

**DNS in EU
before
dns4EU**

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A Measurement Opportunity

- Sometimes there are ideal windows for “before and after” measurements
 - in attempting to measure the effectiveness of changes to the DNS resolution environment
- In this case it's the DNS4EU initiative

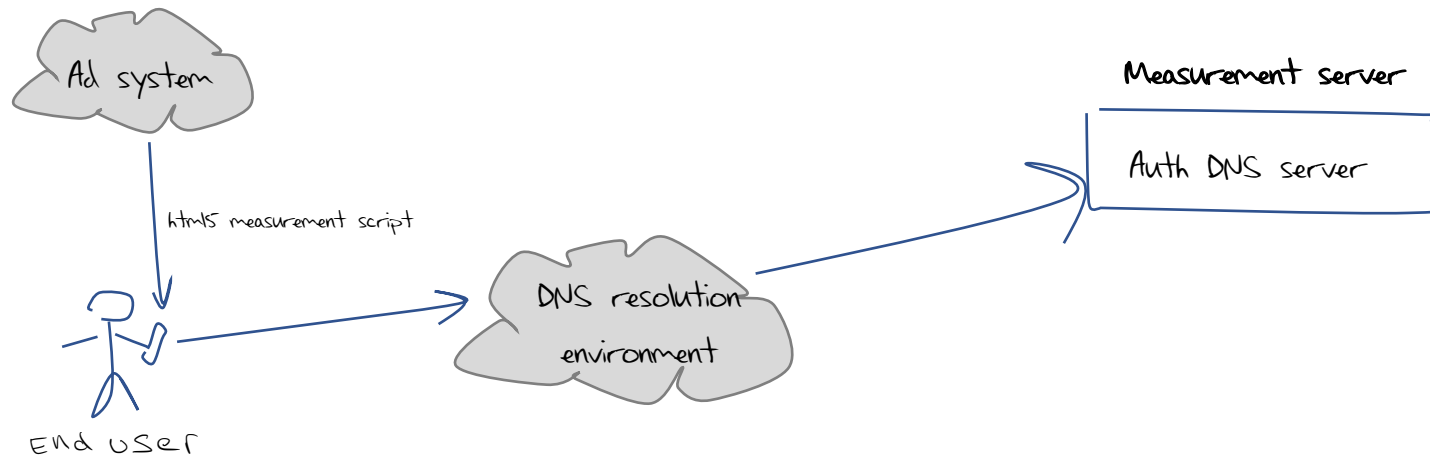
Measurement Questions

- What does the DNS resolution landscape look like before the introduction of DNS4EU?
- How would we like to measure the impact of DNS4EU on EU users?
- What deployment choices for DNS EU would make measurement easier? (or more challenging!)

DNS Resolution in EU

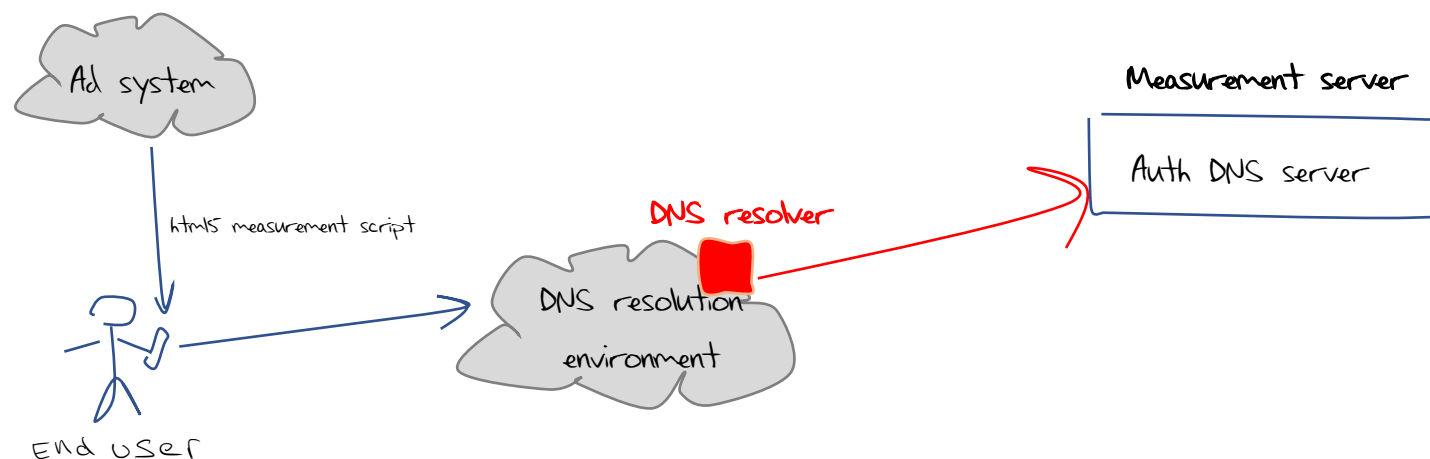
APNIC's Measurement methodology:

- Use an ad campaign to generate URLs with unique DNS labels
- Match the queries seen at our authoritative DNS server to the query names generated when the ad was impressed to the user's browser
- Compare the IP address of the resolver who presents the query to the auth DNS server to the IP address of the user



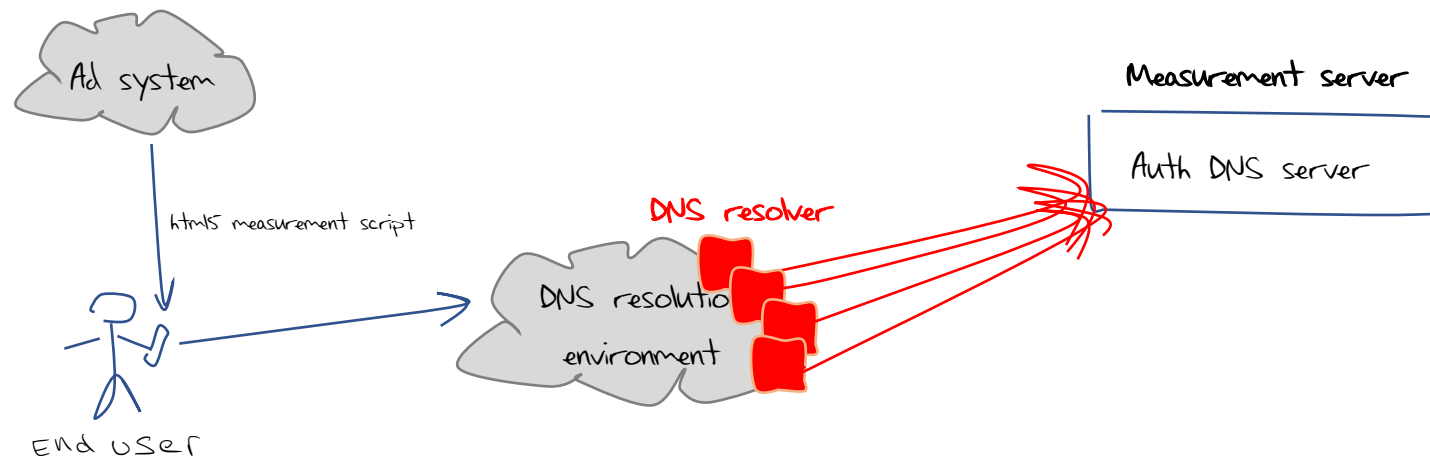
Type of Resolver

- Resolver classes
 - “known” open DNS resolver
 - ISP resolver (same origin AS as user)
 - Same country as user (domestic)
 - Different country to user (foreign)

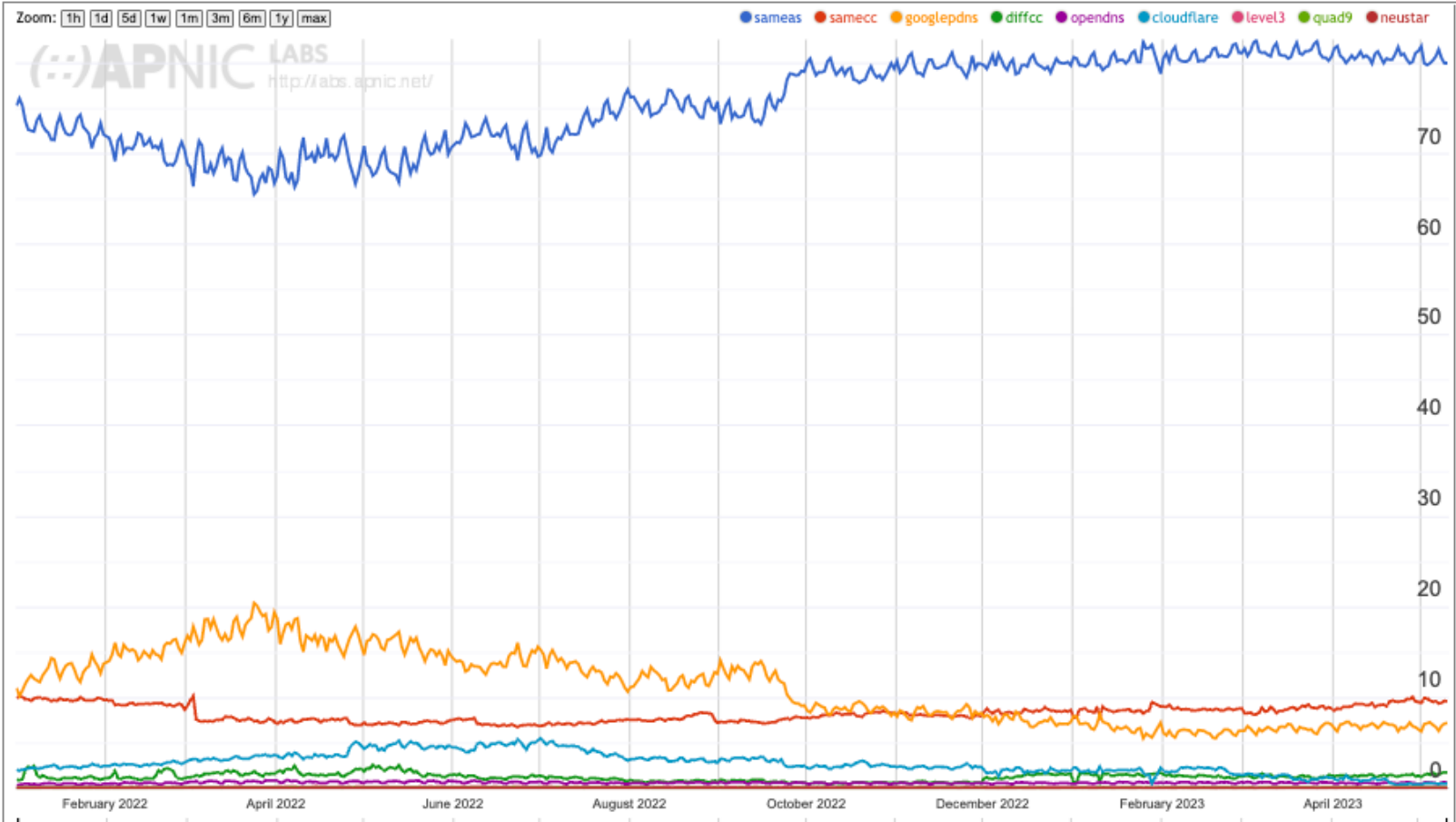


Query Behaviour

- First query (who will the user believe)
- Single query (who gets to see the user's query)
- Multiple queries (who MAY get to see the user's query)



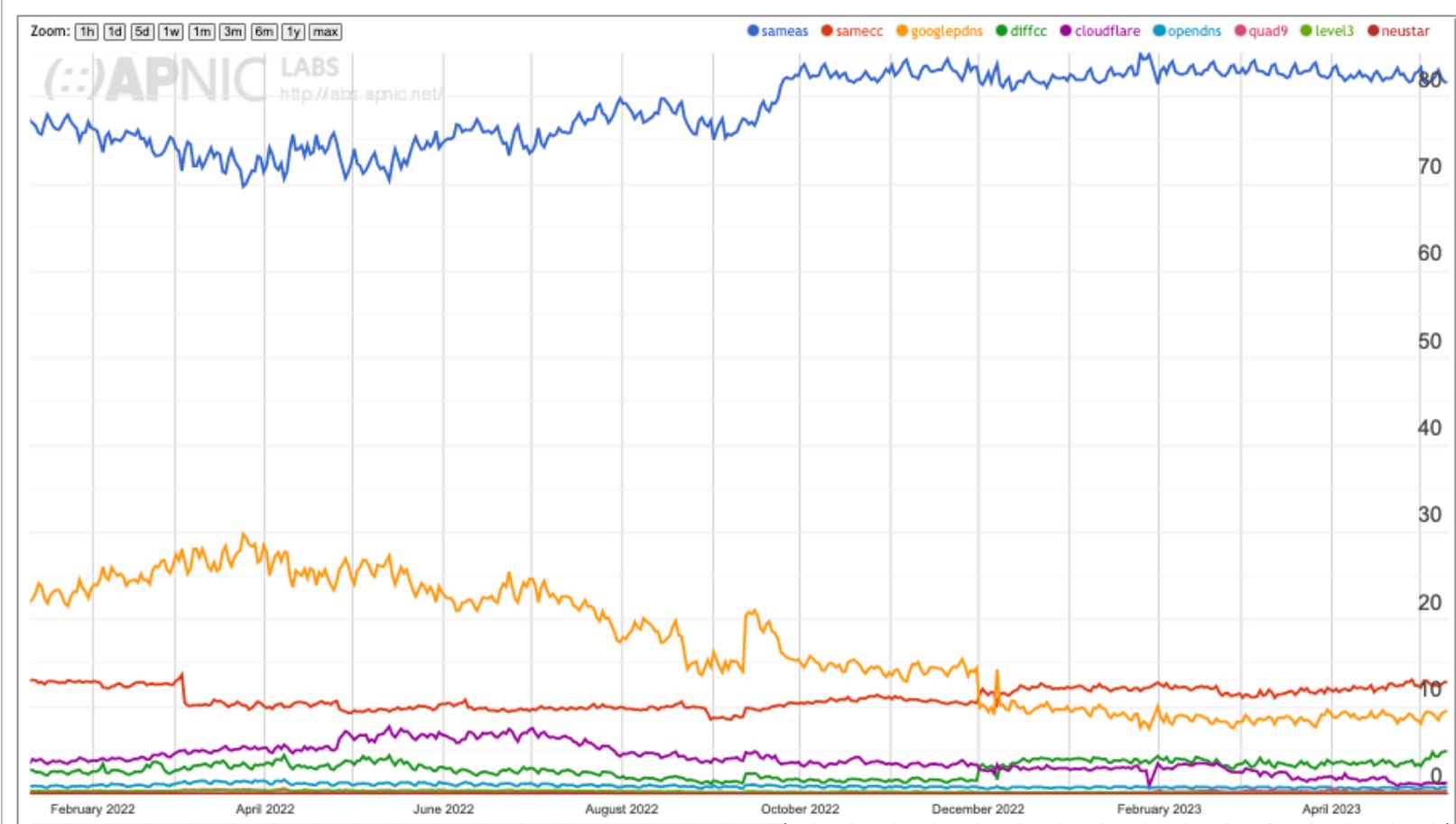
EU Profile - First Query



Same AS

Same CC
Google PDNS

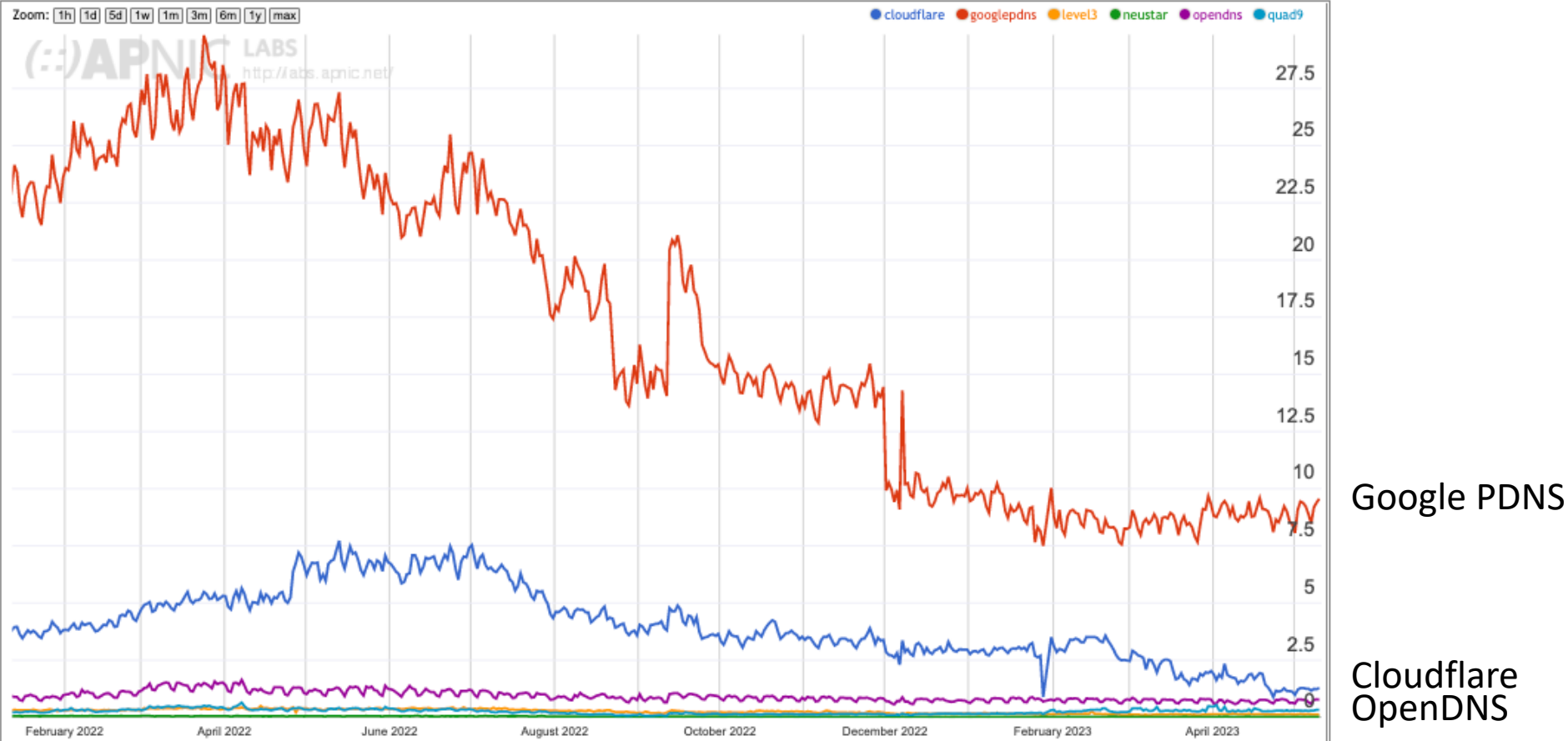
EU Profile - All Queries



Same AS

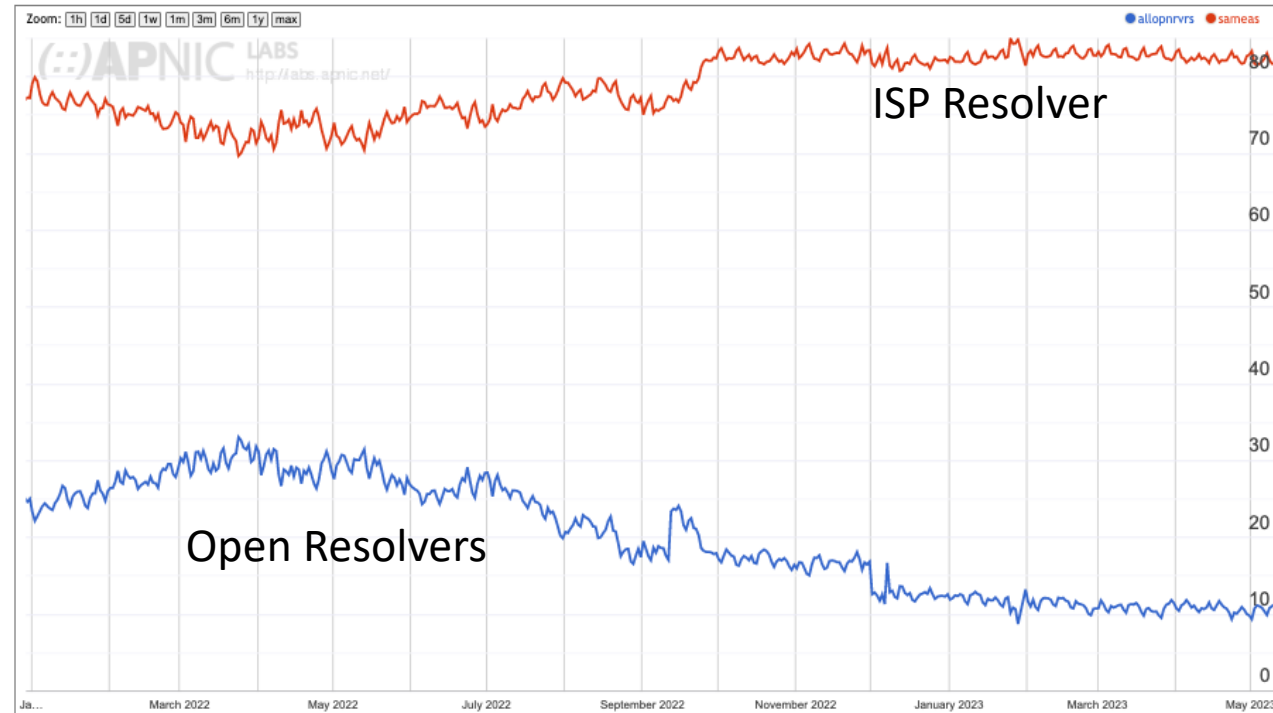
Same CC
Google PDNS
Diff CC

EU Profile - Open DNS resolvers



Use of Open Resolvers in EU

- Declined sharply from a peak of 30% of users in early 2022 to 10% of users today
- Google's Public DNS service has 80% of market share of the open resolver "market"
- Open resolver use has a strong weekday preference – which indicates a strong adoption preference in enterprise networks, but far smaller levels of individual user uptake
 - Users generally don't stray away from the default settings

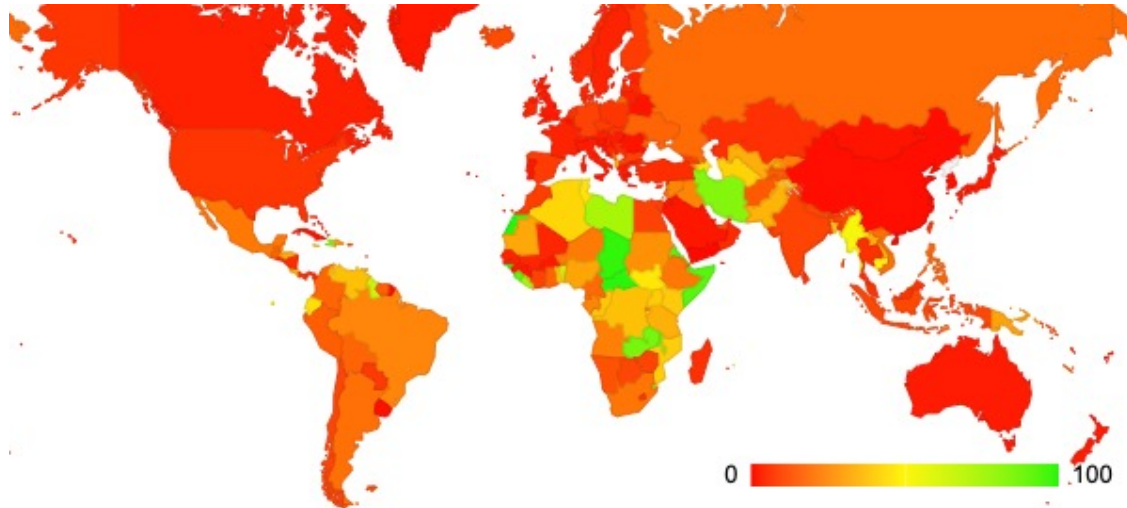


Is EU "different"?

A much larger level of use of open DNS resolvers is seen in Africa, South and Central Americas and Asia

As in EU, the majority of this user of open resolvers is due to the use of Google's service

Use of googlepdns Resolvers within each Economy



Code	SubRegion	allopnrvrs ▲	sameas
QP	Australia and New Zealand, Oceania	7.628%	86.498%
QM	Northern Europe, Europe	7.860%	83.157%
XS	Eastern Asia, Asia	9.973%	82.384%
QN	Southern Europe, Europe	10.645%	82.607%
QO	Western Europe, Europe	12.096%	83.885%
XW	Eastern Europe, Europe	13.614%	76.429%
QS	Polynesia, Oceania	13.976%	79.795%
XQ	Northern America, Americas	15.779%	74.974%
XV	Western Asia, Asia	16.694%	66.630%
XU	South-Eastern Asia, Asia	22.651%	59.476%
XJ	Northern Africa, Africa	23.979%	56.755%
XT	Southern Asia, Asia	23.986%	56.120%
XO	Central America, Americas	24.996%	77.705%
QQ	Melanesia, Oceania	26.438%	74.192%
XN	Caribbean, Americas	27.268%	75.657%
XP	South America, Americas	28.200%	58.443%
XR	Central Asia, Asia	29.482%	65.036%
XK	Southern Africa, Africa	30.441%	65.250%
XL	Western Africa, Africa	31.793%	68.371%
XI	Middle Africa, Africa	38.226%	61.641%
XH	Eastern Africa, Africa	41.952%	55.951%
QR	Micronesia, Oceania	57.737%	49.942%

The potential impact of DNS4EU

- With less than 10% of users directing queries away from the local ISP resolver towards an open DNS resolver it would seem that the potential for change in the EU DNS environment is not all that great

DNS4EU Deployment Options

- Same as existing open DNS resolver services:
 - Anycast service address
 - Multiple service sites
 - Each service site may use a front end load balancer and a collection of backend resolver engines
 - Deployed at IX points(?)
- As a replacement for the ISP's existing recursive resolver service
 - Deeply embedded in ISP infrastructure

Measuring the impact of DNS4EU

- **If** this service will use some form of constant service address and an anycast configuration
 - Then measurement of the uptake of this service can be undertaken in the same way that the use of other open DNS resolvers is measured
- **If** the service is embedded in ISP infrastructure then the measurement of this service will be far more challenging to undertake externally

Comments and Questions?