Influence Map of DNS Root Anycast Servers

This visualization shows the geographic distribution of DNS clients for anycast instances of the C, F, K, and M root servers based on 48-hour packet traces from each anycast instance beginning midnight UTC 9 January 2007. We provide two world maps for each root server, with each individual anycast instance for that root placed on the map at the geographic centroid of its observed clients. Wedges fanning out from each instance indicate the direction, distance, and number of clients observed in the direction indicated by the angle of the wedge.

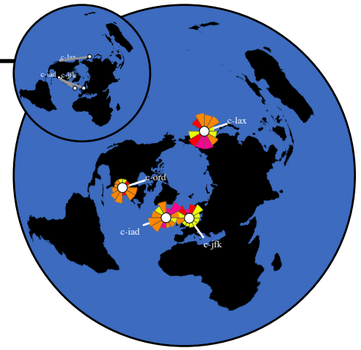
The number of instances, their geographic displacement (the distance between the geographic location of the instance and the geographic centroid of its clients), and the number of clients served by each instance illustrate differences in root server deployment policies.

Geographic and organizational diversification of top-level DNS anycast server instances improves the overall stability, scalability, and sustainability of the Internet through increased infrastructure and lasting international cooperation among nations.

C-root

4 global instances

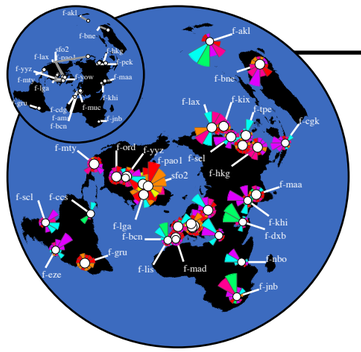
C-root deploys seven global instances, although we only have data from the 4 instances in the US. Of these four, only the Chicago (ORD) node has its geographic centroid in the US. The New York (JFK) and DC (IAD) instances primarily served a European client base. The client population for the Los Angeles (LAX) instance was primarily Asian.



F-root

2 global instances, 33 (of 41) local instances

F-root includes two global instances maintained by ISC in San Jose/San Francisco, CA; 41 local instances maintained by local hosting sites. Nodes on the Location Map that are not drawn on the Displacement Map serve mostly their own geographic region (they are not displaced).



K-root

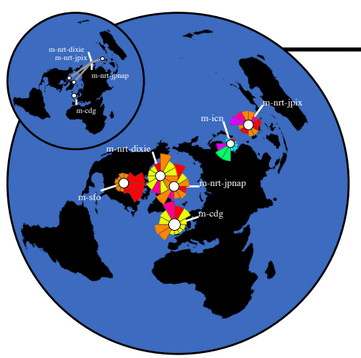
5 global instances, 5 (of 17) local instances

A large set of local instances provides good European coverage with more limited deployment in other geographic regions. The Moscow instance's poplua-tion is largely Asian, while Tokyo's global instance has a client population largely in Japan.

M-root

6 global instances

M-root includes 6 global instances with three instances in Japan, one in the US, one in Korea, and one in Europe. Despite their location in Japan, the two NRT nodes, DIXIE and JPNAP, have a global client population.



Server Key

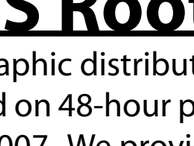
node: number of clients	halo: number of clients		
100	1	2-8	9-71
10,000	72-615	616-5,251	5,252-44,728
1,000,000	44,729-380,839		
100,000,000			

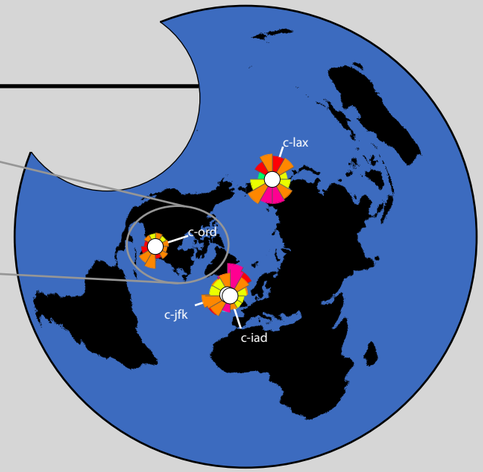
Location Map

To show the relationship between each instance and its clients, the location map (the larger ones, with the displacement maps inset) plots each server as a circle surrounded by a group of wedges. Each wedge represents the number and average distance of clients from the instance's centroid in the direction the wedge points. The color of the wedge represents the number of clients coming from the corresponding geographic region; its length represents the average distance to those clients. The size of the circle reflects the server's total number of clients.

node
number of clients (size)

wedge
number of clients (color)
average distance to clients (size)



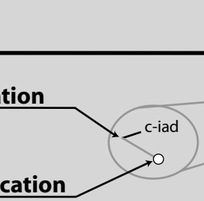


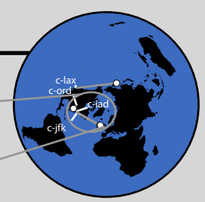
Displacement Map

For anycast instances whose actual location and centroid (i.e., geographic center of the client population) differ significantly, the smaller *geographic displacement* maps show this displacement of the clients relative to the queried instance. The displacement is depicted using a gray "drift" line beginning at the server's actual geographic location, marked by a text label, and ending at the geographic centroid location, marked by a white circle. A short drift line means the instance serves a mostly geographically local population of clients.

geographic location

displacement location





https// www.caida.org/research/dns/influence_map

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