An IETF view of ENUM

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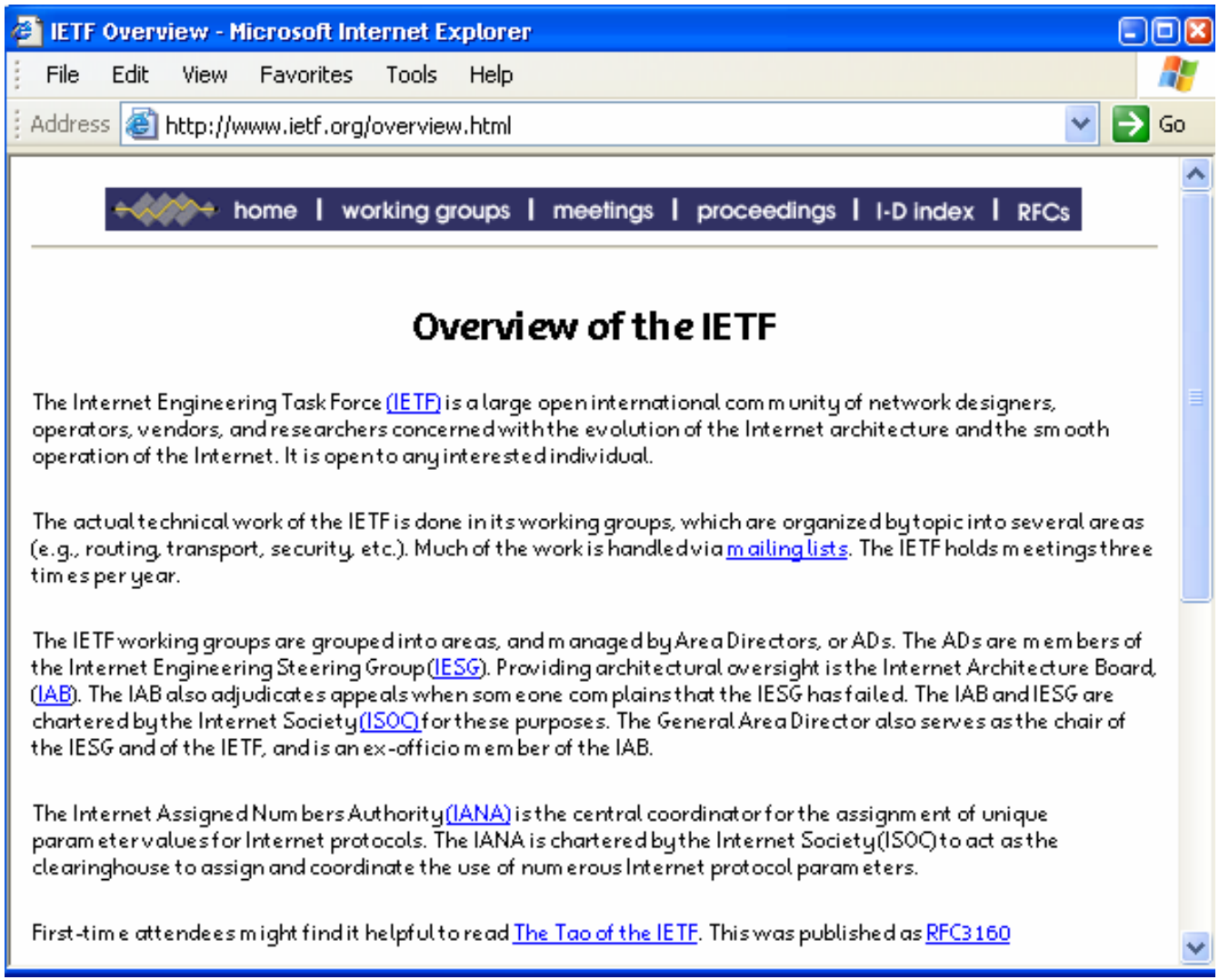
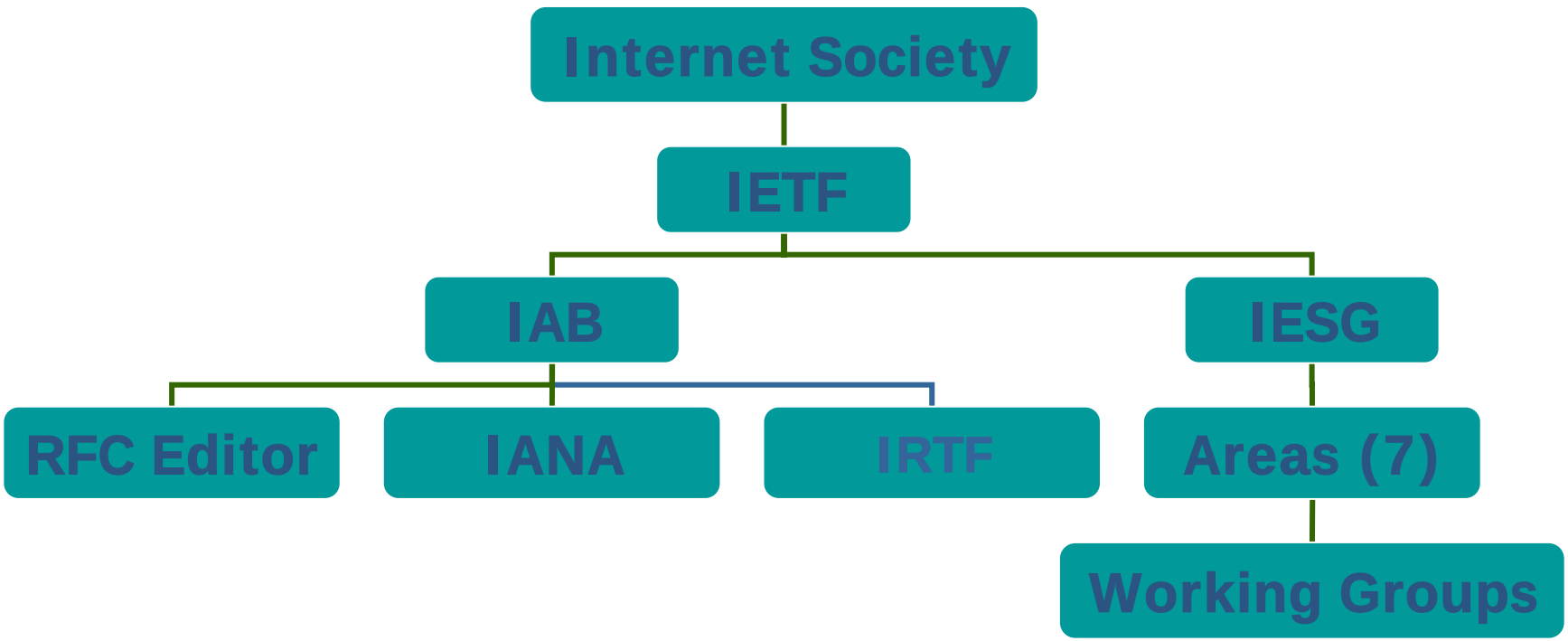
Who is the IETF?

- Internet Engineering Task Force
- The organization that oversees the standards process for Internet protocols and technologies
- Industry-based standards body with broad participation from vendors, operators and researchers
- We make standards that work – how you work them is up to you!

The Structure of the IETF



Huh? - Lets see that again!



How does the IETF Work?

We do not believe in Kings, Presidents and Voting. We believe in rough consensus and running code

Dave Clark, MIT, Former IAB member

The IETF has a focus on developing standards where interoperability testing of conformant implementations of the standard, and use of the technology in production contexts form an integral part of the standards process

How Does the IETF Work?

- Proposed work items are aired at a BOF session
  - Gather interest and support
- A work program is chartered by the IESG
  - Working Group Charter
    - WG Chair(s) and Area Director
    - Working Group statement of activity
    - Schedule of milestones
  - Periodic IESG review and recharter as necessary

IETF Documents

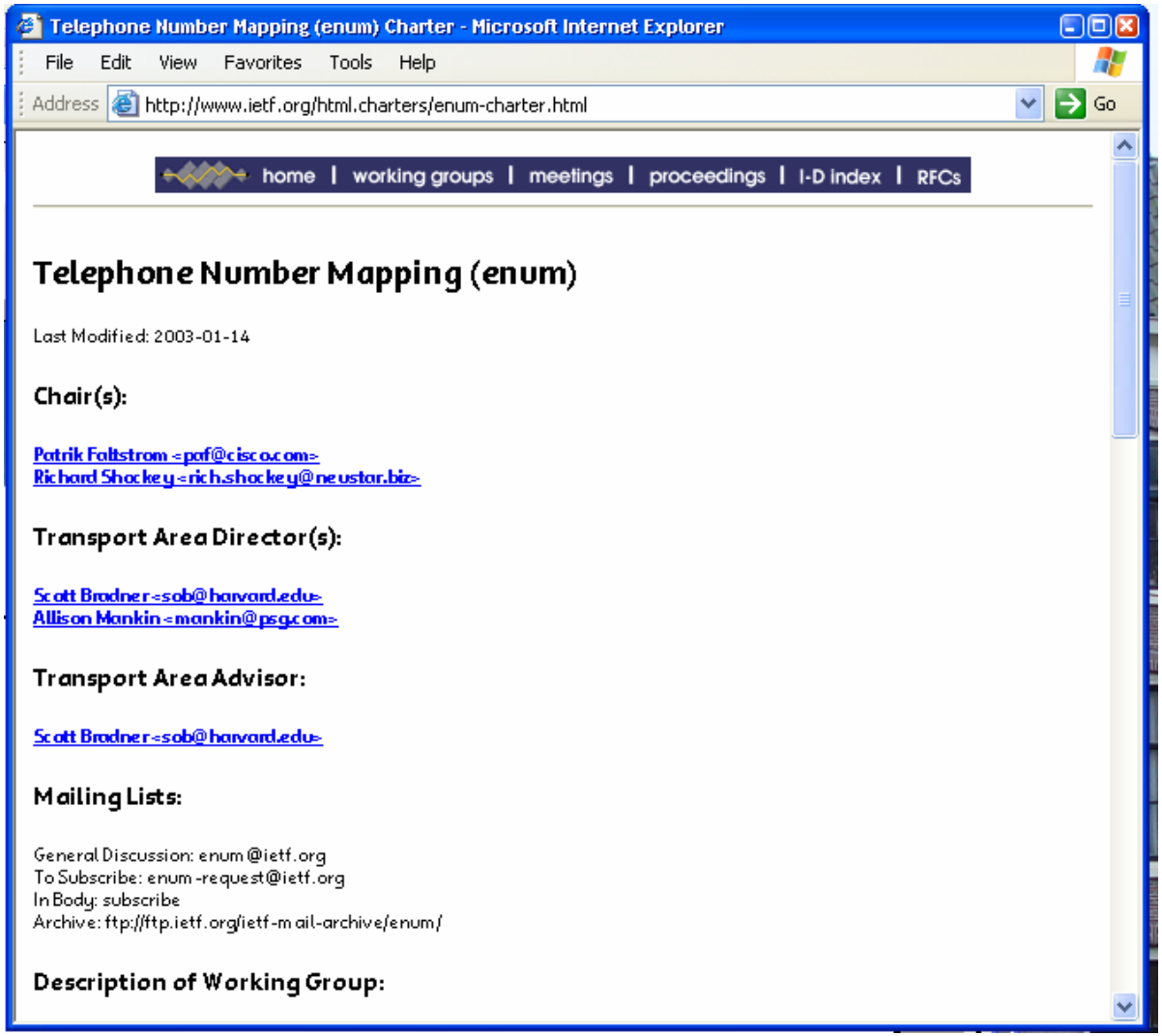
- Internet Drafts
  - http://www.ietf.org/1id-abstracts.html
  - Individual submissions
    - draft-<person>-<header>
  - Working Group Documents
    - draft-ietf-<working group>-<header>
    - Working Group documents denote some level of ‘buy-in’ from the community of interest

IETF Documents

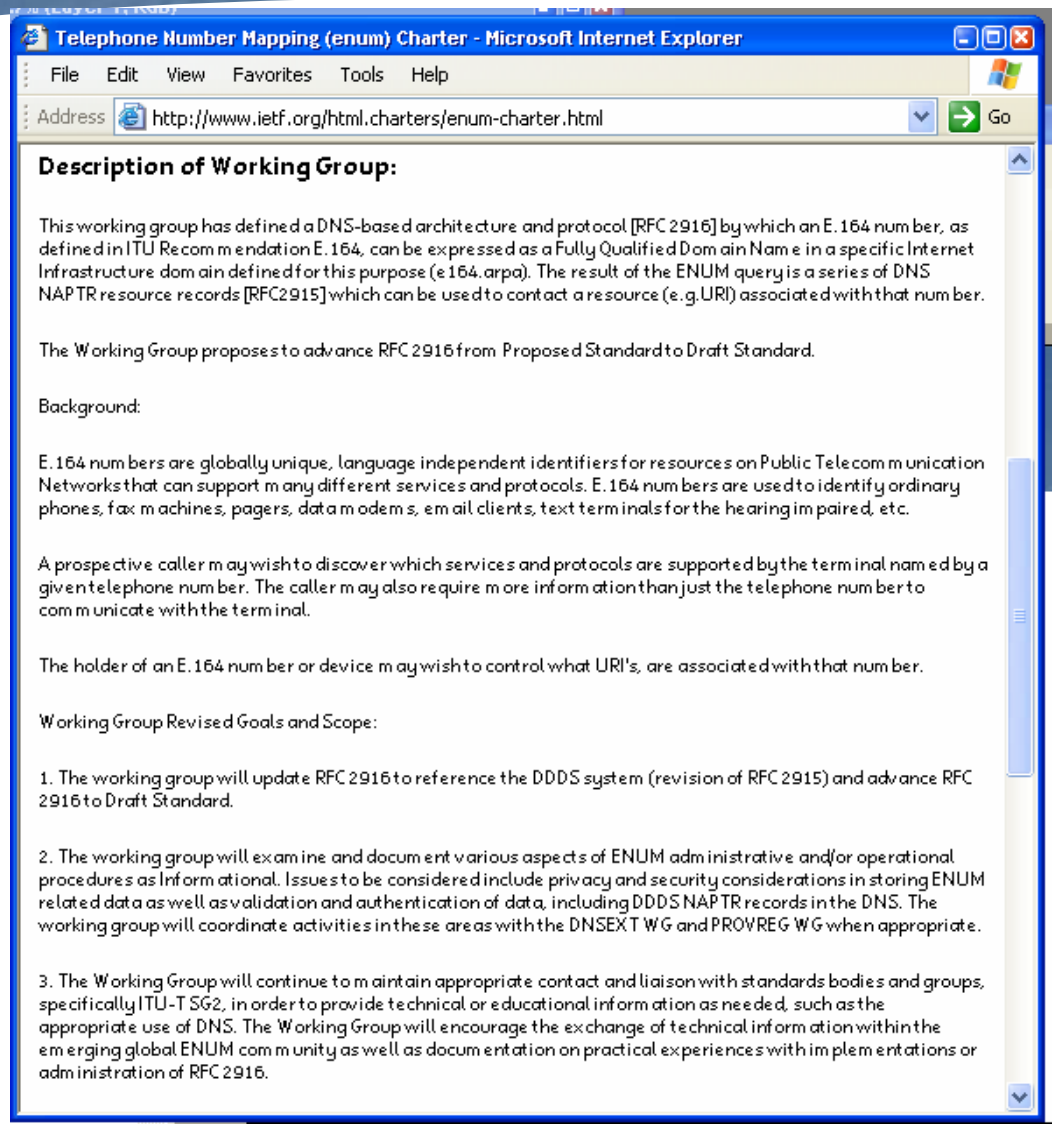
- RFCs
  - Informational
  - Best Current Practice
  - Standards Track
    - Proposed (good idea, clearly written, Working Group approved, peer reviewed)
    - Draft (interoperability tested, sound idea)
    - Full (many people are / were using this technology)
    - Historic (no longer that useful)

ENUM

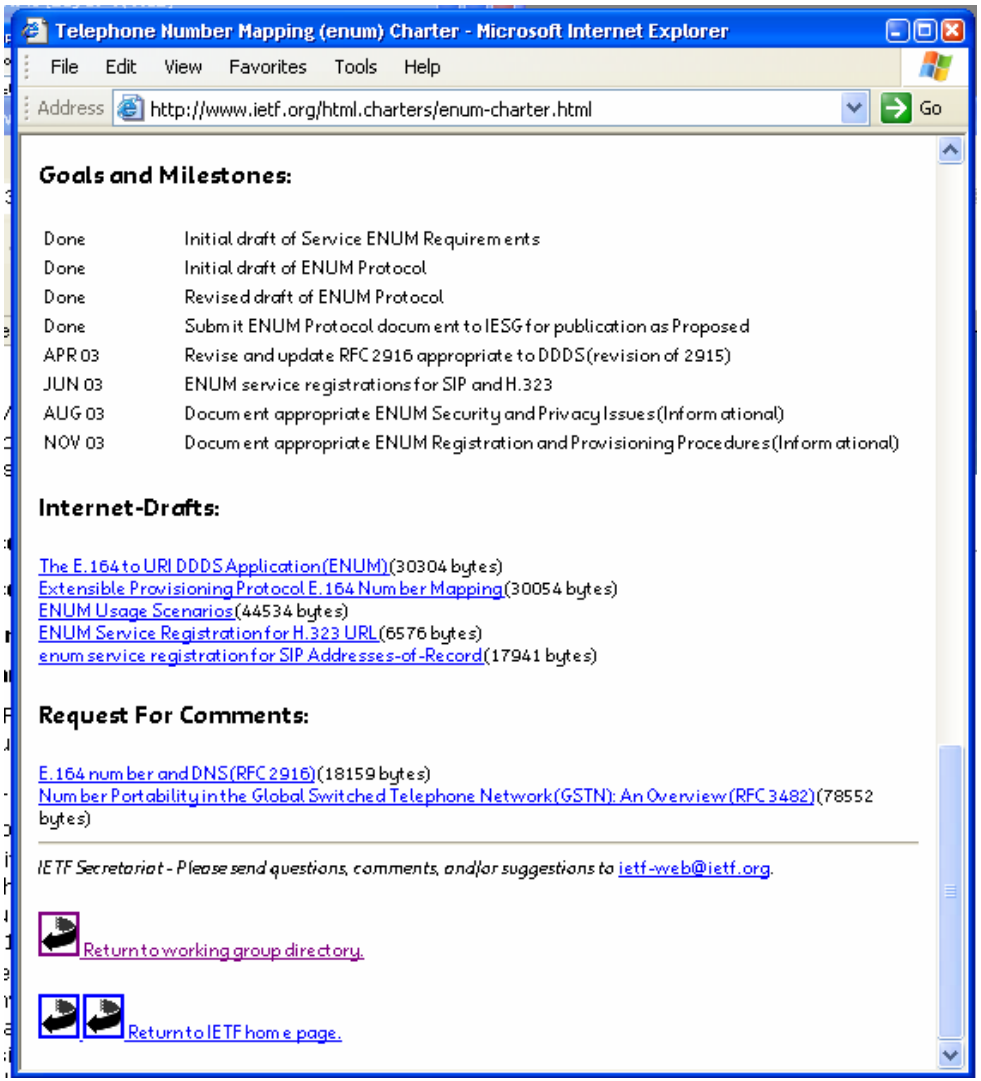
- ENUM is a working group with the IETF Transport Area



ENUM (cont)


Telephone Number Mapping (enum) Charter - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://www.ietf.org/html.charters/enum-charter.html
Go
Description of Working Group:
This working group has defined a DNS-based architecture and protocol [RFC 2916] by which an E.164 number, as defined in ITU Recommendation E.164, can be expressed as a Fully Qualified Domain Name in a specific Internet Infrastructure domain defined for this purpose (e164.arpa). The result of the ENUM query is a series of DNS NAPTR resource records [RFC2915] which can be used to contact a resource (e.g.URI) associated with that number.
The Working Group proposes to advance RFC 2916 from Proposed Standard to Draft Standard.
Background:
E.164 numbers are globally unique, language independent identifiers for resources on Public Telecommunication Networks that can support many different services and protocols. E.164 numbers are used to identify ordinary phones, fax machines, pagers, data modems, email clients, text terminals for the hearing impaired, etc.
A prospective caller may wish to discover which services and protocols are supported by the terminal named by a given telephone number. The caller may also require more information than just the telephone number to communicate with the terminal.
The holder of an E.164 number or device may wish to control what URI's, are associated with that number.
Working Group Revised Goals and Scope:
1. The working group will update RFC 2916 to reference the DDDS system (revision of RFC 2915) and advance RFC 2916 to Draft Standard.
2. The working group will examine and document various aspects of ENUM administrative and/or operational procedures as Informational. Issues to be considered include privacy and security considerations in storing ENUM related data as well as validation and authentication of data, including DDDS NAPTR records in the DNS. The working group will coordinate activities in these areas with the DNSEXT WG and PROVREG WG when appropriate.
3. The Working Group will continue to maintain appropriate contact and liaison with standards bodies and groups, specifically ITU-T SG2, in order to provide technical or educational information as needed, such as the appropriate use of DNS. The Working Group will encourage the exchange of technical information within the emerging global ENUM community as well as documentation on practical experiences with implementations or administration of RFC 2916.

ENUM (cont)


Telephone Number Mapping (enum) Charter - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://www.ietf.org/html.charters/enum-charter.html
Go
Goals and Milestones:
Done Initial draft of Service ENUM Requirements
Done Initial draft of ENUM Protocol
Done Revised draft of ENUM Protocol
Done Submit ENUM Protocol document to IESG for publication as Proposed
APR 03 Revise and update RFC 2916 appropriate to DDDS (revision of 2915)
JUN 03 ENUM service registrations for SIP and H.323
AUG 03 Document appropriate ENUM Security and Privacy Issues (Informational)
NOV 03 Document appropriate ENUM Registration and Provisioning Procedures (Informational)
Internet-Drafts:
The E.164 to URI DDDS Application (ENUM) (30304 bytes)
Extensible Provisioning Protocol E.164 Number Mapping (30054 bytes)
ENUM Usage Scenarios (44534 bytes)
ENUM Service Registration for H.323 URL (6576 bytes)
enum service registration for SIP Addresses-of-Record (17941 bytes)
Request For Comments:
E.164 number and DNS (RFC 2916) (18159 bytes)
Number Portability in the Global Switched Telephone Network (GSTN): An Overview (RFC 3482) (78552 bytes)
IETF Secretariat - Please send questions, comments, and/or suggestions to ietf-web@ietf.org.
Return to working group directory.
Return to IETF home page.

Why ENUM?

- Because tpc.int did not work!
  - tpc.int (c 1992) mapped E.164 numbers to A records (IP addresses) to emulate fax delivery
  - Each new service required a new E.164 -> IP address mapping
  - Did not scale to multiple services using a single mapping
- ENUM is part of a broader IETF approach of splitting out the components of VOIP / PSTN interaction into discrete efforts and addressing each component as a discrete technology standardization effort
- ENUM is not an end in itself

The Good Bits of ENUM

- E164.arpa
  - Single mapping that is service independent
  - Each mapping can be associated with a collection of URIs
  - The mapping may be statically configured or dynamically generated (or both)
  - Each end point of the DNS hierarchy populates the entry with desired service entries
  - Each application selects compatible service entries from the set
  - ENUM is independent of directory, call control, routing and transport considerations
  - Its just a mapping from the E.164 domain into multiple URI service domains

The Not So Good Bit

- The DNS is an issue in all this.....
  - DNS is insecure
    - TSIG, DNSSEC, PKI, etc may help, but when and how much?
  - DNS is variably timed
  - DNS is generally not well maintained
  - DNS is generally not well synchronized
  - There is no “DNS says ‘no’”, only an indistinct timeout
  - Putting regular expressions in the DNS is an fascinating complication
  - But we have nothing better in terms of a very large distributed database to poke towards this problem space

Remember:

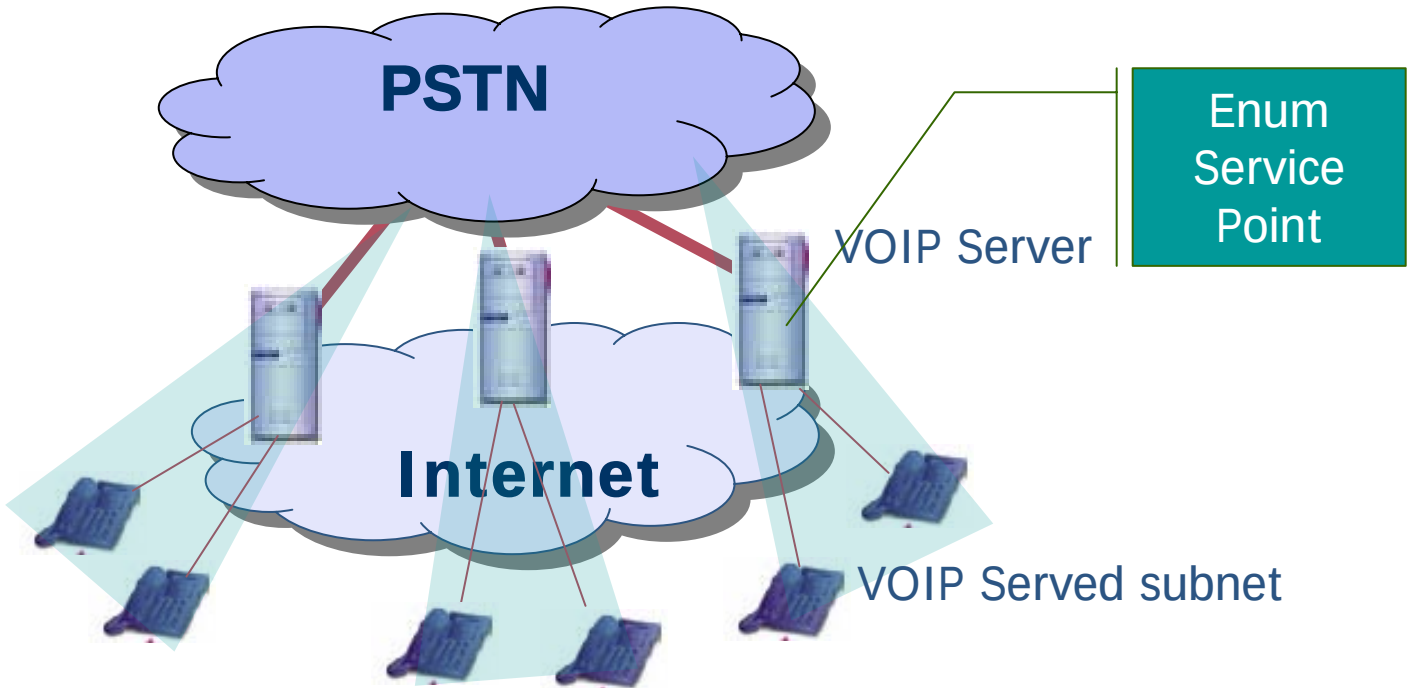
- The DNS is a lousy kitchen sink. We have seen many proposals to “just put in in the DNS”. Be very concerned whenever you hear this!

ENUM is NOT everything

- In particular, ENUM is NOT:
  - a directory
  - a search service
  - a transport service
  - a voice encoding method
  - a rendezvous protocol
- All ENUM is a distributed partial mapping from E.164 addresses into a set of service points identified via a URI labelling

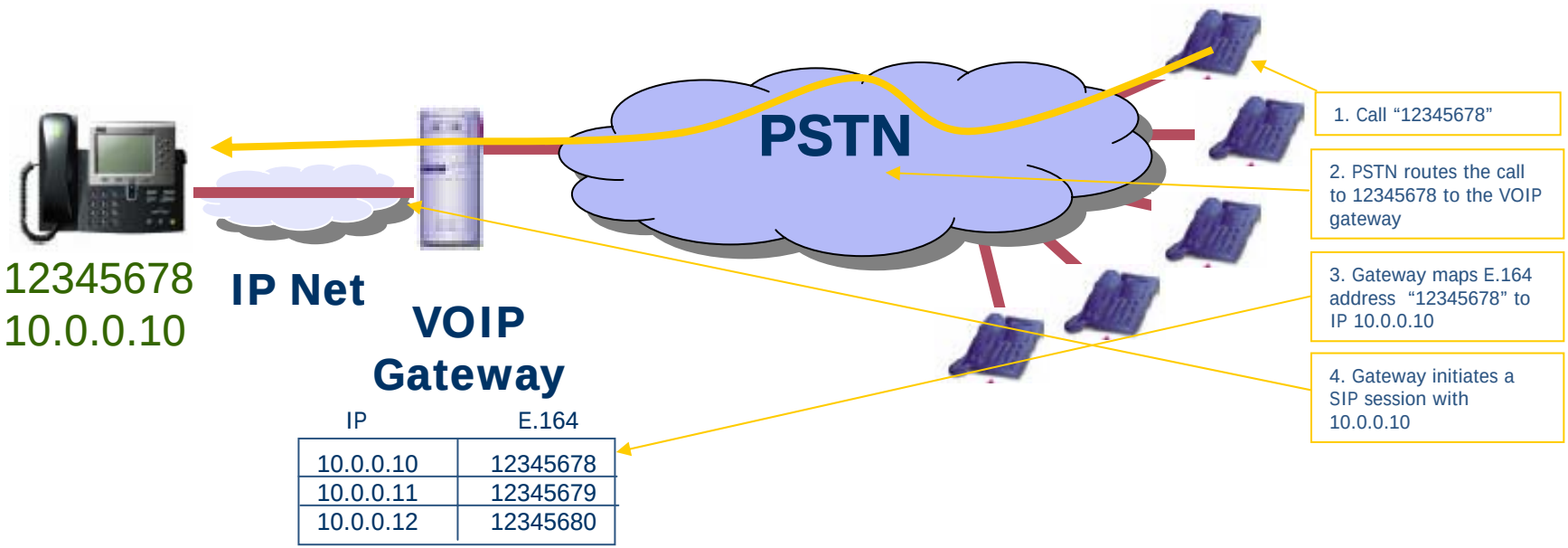
The VOIP Gateway Model for enum

- Most IETF work these days assumes a ‘reference architecture’
- ENUM’s core reference architecture is VOIP-to-VOIP



The Gateway VOIP Model

- The single gateway model is simple:
  - A PSTN / IP gateway maintains a mapping between IP and E.164 addresses



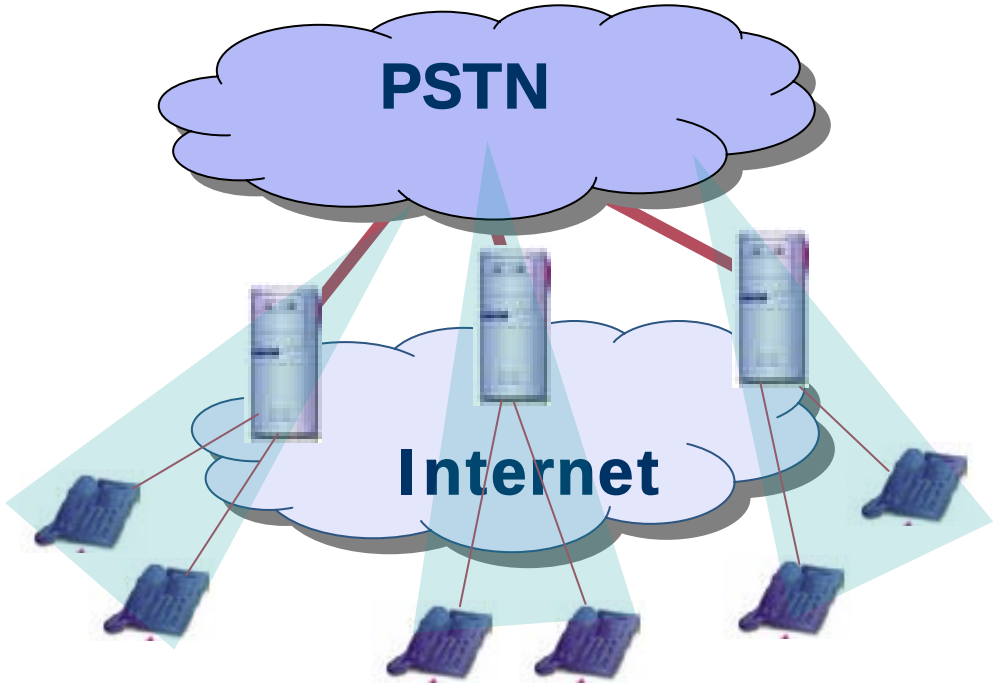
IP	E.164
10.0.0.10	12345678
10.0.0.11	12345679
10.0.0.12	12345680

The multi-Gateway VOIP World

- Use PSTN / VOIP Gateways
  - Each Gateway maps a set of telephone numbers to a set of served IP service addresses
  - Each Gateway knows only about locally served devices
  - Gateway-to-Gateway calls need to be explicitly configured in each gateway to use IP or some private connection, or use the default of the PSTN
  - The PSTN currently is the glue that allows the VOIP islands to interconnect with each other

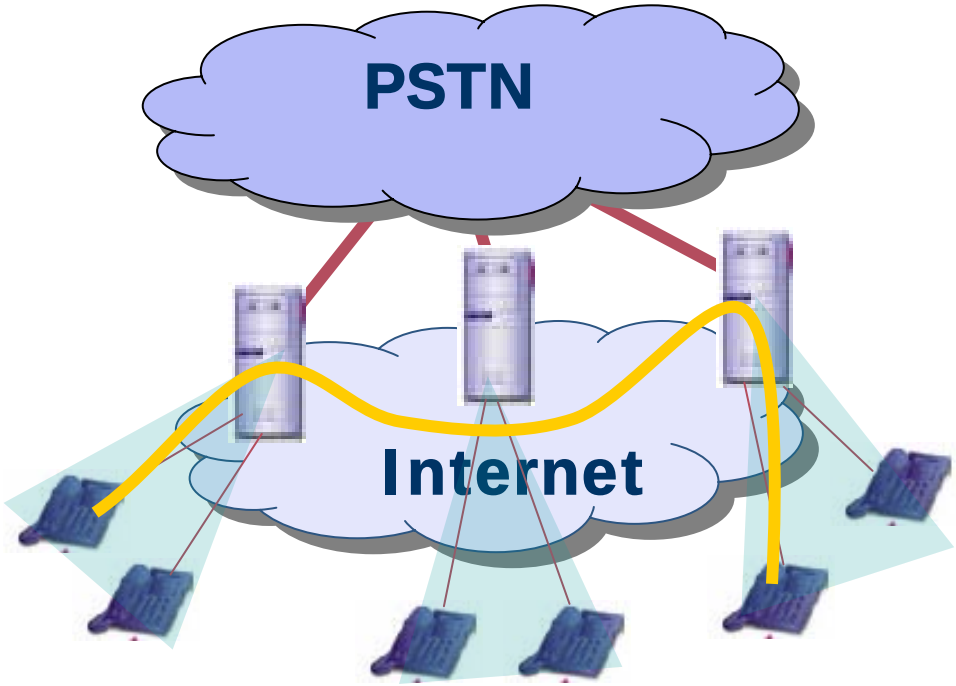
The multi-Gateway VOIP World

- VOIP Islands
  - E.164 numbers are only routable over the PSTN
  - Enterprise or carrier VOIP dialling plans cannot be remotely accessed by other VOIP network segments



The Core ENUM Problem

- 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?



Problem statements for ENUM (1)

1. How do network elements (gateways, SIP servers etc) find services on the Internet if you only have a telephone (E.164) number?

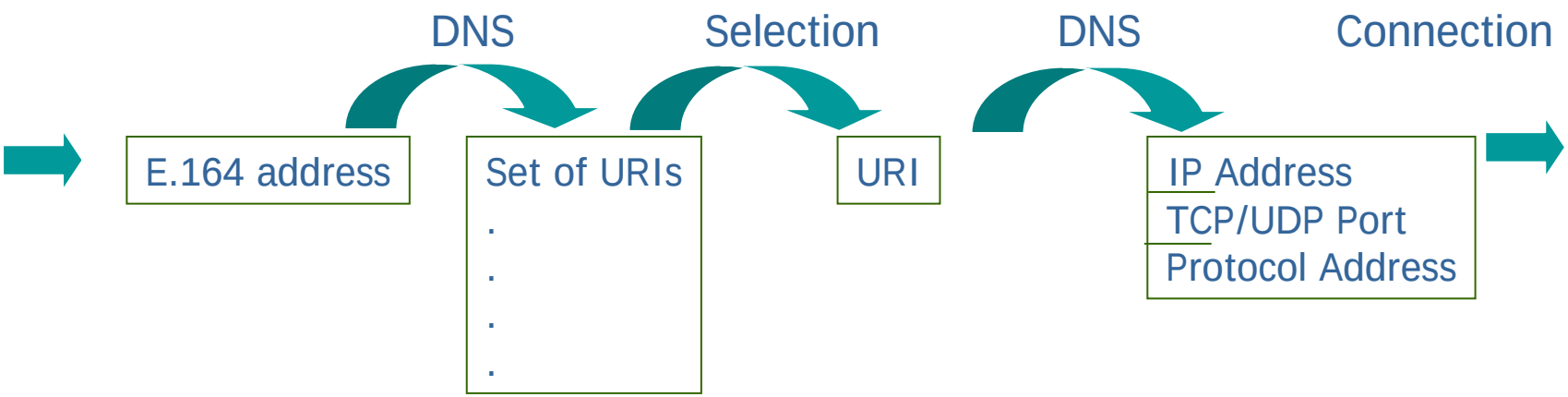
Problem statements for ENUM (2)

2. How can subscribers define their preferences for nominating particular services and servers to respond to incoming communication requests?

The ENUM Objective

- Allow any IP device to establish whether an E.164 telephone address is reachable as an Internet-described Service
  - And ... what the preferred Service Point actually is
  - And if its an Internet-reachable Service Point... what IP address, protocol address, port address and application address should be used to contact the preferred Service Point

ENUM Resolution



- The PSTN is a multi-service platform
- To emulate this in IP, IP services associated with a single E.164 may be provided on a collection of different IP service points
- An ENUM DNS request should return the entire set of service points and the associated service.

Why URIs?

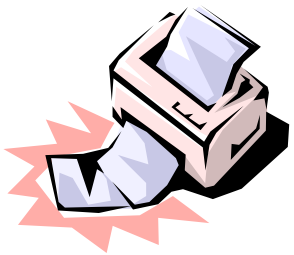
- URIs represent a generic naming scheme to describe IP service points
  - Generic format of
    service:service-specific-address

- A URI in IP context is ultimately resolvable to
  transport protocol (TCP/UDP) selection
  IP address
  Port address
  Address selector within the application session

The Longer Term

- Telephone numbers are well accepted identifiers within their realm of application
- Any collection of service URIs can be linked against an ENUM entry
  - mail, www, irc, sms,...

E.164 as a common address substrate ?



tel:+61 2 62486165

mailto:gih@telstra.net

tel:+61 2 12345678

sip:gih@sip.telstra.net

ENUM

Use this number for any service
+61 2 12345678

Practical Issues

- Issues where the IETF has an active interest...
  - Who should manage the e164.arpa zone?
  - Should there be one root for a single ENUM database or multiple databases for different functions, number ranges, area codes or even numbers?
  - How to secure the DNS to ensure that ENUM answers are valid, timely and authoritative

Practical Issues

- Issues where the IETF has a limited (if any) role to play in ENUM
  - How to protect the privacy of the ENUM database?
  - How to verify changes to the ENUM database?
  - Should telephone number holders ‘opt-in’ or ‘opt-out’ of the system?
  - Portability and ownership of a phone number?
    - Can I cancel all phone services and keep my phone number?
  - Compliance with legislative framework
    - What is a “public telephone call” from a strict regulatory perspective?
  - Is there a valid need for yet another public identity space?