Measuring DNSSEC Configuration of Upstream Resolvers with RIPE Atlas

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SIDN LABS

SIDN

- Domain name registry for .nl ccTLD
- SIDN Labs is the R&D team of SIDN
- > 5.6 million domain names
- 2.5 million domain names secured with DNSSEC

Background

Problem:

- 2.5 Million signed .nl domain names but only a few validating resolvers

Goal:

- Improving DNSSEC deployment at upstream resolvers of (Dutch) ISPs

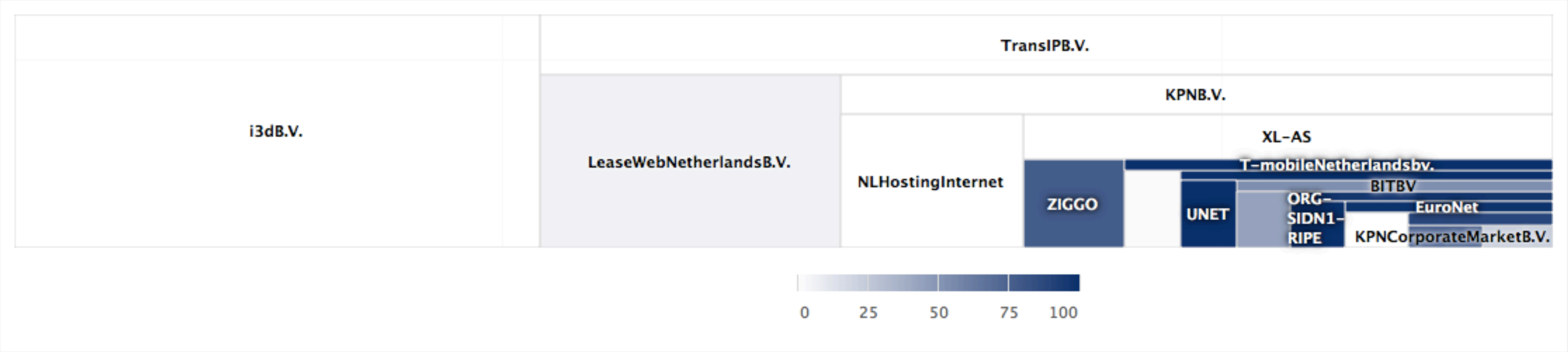
First approach: Passive Measurements

Observe DNS query type at authoritative .nl resolvers

- If:
  - Resolvers ask at least 1.000 times per month for DS or DNSKEY record and has DO bit set
- Then:
  - We label resolver as a validating resolver

First approach: Passive Measurements

- Downsides:
  - Not precise (not sure which resolvers are actually the upstream resolvers of the ISPs)
  - Not sure what resolvers are doing with DNSSEC records (Do they validate? Are they in permissive mode?)



Screenshot from stats.sidnlabs.nl

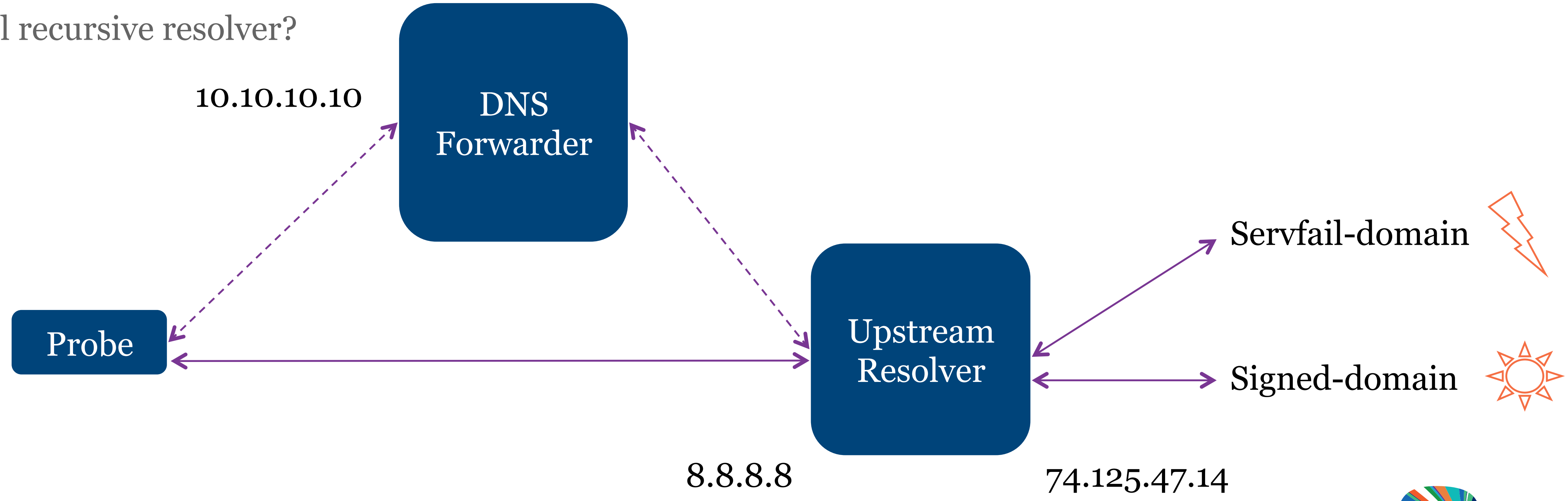
Second approach: Active Measurements - Setup

- Select 500 RIPE Atlas Probes in NL to resolve signed domain and “servfail” domain
- Do bit set
- Use the probe's list of local resolvers

Resolver is:	*Validly Signed Domain*	*AD bit*	*Servfail Domain*
Non-validating	Rcode 0	No	Rcode 0
Validating	Rcode 0	Yes	Servfail
Permissive Mode	Rcode 0	Yes	Rcode 0

Challenges (1/2)

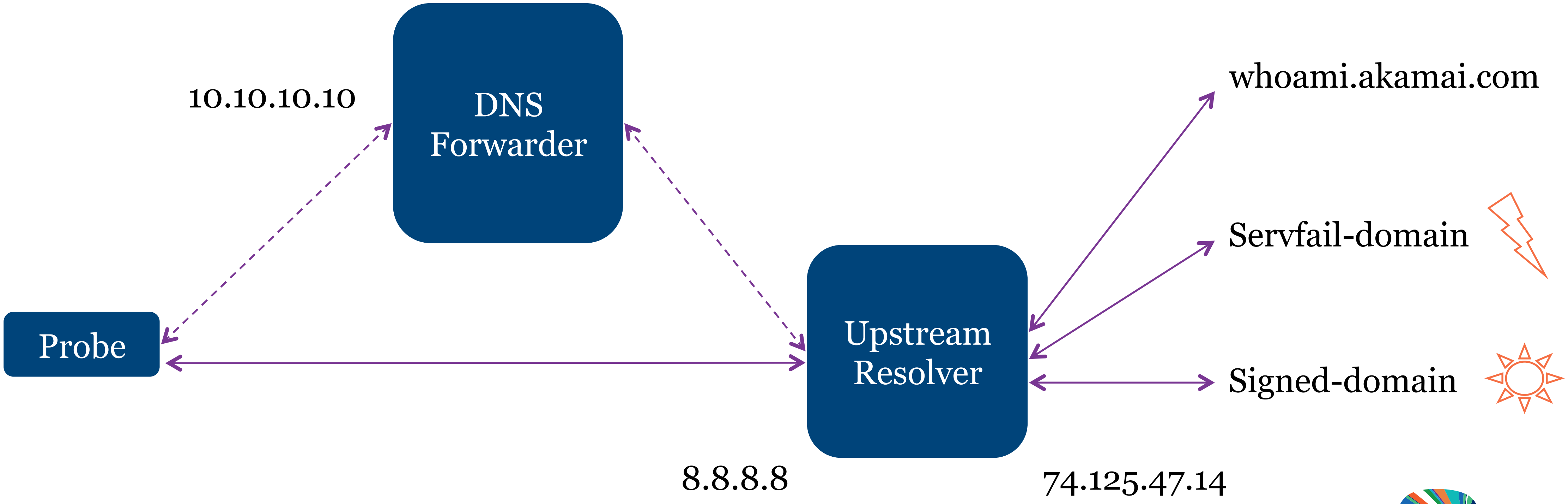
- Which resolver is handling the queries?
  - An upstream resolver of an ISP?
  - A DNS forwarder/proxy?
  - Local recursive resolver?



Challenges (1/2)

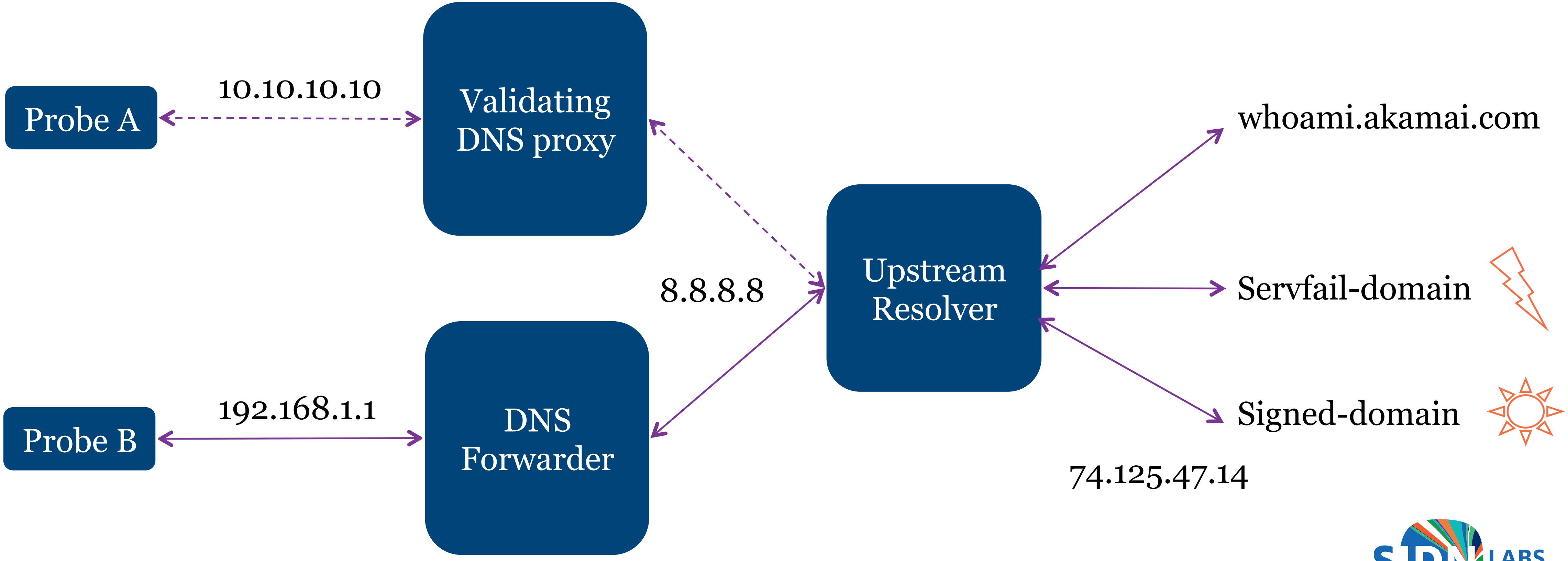
- Which resolver is handling the queries?

→ Third measurement to whoami.akamai.com



Challenges (2/2)

- Validating DNS proxies (like Dnsmasq)
- Contradicting measurement results



Results after 5 weeks of RIPE Atlas Measurements

- 65 unique resolvers (IPs) with at least 1.000 queries and used by 2 probes or more (154 total)
- 9 unique Autonomous Systems
- 24 validating and 41 non-validating resolvers
- 6 % of queries from validating resolvers

Conclusions

- 12 % DNSSEC validation measured by APNIC [1] vs. 6 % by our measurement
- Only a small set of resolvers measured
  - No resolvers of mobile networks
  - Some Dutch ISPs missing
- Measurements: 3671531, 3671532, 3671533

Future Work

- Analyse the different between our measurements and APNIC's
- Encourage ISPs to roll out DNSSEC at their resolvers
- Measure deployment over time
- Feedback from ISPs

[1] http://stats.labs.apnic.net/dnssec/NL

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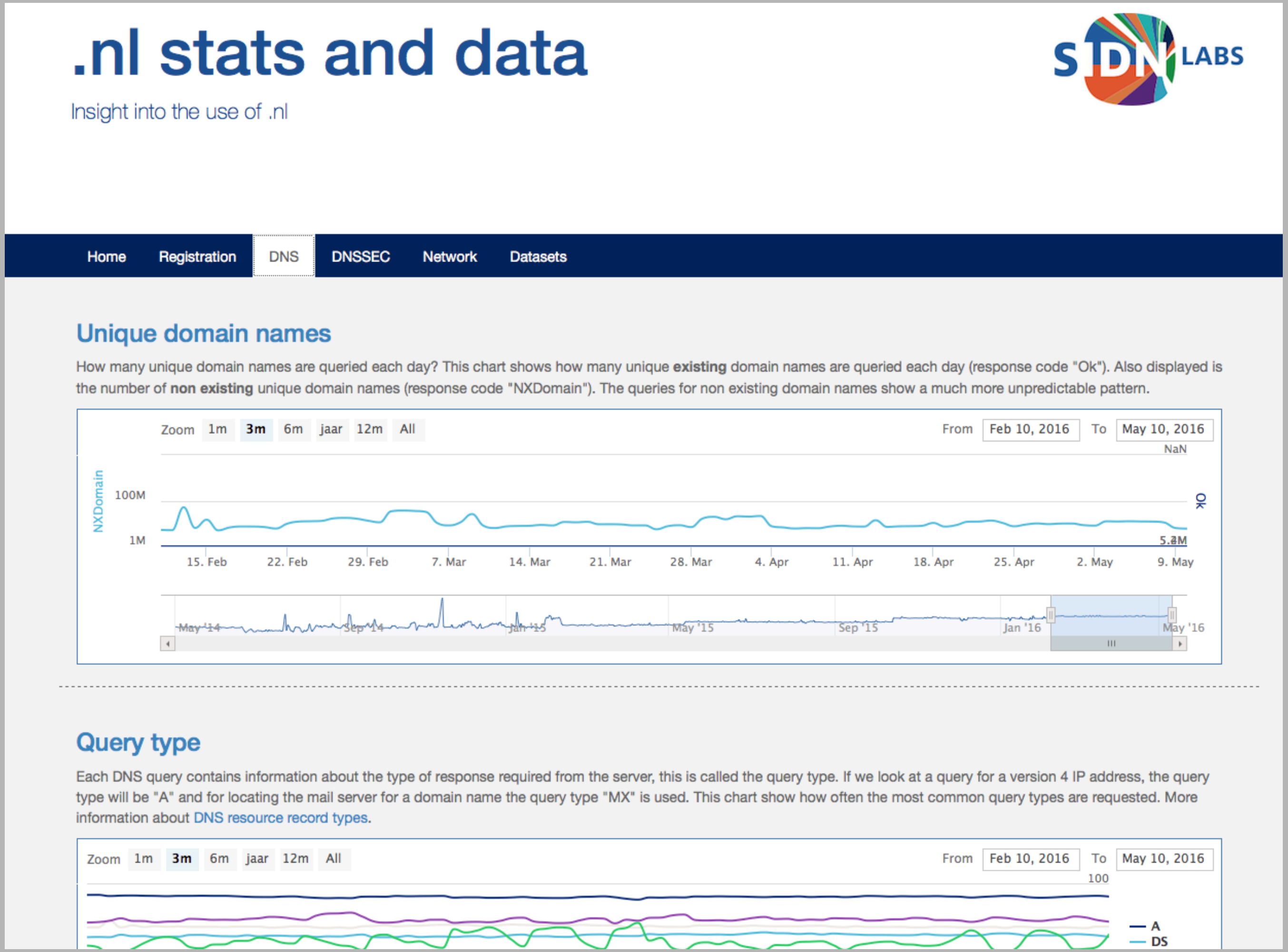

.nl stats and data

Insight into the use of .nl

Unique domain names

How many unique domain names are queried each day? This chart shows how many unique **existing** domain names are queried each day (response code "Ok"). Also displayed is the number of **non existing** unique domain names (response code "NXDomain"). The queries for non existing domain names show a much more unpredictable pattern.

Query type

Each DNS query contains information about the type of response required from the server, this is called the query type. If we look at a query for a version 4 IP address, the query type will be "A" and for locating the mail server for a domain name the query type "MX" is used. This chart show how often the most common query types are requested. More information about DNS resource record types.

stats.sidnlabs.nl

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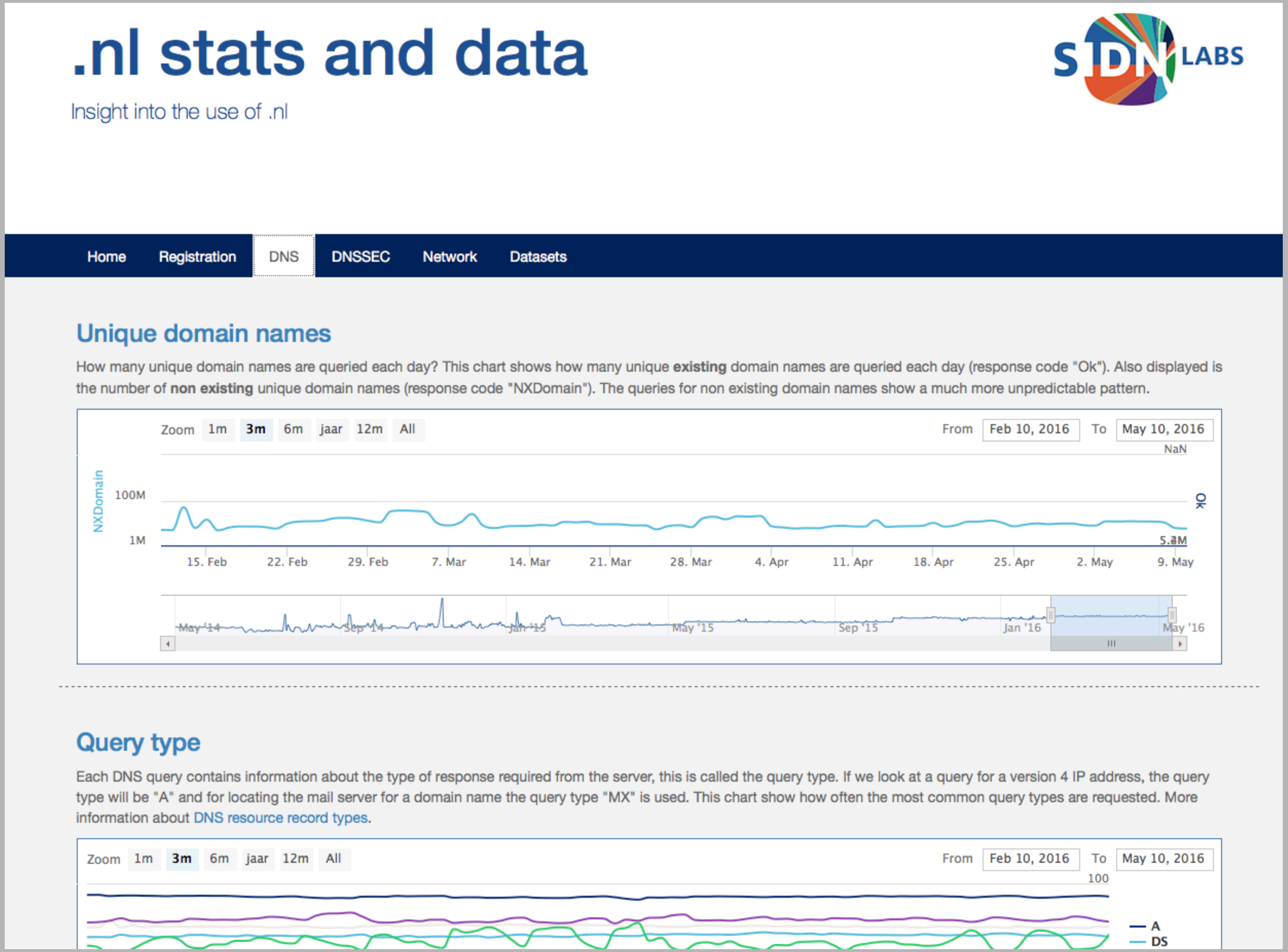
Questions?



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