DNS load visualization

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Introduction

• Any DNS operator, specially those running an anycast infrastructure, need to know if the load is well balanced between the nodes and which would be a right place to put a new node.

• The first question could be answered comparing simple query load graphs, but the second requires some work.

• The following visualizations are intended to help to answer that question.
  – Topological map
  – Geographic map
  – Geographic animated map
Query load per topological origin

- Anycast is based on routing protocols (mainly BGP).
- The selection of the placement for a new node should be ruled by the origin of the queries received, either by country or by AS.
- There is no strict correlation between geography and AS topology
  - One AS could span over several countries.
Query load per topological origin

• Methodology
  – Using a 6-hour packet trace from every node in the .CL anycast cloud and the BGP tables available on those nodes, we counted the number of queries from each origin AS.
  – The map shows AS relations, number of queries originated from those AS and their relation with the AS holding the anycast node.
  – In some cases, there are too many origin AS to fit into the plot. In those cases, only the set of AS representing at least 70% of the total query load are plotted.
Query load per topological origin
Query load per topological origin
Query load per topological origin

• Future Work
  – Node rearrangement based on geography
    • The chilean AS in one side, the rest of the world on the other
  – Include the flow of queries (origin AS to specific node)
  – Use the anycast nodes as the center of the graph.
  – Classify each AS using the categories.
  – Provide better metric on the map (RTT)
Geographic map

• There are several tools to represent the query load aggregated by “geography”
  – Like “root servers influence map” by Bradley Huffaker from CAIDA
• This visualization provides a different angle.
  – Each country is colored by the number of queries originated from there.
  – It is a vector-based format (not raster). Does not lose resolution when zoomed-in.
Geographic map

- Methodology
  - The same 6-hour packet trace used on “topology map”
  - Aggregate the query count by IP address
  - Map IP to country using NetAcuity
  - Aggregate by country
  - Give it to the code and plot it!
  - Uses linear scale
Geographic map

Queries per minute aggregated by country
seen at .CL anycast cloud
from 2007-04-18 11:00 to 2007-04-18 17:00 (CLT)
Geographic animated map

• The next step was prepare an animation showing the evolution of the traffic along the day.
  – Idea inspired by cuttlefish tool from CAIDA
• Methodology
  – One hour traces using dnscap (v1.0 RC4)
  – Generate aggregated traffic by source address using CoralReef (CAIDA tool, version 3.7.5)
  – Map address to geography using NetAcuity
  – Aggregate the query load by country
  – Plot the aggregated data using the home-grown tool.
    • One image per trace
  – Convert the image from vector to raster
  – Merge each image into an animation
Geographic animated map

- Snapshot of the animated map
Geographic animated map

• Future work
  – Receive comments and suggestion
  – Pack the tool
  – Improve documentation
  – Release it to the public