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# Institutionalizing the IANA Functions To Deliver A Stable and Accessible Global Internet for Mission Critical Business Traffic and Transactions

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## Outline

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- ◆ in the beginning
- ◆ current IANA functions
- ◆ future IANA structure and role
- ◆ open issues
- ◆ conclusion

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## Background - Protocol Values

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- ◆ many values are used in network protocols
  - both numbers & strings
- ◆ to identify nodes
  - e.g., IP Addresses & domain names
- ◆ to differentiate applications
  - e.g., IP ports (telnet vs. web)
- ◆ to define options within an application
  - e.g., TELNET line vs. character mode
- ◆ data types
  - e.g., MIME email media types

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## Background, contd.

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- ◆ assignments must be unique and consistent
  - both ends have to know "port 25" means email
- ◆ therefore must have an assigning authority and a repository of values
  - multiple categories of values
    - e.g. telnet options
  - with rules to create additional instances in category
  - new categories come from new applications

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## Assigning Internet Values

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- ◆ Internet value assignment & recording mechanism predates the Internet
- ◆ started at the beginning of the ARPANET
- ◆ continuity of responsibility for more than 25 years
- ◆ documented in RFCs (IETF publication series)

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## RFC History

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- ◆ many RFCs include value assignments
  - 1st RFC ( 7 Apr 1969) *Host Software*  
specified use of values
  - RFC 204 ( 5 Aug 1971) *Sockets in use*
  - RFC 717 (1 Jul 1976) *Assigned network numbers*  
updated regularly ever since
- ◆ now on-line
  - <http://www.iana.org/iana/assignments.html>

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## Other Things to Assign

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- ◆ IP Addresses
- ◆ Top Level Domain Names

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## IP Addresses

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- ◆ Internet Protocol defined in 1981
  - RFC 791 ( 1 Sep 1981 ) *Internet Protocol*
  - uses 32-bit IP Address as interface ID and locator
  - 44 Class A IP Addresses assigned in RFC 790

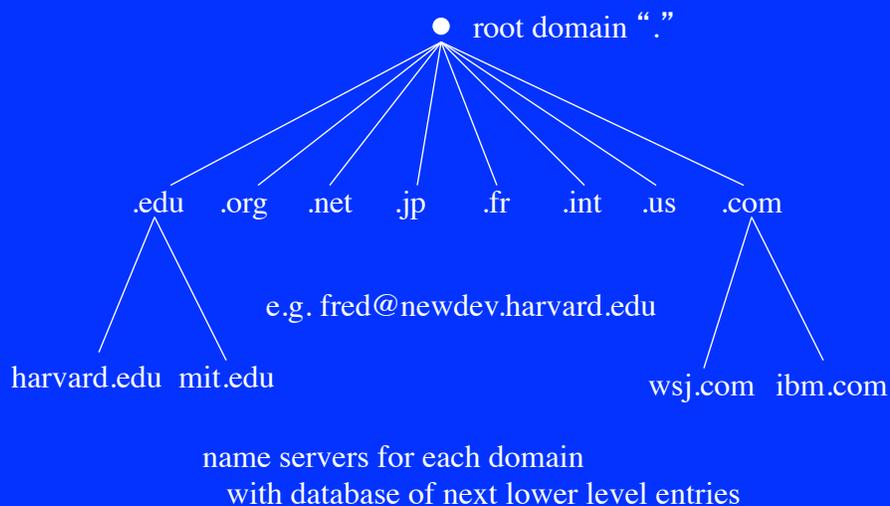
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## Top Level Domains

- ◆ domain names - user-friendly host reference
  - initially conversion to IP Address used table lookup
  - now distributed databases on DNS servers
  - multi part and hierarchical - right most part is TLD
  - RFC 819 ( 8 Feb 1982 ) *Computer mail meeting notes*
    - assigned 1st top level domain (TLD) - .ARPA
  - RFC 920 ( 1 Oct 1984 ) *Domain requirements*
    - added .GOV, .EDU, .COM, .MIL, .ORG
    - and 2 letter country code TLDs

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## Domain Names



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## Assignment Authority History

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- ◆ initially an ad-hoc function  
adjunct to RFC Editor
- ◆ performed initially by Jon Postel then by the IANA  
1969 - 1973 - UCLA  
1973 - 1974 - Mitre Corporation & Keydata  
1974 - 1977 - SRI International  
1977 - 1998 - USC / ISI
- ◆ under ARPA (DARPA) funding
- ◆ Internet Assigned Numbers Authority (IANA)  
name established in 1989

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## Current IANA Responsibilities

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- ◆ IP Addresses
- ◆ Domain Names
- ◆ Root Domain
- ◆ Protocol Parameters

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## IP Addresses

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- ◆ actual assignments performed by regional registries
  - non-profit geographically based organizations
  - ARIN, RIPE, APNIC
  - additional registries expected
- ◆ IANA
  - cooperates in establishing allocation guidelines
    - e.g. RFC 2050 (Nov 1996) *INTERNET REGISTRY IP ALLOCATION GUIDELINES*
  - reviews complaints about registries
  - allocates blocks of addresses to registries

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## Domain Names

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- ◆ IANA only deals with top level domains
  - e.g. .edu, .jp
- ◆ two types
  - country code Top Level Domains - ccTLDs
  - generic Top Level Domains - gTLDs

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## ccTLDs

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- ◆ based on ISO 2 letter country codes
  - e.g., .fr, .jp, .us, .gn
  - note: IANA does not create countries
- ◆ IANA records a registrar for each ccTLD
- ◆ may have to help resolve disputes between competing organizations
  - generally “settle it yourselves”
  - but governments seem to carry big sticks

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## gTLDs

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- ◆ current gTLDs:
  - .com, .net, .org, - general use
  - .edu - 4 year colleges and universities
  - .int - international treaty orgs and Internet databases
  - .gov, .mil - US government & US military
  - .arpa - reverse lookup of IP Addresses
- ◆ most managed by Network Solutions Inc.
  - under cooperative agreement with US National Science Foundation
- ◆ many suggestions for more gTLDs

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## Root Domain

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- ◆ IANA is responsible for the contents of the database that points to TLD registries
  - i.e. defines what TLDs are globally reachable
- ◆ currently includes 230 ccTLDs and 7 gTLDs
  - (.arpa is infrastructure function run by IANA)
- ◆ also list of root nameservers used to configure local nameservers
  - `ftp://ftp.rs.internic.net/domain/named.root`

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## IANA Past & Future

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- ◆ past - US government funded
  - much confusion over management of gTLDs
- ◆ future - self-sustaining non-profit corporation

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## IANA, Inc.

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- ◆ under active development
- ◆ organizational structure in flux
- ◆ today' s fuzzy snapshot

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## Why an IANA

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- ◆ historical continuity
  - prevent perception of a power vacuum
- ◆ outside review of infrastructure policies
  - help ensure fair procedures
- ◆ default home for new infrastructure functions
  - many new ones on the horizon
- ◆ prevent proliferation of infrastructure organizations
  - minimize the number of organizations that must be supported

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## IANA Board of Directors

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- ◆ hire executive director
  - oversee budget
  - apportion IANA costs
  - manage DNS root domain
- ◆ oversee policy setting process
- ◆ provide for legal review of policies in development
- ◆ accept (or reject) proposed policies
- ◆ review appeals of alleged process violations

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## Advice Committees

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- ◆ provide advice to IANA board
- ◆ focus of policy & procedure development
- ◆ Address Committee
- ◆ Names Committee
- ◆ Protocol Committee
- ◆ Industry and User Committee

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## Address Committee

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- ◆ representatives of the IP Address registries
  - 3 from each registry
  - additional registries expected
  - others may be added by Executive Director
- ◆ develops IP Address policy guidelines
  - policies must support and promote industry self governance and permit entry of new ISPs

## Name Committee

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- ◆ representatives of domain name management groups - who is still an open issue
  - POC / CORE
  - country code TLDs
  - whatever happens to .com
  - others may be added by Executive Director
- ◆ develops domain name policies
  - policies for new TLDs
  - policies for assigning registrars for ccTLDs

## Protocol Committee

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- ◆ IETF function
- ◆ Protocol Committee may be IAB (for the IETF)
- ◆ controls protocol parameter assignments

## Industry and User Committee

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- ◆ representatives of industries that use the Internet  
not just ISPs
- ◆ representatives of the users of the Internet  
e.g. consumer advocacy groups
- ◆ fee - based membership

## IANA Board Membership

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- ◆ 9 members
  - 3 year terms - limit 6 years
- ◆ selected by independent support groups providing funding for IANA
  - 2 by IP Address Organization
  - 2 by Name Organization
  - 2 by Protocol Organization (IAB)
  - 3 by Industry and User Organization

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## Support Organizations

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- ◆ addresses
  - GAR?
- ◆ names
  - TLD managers
- ◆ industry
  - new group or ISOC
- ◆ protocol
  - IETF - \$ from ISOC

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## Open Issues

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- ◆ what is a legit name organization?
  - get to create gTLDs
- ◆ rules for new IP Address registries
  - note exclusive territories
  - management of a scarce resource
  - RFC 2050 policies have extended life of IPv4 address space

## Base Questions

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- ◆ what authority would IANA, Inc. have?
  - e.g. who says what new gTLDs
- ◆ how is IANA authority established?
  - very long history
  - very successful history
  - but no “legal basis”
    - but what does legal mean for / in / on the Internet?
  - what government blessing is needed?
    - which government(s)?
    - what does government blessing mean in the Internet?

## Conclusion

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- ◆ 1st pass at answering the 2 basic Internet governance questions

Who says who makes the rules?

Who pays for what?