The Bootstrap Problem
WEIRDS WG, IETF 84
You can't get there from here

- RESTful servers can redirect to each other
- BUT …
- A client has to select an initial server
Numbers bootstrap

• Five major servers, the RIRs
• IPv4: each /8 has a “home” server
• IPv6: only 37 IANA allocations, none since 2006
• ASNs: over 2200 16-bit allocations, 5 32-bit
Names bootstrap

- Currently 314 TLDs
  - In principle, each has its own WHOIS
- About 300 different managers
  - Although many subcontracted
- Likely to be > 1000 more
Names issues

- Query rates vary a lot
  - > 200 query/second in .COM and .NET
  - < 200 query/week in .MUSEUM

- Policies vary a lot
  - Both what the registry knows and what they can publish
Bootstrap approaches

- Master server
- Static table
- Random
- DNS
The ideal that won't happen

• One master well known redirect server
• All queries start there
• Who's going to run a 200 q/s redirect server?
Static bootstrap

• Build the list into the client, or a static file

• Could work for IP addresses
  • IPv4 fully allocated, IPv6 almost never changes

• Maybe for ASNs
  • List is long but changes rarely

• Won't work for names
  • Changes too often
Random bootstrap

- Contact the closest server
  - It'll redirect if the info is somewhere else
- What RIR servers do now
  - Works because only five of them
DNS Bootstraps

- The simple idea: look up part of the object in the DNS to find a server
  - First /8 of IPv4, TLD of name, ...
- DNS can handle query volumes
- DNS management is already distributed
## The options so far

<table>
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<tr>
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<th>SRV</th>
<th>NAPTR</th>
<th>CNAME or A</th>
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<tbody>
<tr>
<td>In TLD</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>In ARPA</td>
<td>?</td>
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</tbody>
</table>
DNS Locations

• In TLD:
  • _nicname._tcp.TLD
  • whois-server-location.TLD

• In ARPA:
  • TLD.weirds.arpa
In the TLD

- TLD operator updates directly as needed
- Name has to be reserved
- Some TLDs have admin issues with 2LDs
- TLD can get SSL certs itself
- In gTLDs, may constitute a “registry service”
  - Requires ICANN process to approve
In ARPA

- Doesn't pollute TLD namespace
- Requires IANA help to manage entries
  - All from entities IANA already deals with
- Requires IANA help for SSL certs
Record types: SRV

• SRV: points to arbitrary server
  _weirds._tcp.TLD SRV 0 5 80
    weirds.server.net.
  _weirds._tcp.TLD SRV 0 5 443
    weirds.server.net.
Record type: NAPTR

• NAPTR: points to a URL

TLD NAPTR 100 10 "U" "weirds:http"

"!.*!http://weirds.server.net!" .

TLD NAPTR 100 10 "U" "weirds:https"

"!.*!https://weirds.server.net!" .
Record type: CNAME or A

- CNAME or A: is the server
  TLD.weirds.arpa. CNAME
  weirds.server.net
Record types (cont.)

• Exactly what SRV and NAPTR are intended for
  • NAPTR can say SSL or not, SRV can hint
• Many clients still can't look up SRV or NAPTR
  • Particularly web browsers
• Workarounds possible
  • Performance and security issues
Record types (cont.)

- CNAME or A gives each TLD's server a different name
  - Each needs its own SSL cert
  - Admin hassle for multi-TLD registries