Optimizing DNS Authority Server Placement

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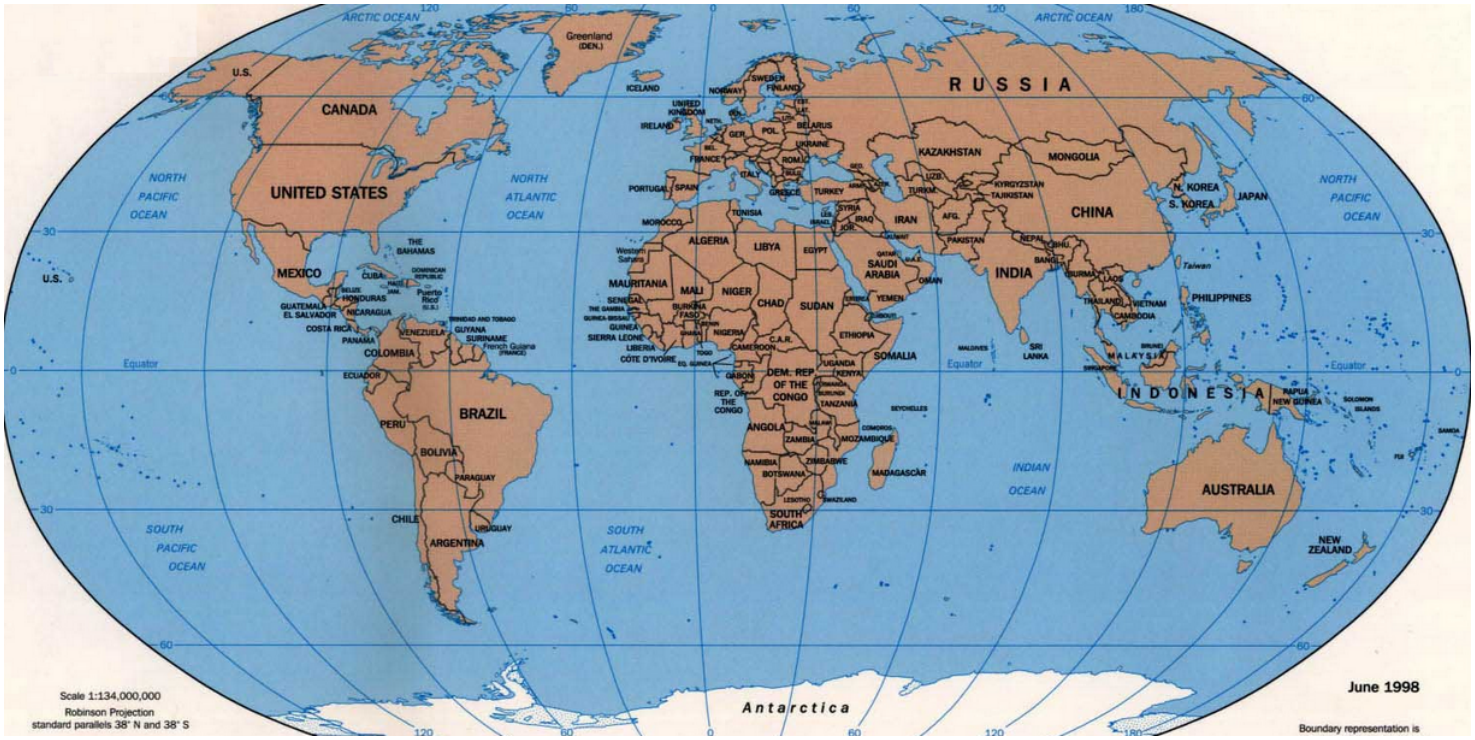
IETF 89, DNSOP

Background

- DNS system needs to be globally deployed in a distributed way
  - Preventing DDOS attacks
    - Mirror servers are needed especially when sudden DDOS occurs
    - E.g. root servers are globally deployed on more than 380 locations
  - Deployment of DNSSEC
    - More servers are needed due to the increase of CPU, memory and bandwidth resource
  - launch of new gTLDs
    - New DNS servers may be deployed

Problem Statement

- When considering deploying DNS authority servers, which locations are the best choice so that the DNS query delay and the deployment cost are minimized?



Use Case

- How to choose the optimal locations of all the DNS authority servers for a new gTLD?
- How to choose the optimal locations of new DNS authority servers for a TLD?
- How to make the optimal plan for adjusting the locations of the current DNS authority servers for a TLD?

DNS Server Placement Model (1/3)

- Factors need to be considered
  - DNS query delay
    - Average query delay between authority and recursive servers
    - Maximal query delay between authority and recursive servers
    - Others ?
  - Financial cost
    - Server cost
    - Energy cost
    - bandwidth cost
    - Others ?

DNS Server Placement Model (2/3)

- Input
  - Potential server locations (which may number in thousands even in tens of thousands)
  - RTT between potential locations and recursive servers (which can be samples from the whole sets according to certain policy for reducing complexity)
  - The price level on each potential locations
  - Others ?
- Output
  - The optimal locations of DNS authority servers
  - The optimal capacity of each location
    - The number of servers, the bandwidth, et al.

DNS Server Placement Model (3/3)

- Optimization goal
  - Minimizing financial cost on the condition that the DNS query delay is below its upper bounder; or,
  - Minimizing DNS query delay on the condition that the financial cost is within its budget
- Possible classic optimization algorithms for solving the model
  - Simulated-annealing Algorithm
  - Genetic Algorithm
  - Others ?

Open questions

- Is this topic in the scope of DNSOP WG?
- How many people interested in this work?
  - Document a draft
  - Review the draft

Any Comments?

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Thanks!