Measuring the Impact of the Integrated Infrastructure for Voice Video and Data on Traditional Telephone Services and Administration

Scott Bradner
Harvard University / IETF / ISOC / ARIN
sob@harvard.edu

Outline

- Internet domain names
- Internet administrative infrastructure
- role of government
- role of traditional telecommunications bodies
- domain name administration
- intellectual property rights and domain names
- dispute resolution
- phone numbers in the Internet
- complications

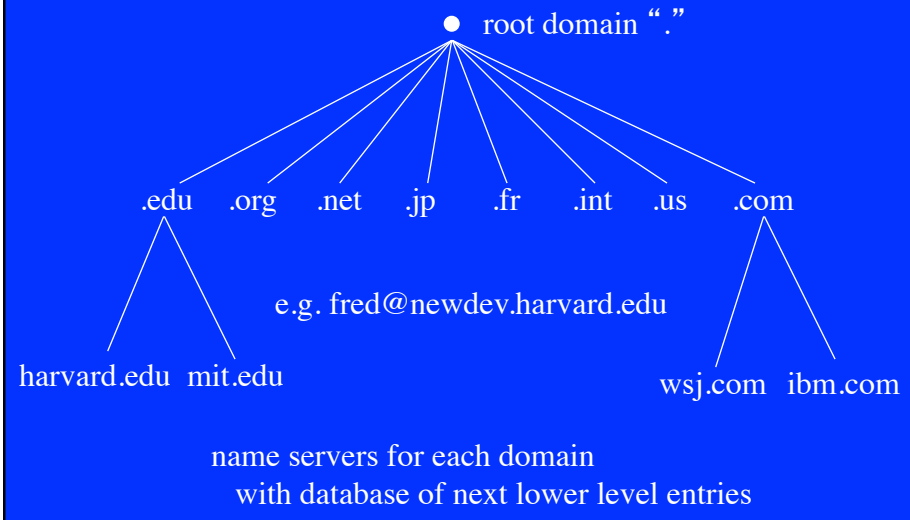
Internet Addressing

- every node reachable through the Internet has its own unique IP address
  e.g. 128.103.8.36
- 32-bit value - ~4 billion total
  < 1/3 currently assigned
- can be temporarily assigned number - e.g., DHCP
- could be a mapped number - e.g., NAT box
- but hard to remember
- changes when network is reconfigured

Internet Domain Names

- domain names - user-friendly host reference
  initially conversion to IP Address used table lookup
  now distributed databases on DNS servers
  domain name is long term, IP address can be short term
- 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

Domain Names



Administrative Infrastructure

- 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

Current IANA Responsibilities

- IP Addresses
  - delegate to regional registries - ARIN, RIPE, APNIC
- Domain Names
  - only top level domains (TLDs)
    - country code TLDs - ccTLDs
    - generic TLDs - gTLDs
- Root Domain
  - control file for root servers
- Protocol Parameters
  - record values for IETF standards process

irr - 7

ccTLDs

- 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

irr - 8

gTLDs

- 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

Root Domain

- 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

IANA Past & Future

- past - US government funded
  - much confusion over management of gTLDs
- future - self-sustaining non-profit corporation proposed by US government "Green Paper"
  - through comment period - new version due soon

irr - 11

Why an IANA

- 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

irr - 12

Green Paper Proposal

- IANA, Inc.
  - board from IP & DNS registries, IETF, industry & public
- IP addresses
  - assigned through regional registries as now
- ccTLDs
  - managed through country-based registries as now
- gTLDs - split registries and registrars
  - gTLDs assigned to specific registry (technical requirement)
  - for-profit registries (an issue) and registrars (no issue)
  - all registrars able to register in all registries (some issue)

irr - 13

DNS Fight

- basic fight over ownership of gTLDs
  - if for-profit the potential big revenue stream
    - e.g., NSI "owns" .com - > $200 M revenue to date
  - assumption is that marketplace will fix abuses
    - but very hard to change domain name
      - need to "unwind the web"
- also - who says what new gTLDs
  - trademark lawyers want no new gTLDs
  - some people want a few new gTLDs
  - some people want no limit on gTLDs

irr - 14

POC / CORE

- IANA asked ISOC to support the development of a plan to expand the number of gTLDs
  - before the US government started to look at the issue
- ISOC formed the International Ad Hoc Committee (IAHC) members representing many organizations
  - US government, ISOC, IETF, ITU, WIPO & IANA
- proposed non-profit registry and multiple registrars
- proposed 7 new gTLDs (to start)
- MOU managed by the ITU
  - ~200 signers of MOU and > 80 registrars
  - on hold pending US government actions

irr - 15

Role of Government

- US government has been paying for the IANA
  - IANA acting as an agent of US government
- US government paid for initial technology development
- stated plan in Green Paper is to move all to non-governmental private corporation - IANA, Inc.
  - some worry about exact wording in Green Paper
    - looks like US government wants to stay in control
    - a problem for other governments - many support the poc / core proposal

irr - 16

Role of Traditional Telcom. Bodies

- most traditional telecommunications bodies have ignored the Internet
  - that is changing - Internet is too big and too much money
  - European governments support strong ITU role
- ITU involved in POC/CORE
  - keeps the MOU - non-voting representative on POC
- alternative if private organization proposed by Green Paper fails

irr - 17

Current Domain Name Administration

- ccTLDs administered by "local" registry
  - selected by IANA
- .mil & ,gov administered by US government
- .com, .edu, .net & .org administered by NSI under NSF cooperative agreement
  - up in September 1998
  - flat fee
    - was $100 for 2 years, $50 / year after that
      - with 30% to infrastructure fund
    - infrastructure fee no longer collected (as of 1 April)

irr - 18

IPR and Domain Names

- domain names can look like trademarks
  - www.microsoft.com
- and be used to mislead
  - claim in roadrunner case
- trademark owners have to defend trademark or could lose it
  - means challenges even when little confusion potential
- problem comes from use of DNS as a directory service

DNS Functions

- database used to
  - return an IP address if given a name
  - return a name if given an IP address
- surrogate directory service
  - locate a known organization
  - easy to remember "names"

DNS as Database

- basically no current technical problem
- scaling issue in the future
  - .com currently >600K names
  - not clear when it will be a problem
- some worry about size of zone transfers
  - Incremental Zone Transfer (RFC 1995) may help

DNS as Directory

- users assume that a DN relates to a company name
- want to be able to "guess"
  - IBM's web page ***must*** be at "www.ibm.com"
- assume easy to remember domain names
  - for business card email address
  - note: "easy to remember" phone numbers are not assumed

DNS as Directory-bounded names

- in non-DNS world a name is bounded by
  - geography
  - line of business
  - logo
  - full name
- DNS names bounded only by higher level domain
  - e.g., - .com is global

Advantages of Bounding

- restrict scope of lookup
  - just use yellow pages for Seattle
- additional qualifiers
  - Acme Glass not the same as Acme Pizza
  - Acme Glass in Seattle not the same as Acme Glass in Boston

DNS != Directory

- the DNS does not make a good directory
- have to define / develop a good directory
  - web-based search engines would work for many needs
  - do not deal with email address problem
- known this for years - but still a problem
- X.400 is part of the problem
  - because it "fixed" the issue but was far too complex
  - some people just want to use X.400
  - others fear that any attempt to address issues will create new X.400

irr - 25

Dispute Resolution

- because DNS is used as a directory service
- disputes are normally over trademark rights
- resort to courts from time to time
  - not often but still a problem
  - a real problem of TLD coverage not a single legal jurisdiction - e.g. all gTLDs
  - which is why trademark lawyers do not want more gTLDs
  - more places for conflict

irr - 26

Dispute Resolution for NSI

- NSI has defined a dispute resolution process for .com, .net and .org
- can present NSI with copy of trademark registration
  - must be exact match to disputed domain name
    - "Harvard" is not enough to stop "HarvardYard.com"
  - must include documentation of attempt to otherwise stop infringement
- NSI will put name "on hold" until told what to do by a court or name owner lets go

irr - 27

Other Dispute Resolution

- POC / CORE proposed arbitration overseen by WIPO
  - includes exclusion list - trademark holder can register trademark to block use by others
    - small fee to register
    - large fine if false trademark claim
- Green Paper required a dispute resolution process be defined for each registry
  - but does not say what it should be

irr - 28

Phone Numbers in the Internet

- Internet FAX and phone involve phone numbers
- may need to map domain name to POTS phone number
- may need to map POTS phone number to domain name / IP address
- proposals to use domain name system for this

Domain Names to Phone Numbers

- add a new data type in DNS entry
- DNS servers already have many types of data

  IP address, mail exchanger address, computer type, security information, etc.
- add a new type so that when domain name is looked up a relevant phone number can be returned

  might be more than one type

  POTS phone number, POTS FAX number, IP telephony DNS name, Internet FAX DNS name

Phone Numbers to Domain Names

- already have reverse lookup for IP addresses
  - returns domain name when given an IP address
  - used in network management and security
- use same mechanism for phone numbers
  - a version proposed in 1994 (RFC 1703)
    - as part of an Internet-based FAX distribution service

TPC.INT

- create special domain names from phone numbers
  - +1 617 495 1000 would be
    - 0.0.0.1.5.9.4.7.1.6.1.tpc.int
    - .int is the existing TLD for Internet databases
- program, not human created, pseudo domain name
- process from right to left
  - just like other domain names
  - goes to server for the 1.tpc.int domain
  - then to the server for the 6.1.tpc.int domain
  - etc.

TPC.INT, contd.

- each level has information for its subdomains
  - tpc.int has database of 1st digits of country codes
  - 10 subdomain servers have database of next level etc
- could do country code as a unit
- many issues
  - e.g. who runs servers?
    - restraint of trade opportunity
- work starting in a number of standards bodies

Complications

- governance is an ongoing issue
  - who says who makes the rules?
  - Internet is now too important to ignore
- trademark issues can not be resolved
- who runs Internet-based infrastructure services
  - 2nd level DNS now volunteer effort - time to change
  - but who pays for what?
- scale
  - designing to support 100,000 means failure

I wish you all luck