Centrality in the DNS

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Is the Internet (becoming) centralised?

- There is currently quite a bit of debate in governance areas about whether certain Internet actors have too much market share in different Internet services.
- People refer to this as Internet centralisation or consolidation
- Apart from the economic and political concerns there are also issues about how this might affect Internet evolution if some actors become dominant

What would centralisation look like?

- Many definitions.
- Not enough time today
- Have a look at earlier blog post

Let’s look at the DNS

- Recursive DNS service
- Authoritative DNS service

Measuring Resolver usage

- We are using our measurement platform to gather data on which resolvers get used but users across the Internet
- Google ads presents about 10-20 million ads to users across the whole Internet every day
  - Each ad loads a tiny bit of javascript that asks the user's browser/app/game/youtube viewer to fetch a few URLs using unique DNS names for which we run the authoritative servers
  - We watch our server logs for those incoming queries

Gathering data

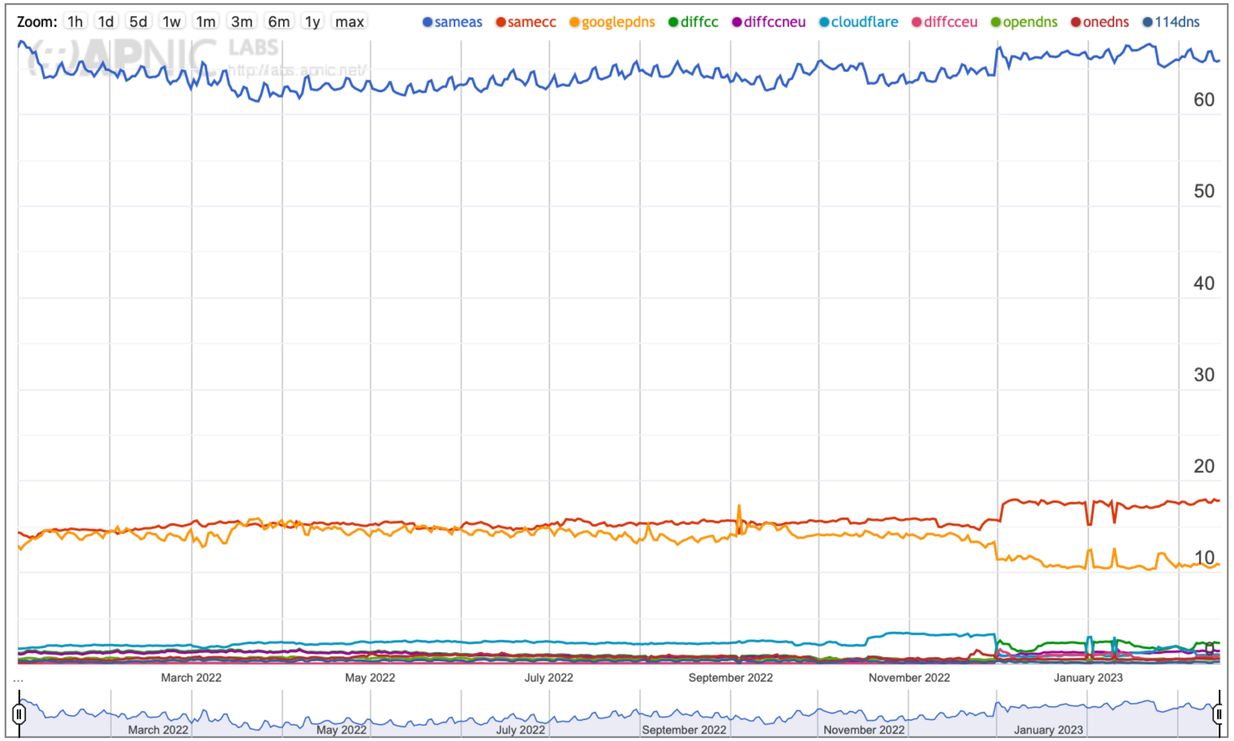
- One of the names points to a DNS server that always returns SRVFAIL, forcing the client to go through its entire list of configured resolvers
- Other names exhibit normal resolution
- In this way we can gather information about what the preferred and backup resolvers are across the Internet
  - Most users will use whatever is given to them by ISP configuration (DHCP, PPP, etc)
  - A few will tweak settings

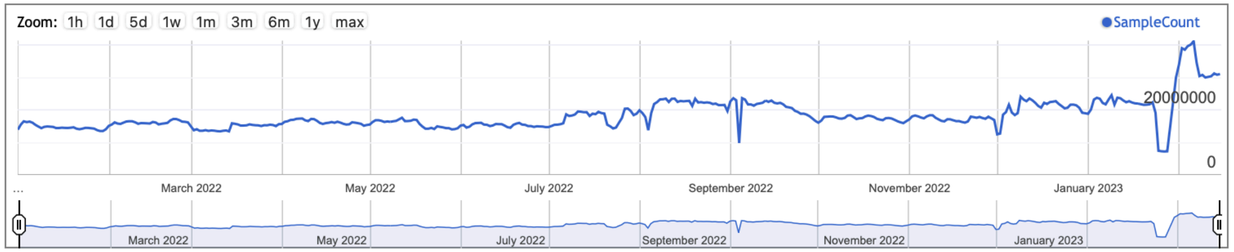
What does this look like?

https://stats.labs.apnic.net/rvrs

Report Type

- (•) First Resolver
- ( ) Single Initial Query
- ( ) All Resolvers





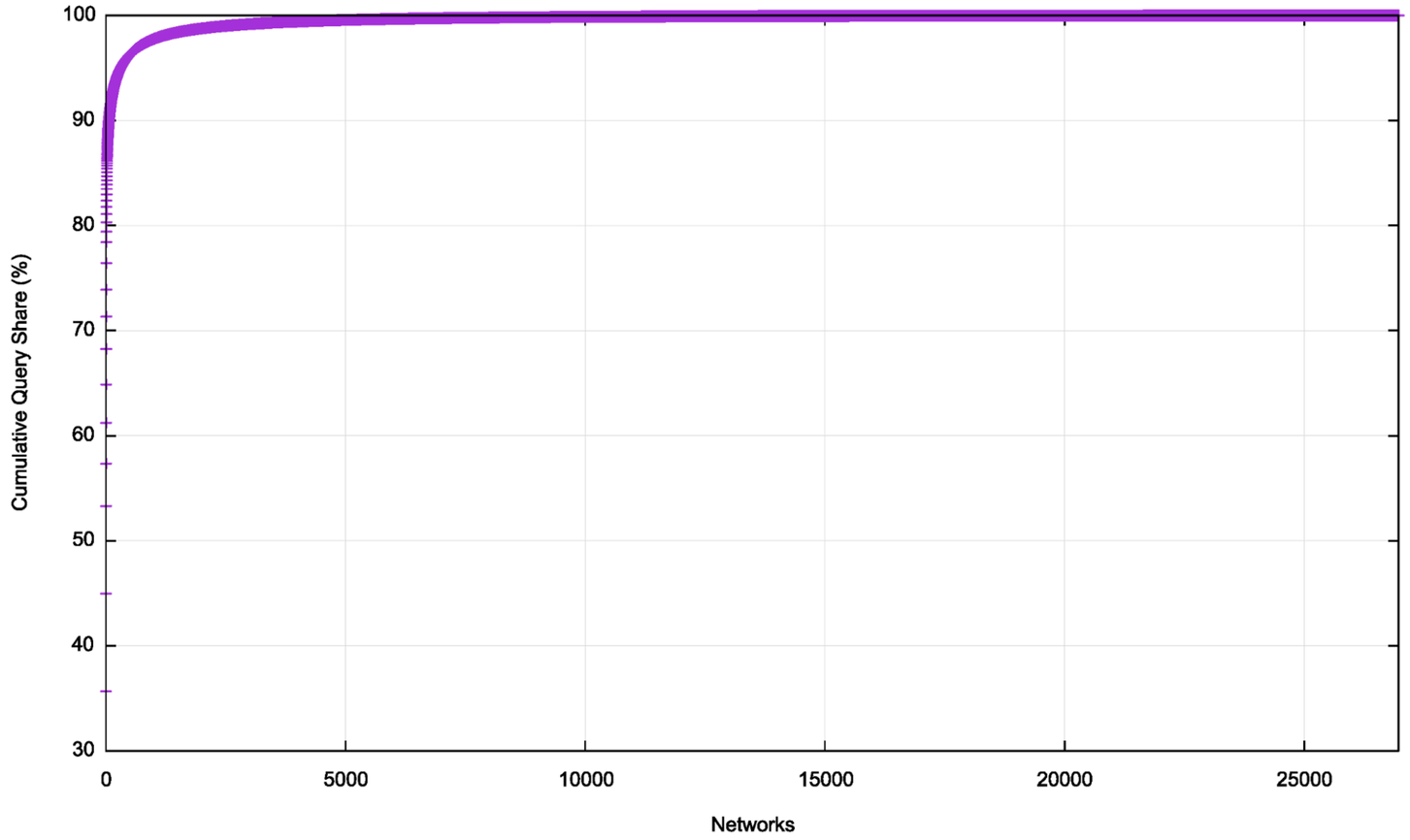
Authoritative DNS view

- What we are trying to see here is where are DNS zones served from
- We get a stream of incoming queries at Cloudflare's Open recursive resolver (1.1.1.1)
  - We want (and get) minimal data: Domain name of query and query counts for each name
  - No user data (no IP address, no location)
- We go through the list, discard the invalid queries (!) and proceed to fetch a list of the DNS servers listed for each name

Preliminary view

- Data from single day in September 2022
- Saw servers in 26,971 unique ASNs
- Approximately one-third of networks host at least one queried authoritative nameserver
- the top 50 ASNs have 89.2% of the query share
- Working on making this an ongoing report

What those words mean



And the corresponding numbers are

Rank	ASN	Auth server query share	Cumulative	Name
1	AS16509	35.7%	35.7%	Amazon-O2, US
2	AS13335	9.3%	45.0%	Cloudflare, US
3	AS15169	8.3%	33.3%	Google, US
4	AS21342	4.0%	57.3%	Akamai, US
5	AS8068	3.9%	61.2%	Microsoft, US
6	AS397239	3.7%	64.9%	UltraDNS (Neustar), US
7	AS714	3.4%	68.3%	Apple, US
8	AS31898	3.1%	71.4%	Oracle, US
9	N/A	2.5%	73.9%	NXDOMAIN
10	AS62597	2.5%	76.4%	NSone, US

More info

- Initial blog post: https://blog.apnic.net/2022/11/22/looking-at-centrality-in-the-dns/
- APNIC Labs ongoing measurements:
  - All: https://stats.labs.apnic.net
  - Resolvers: https://stats.labs.apnic.net/rvrs
  - Authoritative: watch this space