Yeti DNS
ICANN 53 Tech Day
Shane Kerr / BII Lab
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Origin Story

Once upon a time at WIDE Camp, Davey Song and Paul Vixie were wondering if there was a way to research the DNS root server system without process or political issues.

"If only there was a way to look at technical questions in a scientific way... a way to strictly research... if only..."
DNS Root Server System

- 12 root server operators
- More than 475 anycast nodes

<table>
<thead>
<tr>
<th>Hostname</th>
<th>IP Addresses</th>
<th>Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.root-servers.net</td>
<td>198.41.0.4, 2001:503:ba3e::2:30</td>
<td>VeriSign, Inc.</td>
</tr>
<tr>
<td>b.root-servers.net</td>
<td>192.228.79.201, 2001:500:84::b</td>
<td>University of Southern California (ISI)</td>
</tr>
<tr>
<td>c.root-servers.net</td>
<td>192.33.4.12, 2001:500:2::c</td>
<td>Cogent Communications</td>
</tr>
<tr>
<td>d.root-servers.net</td>
<td>199.7.91.13, 2001:500:2d::d</td>
<td>University of Maryland</td>
</tr>
<tr>
<td>e.root-servers.net</td>
<td>192.203.230.10</td>
<td>NASA (Ames Research Center)</td>
</tr>
<tr>
<td>f.root-servers.net</td>
<td>192.5.5.241, 2001:500:2f::f</td>
<td>Internet Systems Consortium, Inc.</td>
</tr>
<tr>
<td>g.root-servers.net</td>
<td>192.112.36.4</td>
<td>US Department of Defence (NIC)</td>
</tr>
<tr>
<td>h.root-servers.net</td>
<td>128.63.2.253, 2001:500:1::803f:235</td>
<td>US Army (Research Lab)</td>
</tr>
<tr>
<td>i.root-servers.net</td>
<td>192.36.148.17, 2001:7fe::53</td>
<td>Netnod</td>
</tr>
<tr>
<td>k.root-servers.net</td>
<td>193.0.14.129, 2001:7fd::1</td>
<td>RIPE NCC</td>
</tr>
<tr>
<td>l.root-servers.net</td>
<td>199.7.83.42, 2001:500:3::42</td>
<td>ICANN</td>
</tr>
<tr>
<td>m.root-servers.net</td>
<td>202.12.27.33, 2001:dc3::35</td>
<td>WIDE Project</td>
</tr>
</tbody>
</table>

https://www.iana.org/domains/root/servers
Politics

- Root server system does not evolve
  - Roughly identical to 15 years ago
  - Stopped changing when Jon Postel died
- Presence & ”ownership” of root servers
  - Countries perceive as crucial infrastructure
  - US dominance of root servers a concern
- Feelings not grounded in technical issues
  - But still real!
Yeti DNS: An DNS Root Server Testbed

- Many things to test about the DNS root
  - DNSSEC parameters & operations
  - Root server renumbering
  - Adding/removing root servers
  - Scaling Limitations
  - IPv6-only operation!

- Cannot use production root servers
  - Large-Scale testbed (Yeti) vs. lab testing

https://yeti-dns.org
Yeti DNS: NOT a Alternate Namespace

- The Yeti DNS project uses the ICANN root zone.

- The Yeti DNS project is not intended to research the contents of the root zone.

- The Yeti DNS project is not about policy or political subjects.

https://yeti-dns.org
Yeti DNS: How It Works

IANA
via F.ROOT-SERVERS.NET

BII DM

WIDE DM

TISF DM

Yeti root.zone

Yeti root.zone

Yeti root.zone

Yeti Root Servers

https://github.com/BII-Lab/Yeti-Project/.../doc/Yeti-DM-Setup.md
Yeti DNS: Components

- Yeti Distribution Masters (DM)
  - Produce the Yeti root zone
- Yeti root servers
  - AXFR Yeti root zone from Yeti DM
  - Serve as DNS root servers
  - Capture traffic information
- Yeti resolvers
  - Use Yeti root servers
  - May capture traffic information
Yeti DNS: Who Does What

- Coordinators initiated & administer Yeti
- Yeti root operators run Yeti root servers
  - 12 root operators (will add more)
  - 1 in USA, 1 in Columbia, 7 in Europe, 3 in Asia
- Resolver operators send queries
- Experimenters propose & conduct experiments

https://yeti-dns.org/operators.html
Planned Experiments & Other Investigations

- Impacts of IPv6-only DNS
  - Bigger minimum packet size
  - Different IP-fragmentation model
- Changes in DNSSEC
  - KSK rollover, KSK/ZSK rollover frequency, algorithm, signature size
- Changes to root servers
  - Lots/few of root servers, churn in root server set
- And many more...
Example: Multiple-ZSK

- Try separate ZSK – 1 per DM operator
- Lab experiments first
  - Insure behavior is as expected in software
- Design & propose experiment to Yeti
  - Must document plan, outcome, and so on
- Run on Yeti platform
- Document results
Challenges

- Getting more root operators
  - Maybe you can help?

- Getting enough query traffic
  - University resolvers (BUPT as a model)
  - Mirroring real-world traffic
  - Measurement networks (RIPE Atlas)
Testbed or Prototype?

- **Testbed:**
  - A place to run experiments
  - Can break
  - Temporary

- **Prototype:**
  - Place to get ready for the production version

- Today Yeti is a testbed
- In the future perhaps a prototype
Status & Next Steps

• Platform Stable
  – Infrastructure, processes, and so on
• Have enough root servers to begin
  – More is always better
• Ready for experiments to start!
Yeti Coordinators

BII Group — the parent company of BII (Beijing Internet Institute), a public interest company serving as BII's Engineering Research Center.

WIDE — Widely Integrated Distributed Environment.

TISF — a collaborative engineering and security project by Paul Vixie.

https://yeti-dns.org