DNS load visualization

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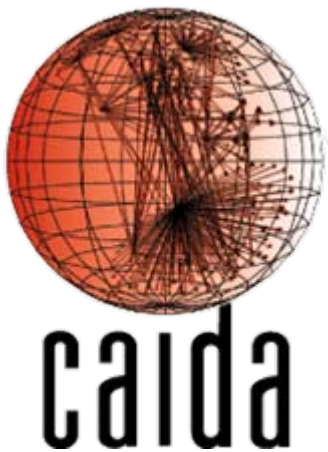

CAIDA
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Introduction

- 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

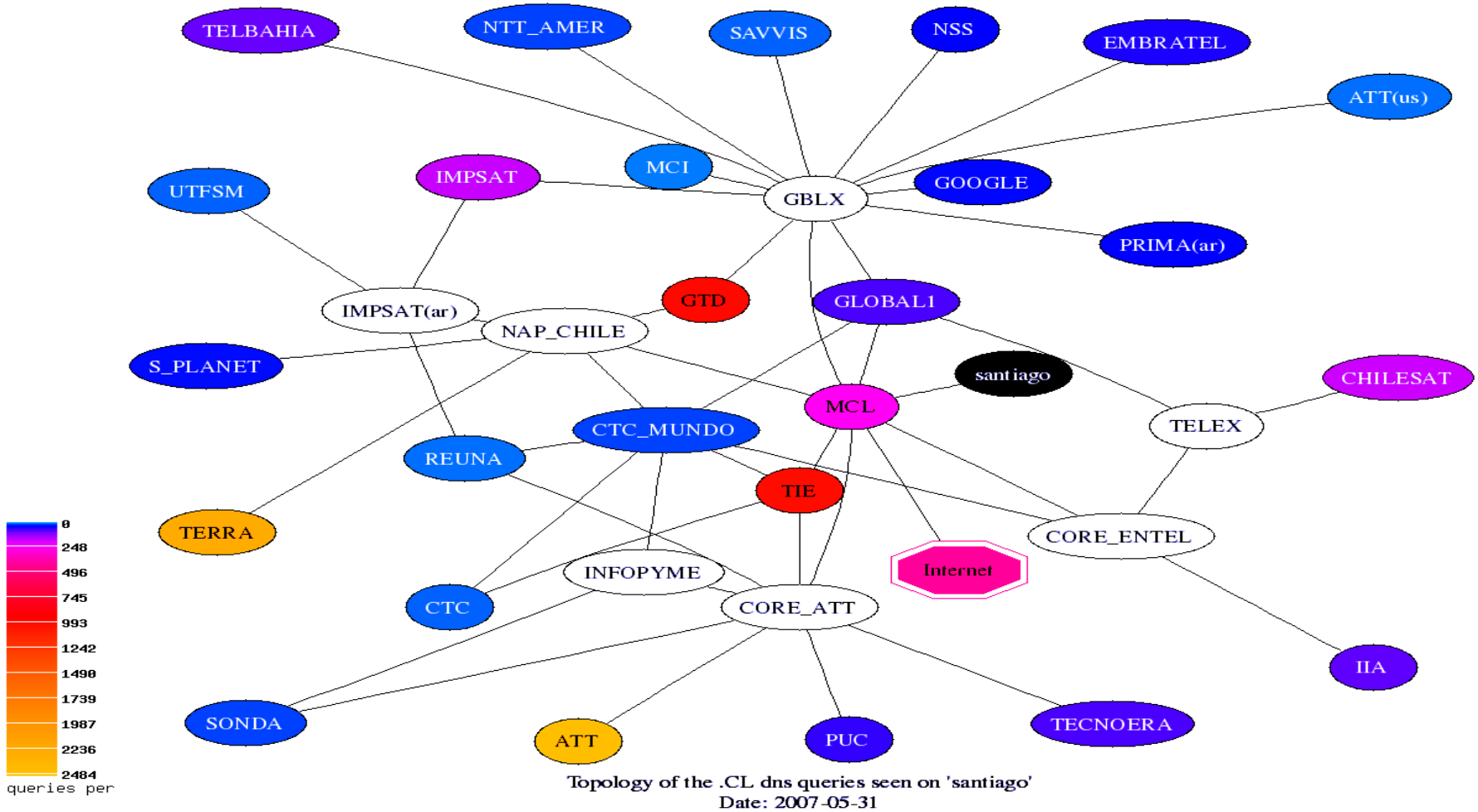
Query load per topological origin

- 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.

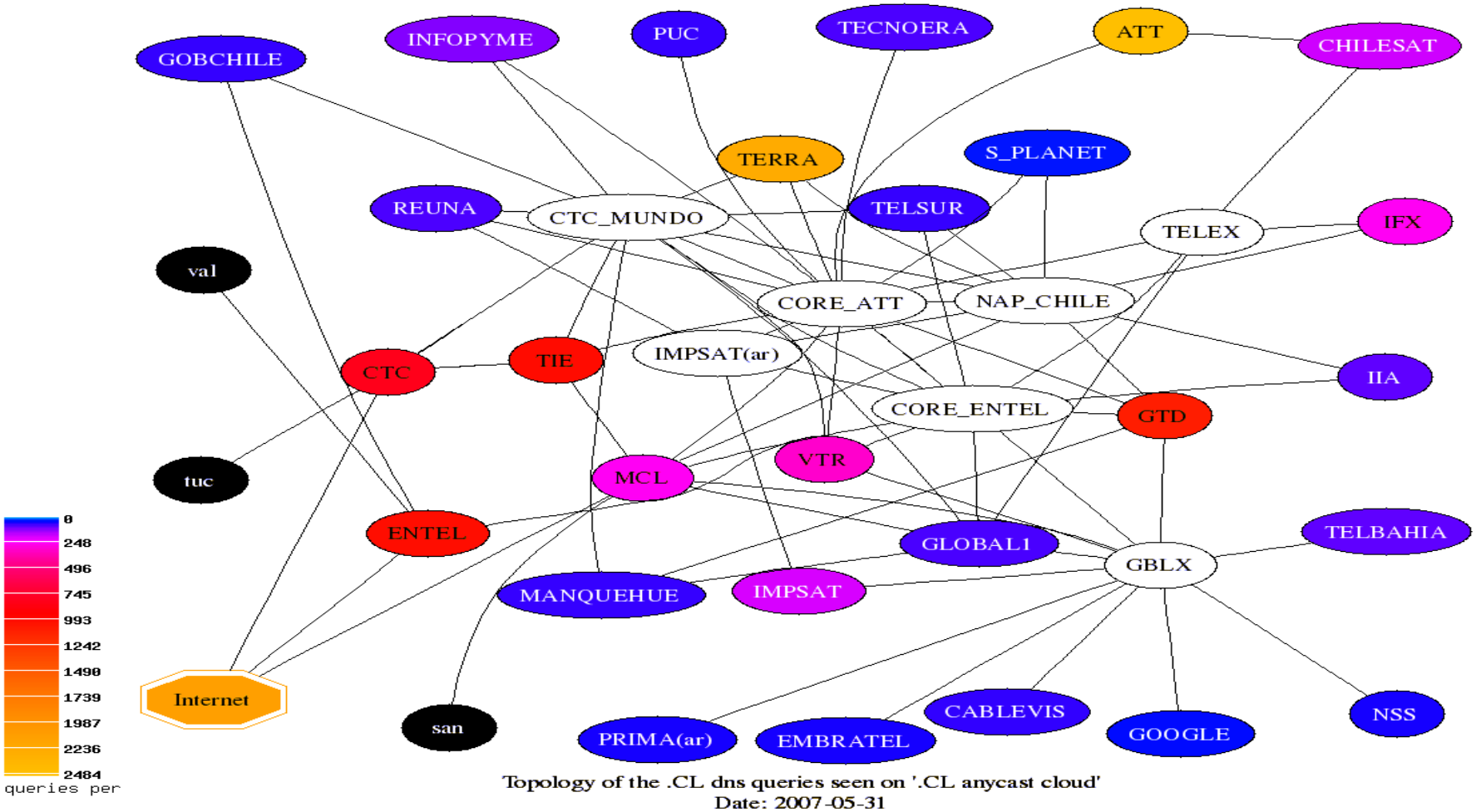
Query load per topological origin

- 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



Topology of the .CL dns queries seen on '.CL anycast cloud'
Date: 2007-05-31

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)

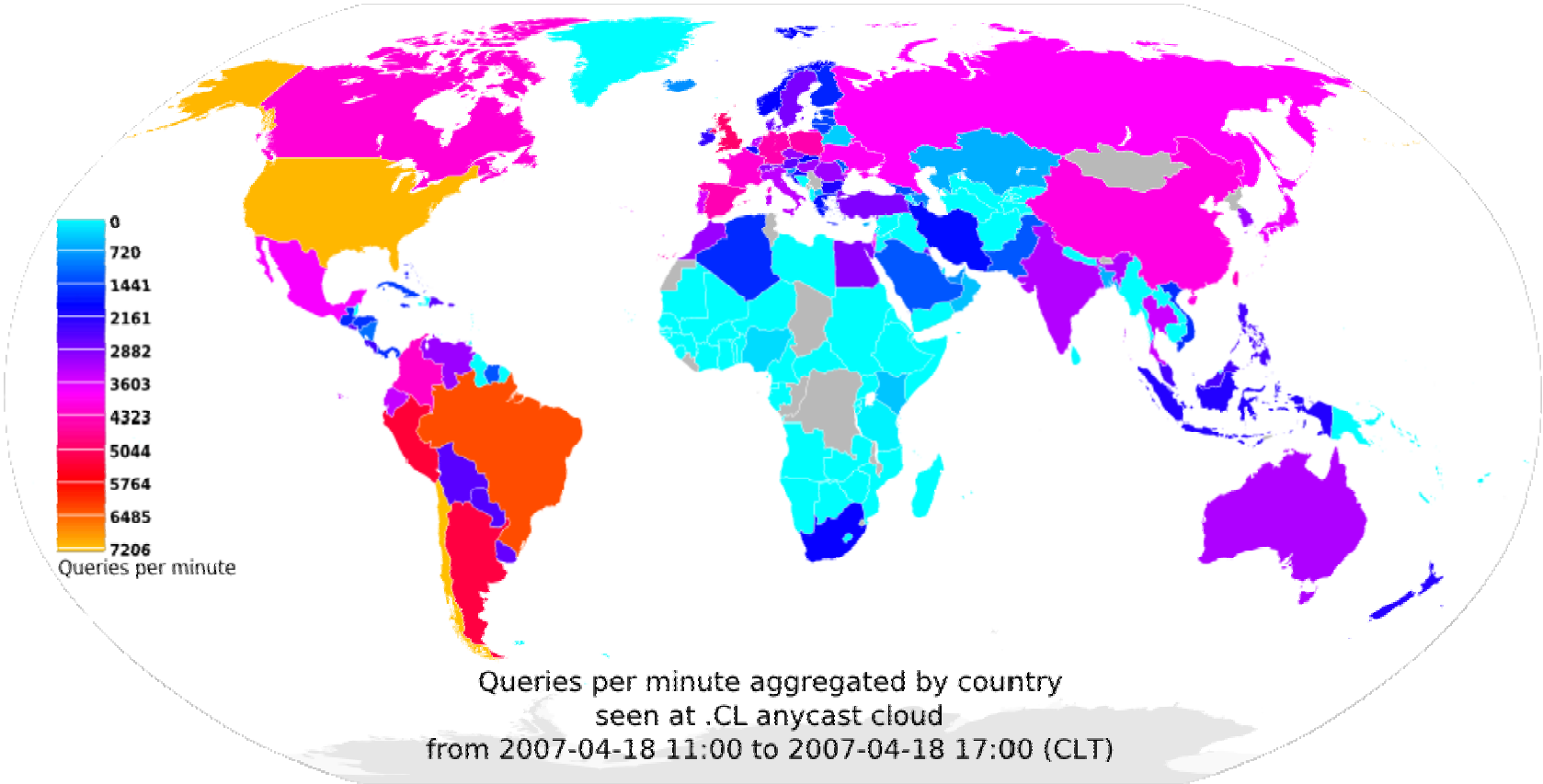
Geographic map

- 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 loose 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

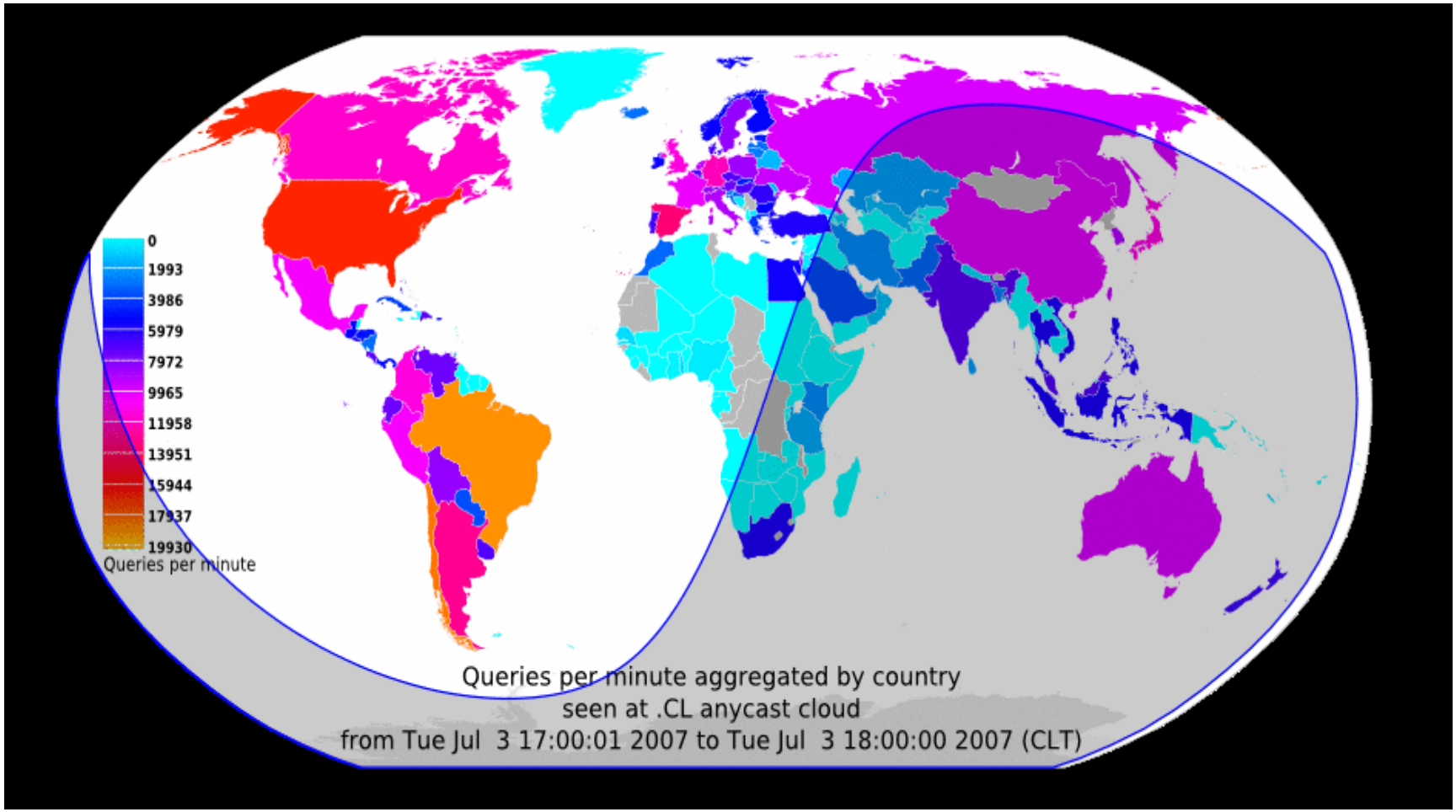
Geographic map



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
  Live version at http://www.caida.org/research/dns/cl/animated_maps/

Geographic animated map

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