

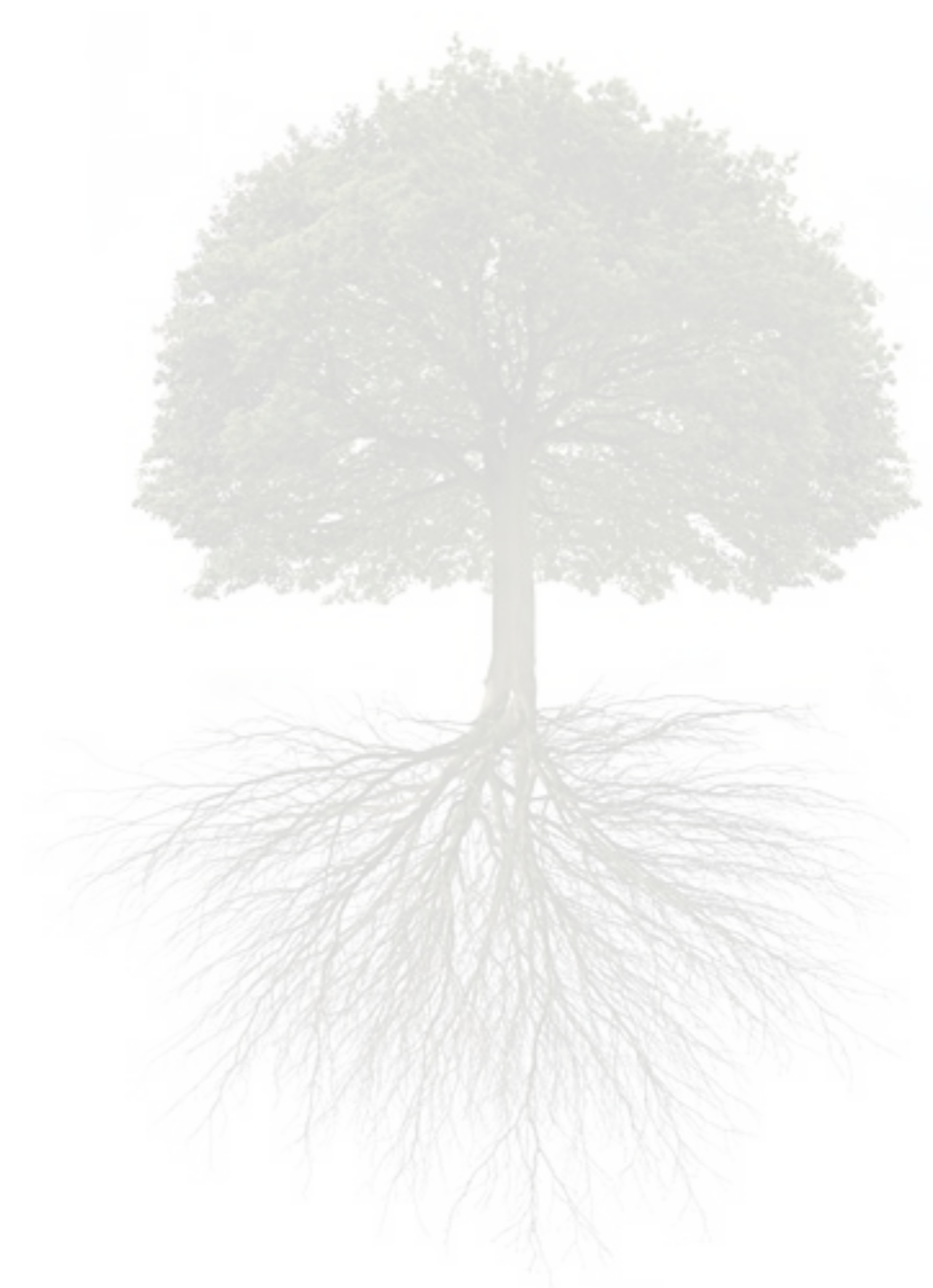


Thoughts on F-Root Futures

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What's the Point?

- What is a root server?
- Root server traditions
- Current root server realities
- Post mortem of root attacks
- New root server purpose
- Server management?
- More and smaller F-root servers





What is a Root Server?

- A root server is little known outside places like this
- Wikipedia states, “A root name server is a name server for the root zone of the Domain Name System (DNS) of the Internet.”
- But really a root server is just an IP address
- Some agent with that IP address agrees to maintain current data and to answer queries from it
- External forces guide your query to that agent

Root Server traditions

- In the beginning there were exactly 13 devices in the world that could answer root queries
- Each was 7.7% of the world's root service capacity
- Most root servers were in the USA; failure of one node outside the USA could damage root service for half the world
- Root servers were built and operated as if a matter of life and death

Current Root Server Realities

- root-servers.net listed 572 root server devices last month
- If one fails or is attacked, global capacity falls by 0.17%
- No longer necessary for every root server node to be built to space shuttle specifications
- Individual root servers have acquired a new role: sacrificial protection of the overall root system. (Think sacrificial anodes.)
- Yes, root servers must serve the root, but they also serve as attack targets, closer to the attacker

Post mortem of root attacks

- Historically, published post mortem analyses of root server attacks have counted failed servers
- Given current numbers, better to count those that didn't fail. How many were left standing? More than 13?
- Individual servers don't have to be bomb-proof
- Like a swarm of small animals, what matters is how many survive and not how many are eaten by lions

New root server purpose?

- Yes, a purpose of a root server is to serve the root
- A purpose of having hundreds of root servers is to give faster response times
- A new purpose of root servers is to be sacrificial: to absorb attacks that might reach other root servers
- Root servers nearer the edge will intercept attack traffic sooner

Server management?

- When classic root server systems fail, 25 pagers around the world ring
- Is there an F-Root small enough that if it fails you say "oh well" and plan to go fix it next month?
- Do small servers even have to be managed? What if you have so many that you can take roll weekly?

Current state of F-root

A stylized tree with a brown trunk and green foliage, growing out of a globe. The globe is light blue and white, showing the continents. The tree's roots are visible, extending into the globe. The background is white.

- 58 instances in 50 countries
- Most of them fill a rack
- Managed by exception when pager wails
- Requires notable ongoing support by experts

Smaller F-Root servers

- What would a smaller server look like? Where would it be deployed?
 - Single-box 1U rackmount: Dell based F single
 - Small form-factor standalone server devices: Beagle, Minnow, Pine
 - Software load in an existing device container: docker
 - Configuration addition to an existing device: RFC 7706

Questions?



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