An Introduction Internet Protocol and Domain Names

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## Technical and Policy Interactions

What is IP?

Why does it matter?

What is DNS?

What is the interaction between IP and DNS?

Why does DNS Matter?

Where are we now?

IP: The Internet Protocol

- **There must be coordination of IP address assignment**
- **There is no central directory which correlates IP address with location**
- **IP is the structure, the core, the one thing that must work on the Internet**

How Routing Works: A Bad Analogy

- **Packets are postcards: imagine we are all mail carriers**
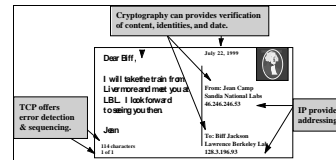
Imagine there is no Central Post Office -- no 411, no 555-1212

- **How do you get the message delivered?**
  - **do NOT try to develop your own complete directory**
  - **do try to develop a network**
  - **imagine the Internet a social network**

Name	Location	Can Connect To
Carlos	Chicago, Milwaukee	Pittsburgh (1) Philadelphia (2)
Cathy	Dallas, Austin, SF	San Francisco (3) San Juan (8), Austin (1)
Catlin	Charlotte, Atlanta	Jacksonville (2), Miami (3)
Carter	Oklahoma City	almost anywhere

Updating Information

- **People share information, update routes**

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What Does This Imply?

- **The Internet is a network of trust**
  - bad routing information can cause damage to the extent it is trusted
  - a company claiming an IP address will be trusted until disruptions are detected
  - routing errors thus far have been primarily errors, not bad faith

- **The Internet is decentralized, no core in IP**
  - no central obvious target
  - almost anyone can screw it up
  - but no one can break it completely

What is DNS?

- **Domain Names are a set of mnemonics so that people don't have to remember IP address**
  - jean_camp@harvard.edu is easier than jean_camp@128.103 and
  - jean_camp@bullwinkle.ksg.harvard.edu is easier than jean_camp@128.103.190.164

IP:DNS

- **A Domain Name must correlate to an IP address.**

- **Many Domain Names can point to one IP address.**

- **One IP address must correlate with one network or machine at any one time**

- **The first thing to do in a route is to find the IP that corresponds to the Domain Name (bind)**

- **Domain names are static**
  - IP addresses change (dynamic IP, IP sprayers...)

What is DNS

- **There are top level generic domains**
  - gov, com, org, net, mil

- **Top level country code domains**
  - fr, uk, tv,

- **Second level domains**
  - harvard.edu

- **Third & fourth level domains ....**
  - ksg.harvard.edu
  - bullwinkle.ksg.harvard.edu

Domain Name Allocation

- **Domain names are assigned at each level by the higher level**
  - Harvard assigned ksg.harvard.ed
  - Kennedy School assigned bullwinkle.ksg.harvard.edu

- **The $1,000,000,000 question:**
  - Who assigns .net, .com, and .org?

Regional Domain Names Use

Region	Hosts in Jan. 96	Hosts in Jan. 97	Hosts in Jan. 98	Hosts in Jan. 99
North America	7,088,754	11,216,036	20,302,652	33,702,867
Western Europe	2,699,559	4,352,152	5,537,049	9,300,942
Eastern Europe	168,142	238,580	443,191	694,723
Middle East	44,484	58,930	103,925	211,824
Africa	84,715	104,838	199,958	284,912
Asia	672,495	1,006,664	1,661,034	3,089,659
Pacific	475,505	647,948	916,538	1,066,398

Institutional Domain Name Use

Legend:
- .com
- .net
- .org
- .mil
- .edu
- int'l & gov
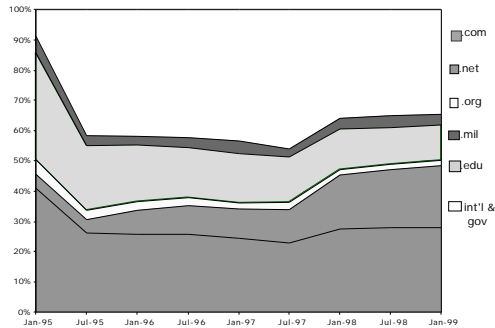
Why Does DNS Matter?

- **DNS is the Centralized Element**
- **When Domain Names are removed, it is possible to effectively remove from a site the Internet's power to reach out to many**
- **It is not possible to remove the group or person from the Internet**
  - Taking a domain name 'soapbox' limits the set of users who will access content
  - Not silenced but no longer effective

Details, details....

- **Ownership**
  - Who owns a word? "Workingwomen", "nike", "Gore", "catfood"
- **Speech**
  - When is a domain name speech?
    » netscapesucks.com or netscapesucks.org
    » godhatesfags.com, godlovesfags.com
    » GWBush.com
  - Or property?
    » nike.com
- **Governance Principles**
  - Who defines speech and property?
  - Who decides who defines?

Cases to Consider

- **GWBush.com**
  - Satirical site, links to the campaign's site
  - Deeply opposed by GWBush
- **Cybersquatters vs. first movers**
  - First movers have an advantage
  - What if the first movers are critics?
    » People Eating Tasty Animals ... peta.org

ICANN

- **First there was Jon Postel: from the self-organizing meritocracy of scientific research**
- **IANA, a first attempt to move from meritocracy to institution, Jon still critical**
- **ICANN came from IANA**
- **A self-organizing meritocracy develops formal structures as powerful interests become involved**

ICANN: Core Questions

- **What illustrates consent of the governed in the Internet?**
- **ICANN decides *how* the decision of *who* determines rules of DNS is made**
- **How is one board bound by decisions of previous board**
- **Is there a DNS Bill of Rights? For whom?**
  - Iproperty owners, domain name holders, readers, speakers...

ICANN's Charge

- Answer previous questions
- Meet the needs of all stakeholders
- Be representative
- Be Quick
- Note: not all simultaneously possible

NSI

- Consecutive in time with IANA
- US government has no interest in administering DNS
- Then there was early market governance
  - NSF contracted out as .com gold rush began
  - NSI monopoly
  - Market discipline
- Market oversight only works in theory with competition

Current State of Affairs

- Network Solutions Monopoly on gTLD
  - American law rules NSI
  - American law rules the Internet world (in that it is ruled)
  - Monopoly is being phased out
  - Speech discounted, early movers discounted
    - PETA.org, workingwomen, veronica
  - ICANN proposes market discipline
- ICANN and NSI
  - Tilt the balance between speech and property towards property WIPO proposals would provide mechanisms to eliminate the Internet as an effective platform for speech threatening to interests of intellectual property holders

An Example

- "Network Solutions has a right founded in the First Amendment to the US Constitution to refuse to register, and thereby publish, on the Internet registry of domain names words that it deems to be inappropriate. Additionally, Network Solutions' outside counsel has advised us that the Supreme Court of the United States has held that no corporation can be compelled to engage in publication which that corporation finds to be inappropriate."
- "Whether [ICANN] will have any such rules or not remains to be seen. It'll be up to the board." Sims

Controllers of DNS Can...

- Alter the balance between speech & property by removing any domain name contested as property
  - Change the current balance of power of speech between
    - the George Bush campaign & GWBush.com
    - microsoftsucks.com and Microsoft
- Prevent a specific type of misrepresentation
- Remove domain names or alter ownership
- Connect individual responsibility to authorized use of a site

Controllers of DNS Cannot..

- Police the Internet
- Remove a single machine from the Internet if it is attacking, etc.
- Prevent misinformation

What Price Internet Property?

- **What are the costs of erring on the side of speech and property, respectively?**

- **For which, if either, can there be remedy after the fact?**

- **This will be the last year that the majority of new websites are in English... it isn't going to get easier as the Web gets wider**