24.9	12.8	124.1
2009	32.3	60.8	20.9	12.3	126.3
2010	28.3	72	17.4	11.7	129.4

Source: TIA, InfoTech

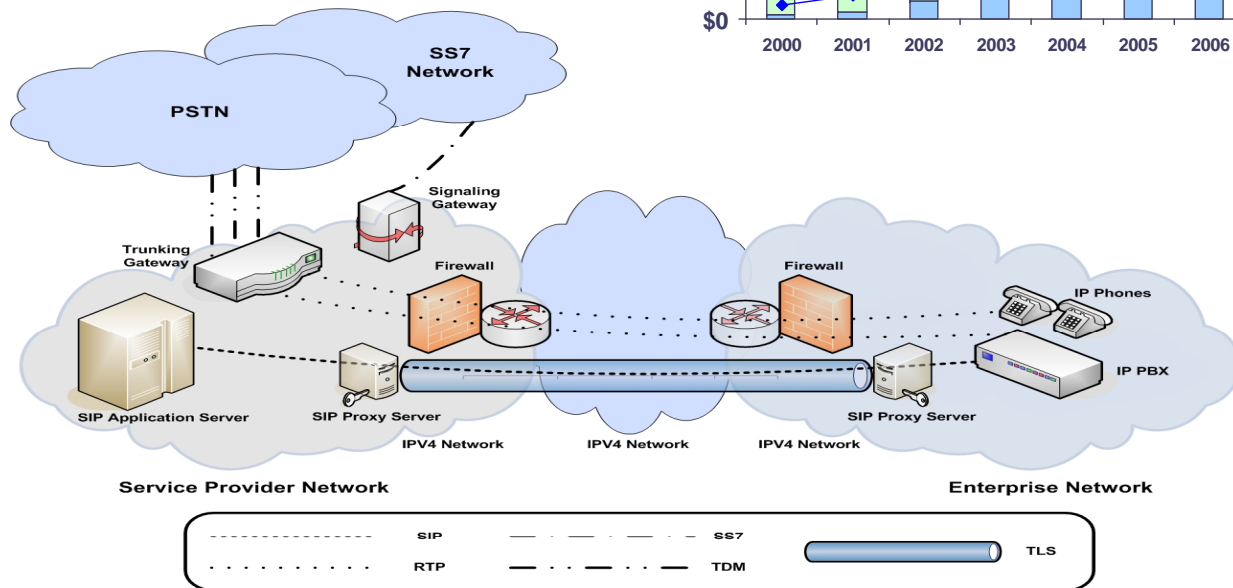
Business Lines are the most profitable part of Incumbent Voice Networks



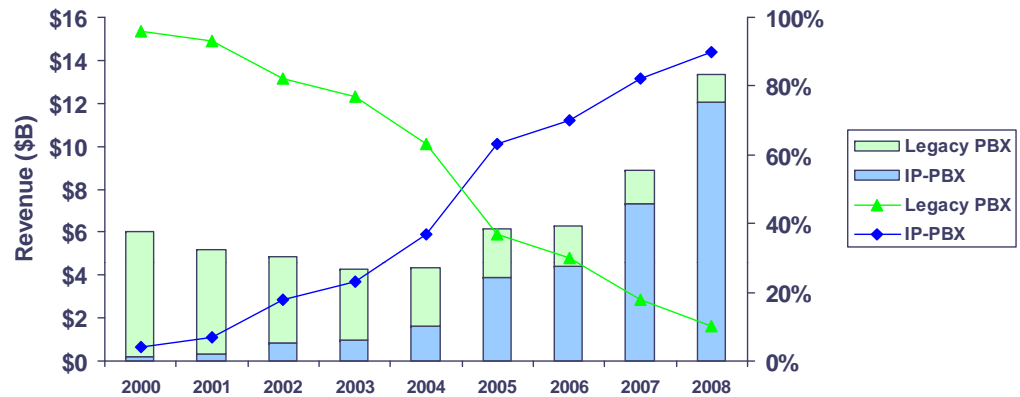
Coming – Direct Trunking of VoIP to SP Networks

Driving the need for all IP Signaling

SIPconnect



U.S. PBX Revenue Forecast

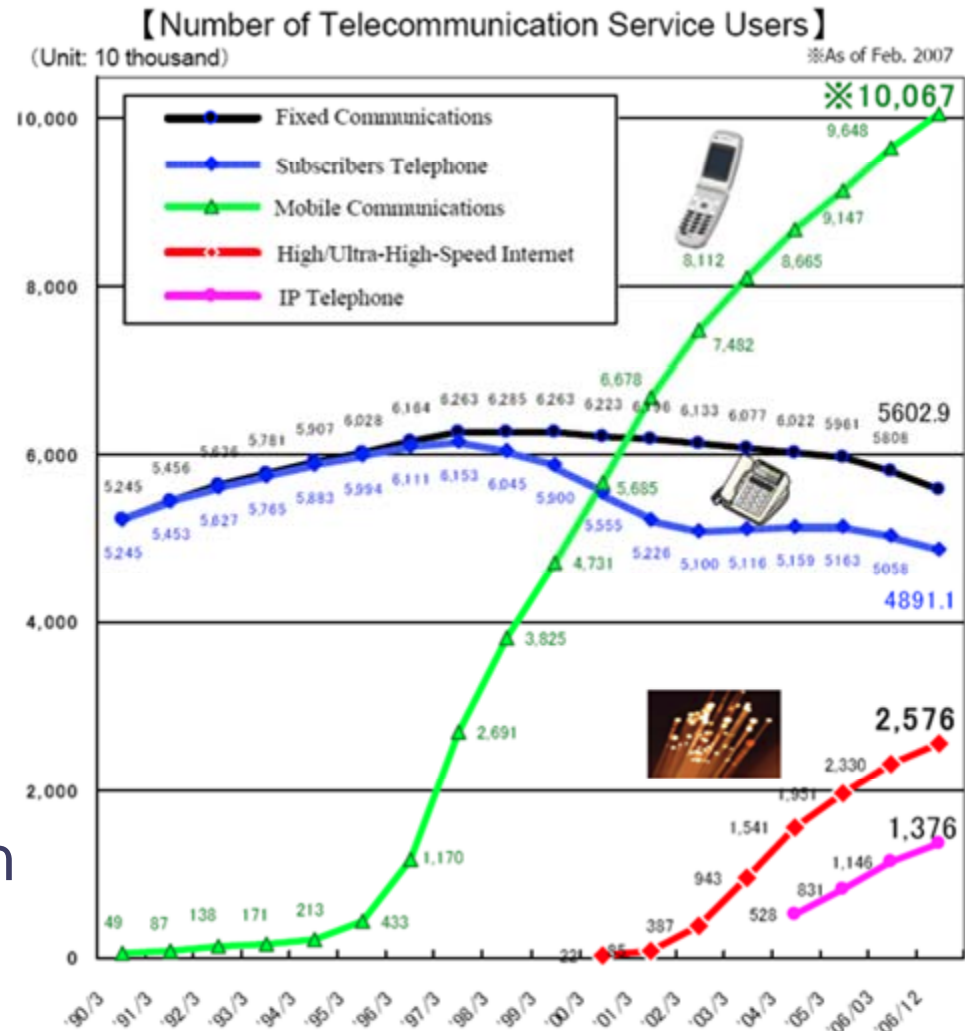


<http://www.sipforum.org/sipconnect>



But on the other hand....

- A reactionary thought .
- In the US 12 % of households have a landline phone but no mobile phone
- 14% of households have a 1 or more mobile phones but no landline.
- Is there any future for landline at all (other than IP backhaul - UMA or Femtocell) ?



Dual mode phones are proliferating

Do you really want desk phone and a landline phone?
Most young people under 25 have made the choice.



The future of Infrastructure ENUM and Interconnection

- Is VoIP dead ... is it really SoIP “Services over IP”
- Will the distinction in the EC between Landline and Mobile numbers go away if mobile voice communications dominates the market?
- Will E.164 numbering take on the characters of email.
 - We have multiple email addresses for “identities”
 - Public Business vs Private Business
 - Public Personal vs Private Personal ..

Thank you ...

