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

Updating Information

- People share information, update routes

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Can Connect To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlos</td>
<td>Chicago, Milwaukee, SF</td>
<td>Pittsburgh (1), Philadelphia (2)</td>
</tr>
<tr>
<td>Cathy</td>
<td>Dallas, Austin, SF</td>
<td>San Francisco (1), Austin (1)</td>
</tr>
<tr>
<td>Catlin</td>
<td>Charlotte, Atlanta</td>
<td>Jacksonville (2), Miami (3)</td>
</tr>
<tr>
<td>Carter</td>
<td>Oklahoma City</td>
<td>almost anywhere</td>
</tr>
</tbody>
</table>
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@128.103.190.164
  - 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.edu
  - Kennedy School assigned bullwinkle.ksg.harvard.edu
- The $1,000,000,000 question:
  - Who assigns .net, .com, and .org?

Regional Domain Names Use

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>7,088,754</td>
<td>11,216,036</td>
<td>20,302,652</td>
<td>33,702,887</td>
</tr>
<tr>
<td>Western Europe</td>
<td>2,699,559</td>
<td>4,352,152</td>
<td>5,537,049</td>
<td>9,500,942</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>168,142</td>
<td>238,580</td>
<td>443,191</td>
<td>694,723</td>
</tr>
<tr>
<td>Middle East</td>
<td>44,484</td>
<td>58,930</td>
<td>103,925</td>
<td>211,824</td>
</tr>
<tr>
<td>Africa</td>
<td>84,715</td>
<td>104,838</td>
<td>199,958</td>
<td>284,912</td>
</tr>
<tr>
<td>Asia</td>
<td>672,495</td>
<td>1,006,664</td>
<td>1,661,034</td>
<td>3,089,659</td>
</tr>
<tr>
<td>Pacific</td>
<td>475,505</td>
<td>647,948</td>
<td>916,538</td>
<td>1,066,398</td>
</tr>
</tbody>
</table>
### Institutional Domain Name Use

- **.mil**
- **.edu**
- **.org**
- **.net**
- **.com**

### 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, working women, veronica
  - ICANN proposes market discipline
- ICANN and NSI
  - Tilt the balance between speech and property towards property

ICANN proposes market discipline

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. If it will 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