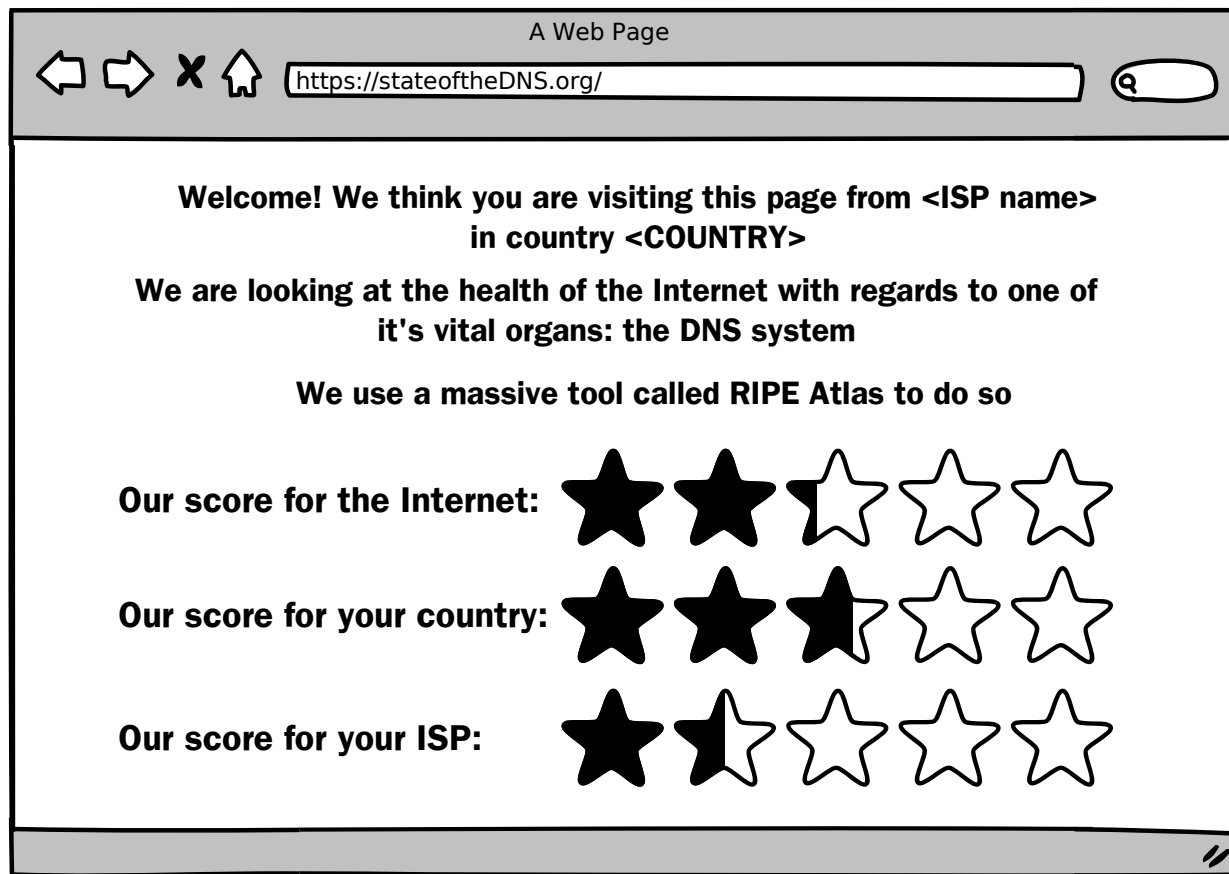


State of the DNS

*How is your DNS compared to your ISP,
your country,
the Internet?*



Willem Toorop

NLNETLABS

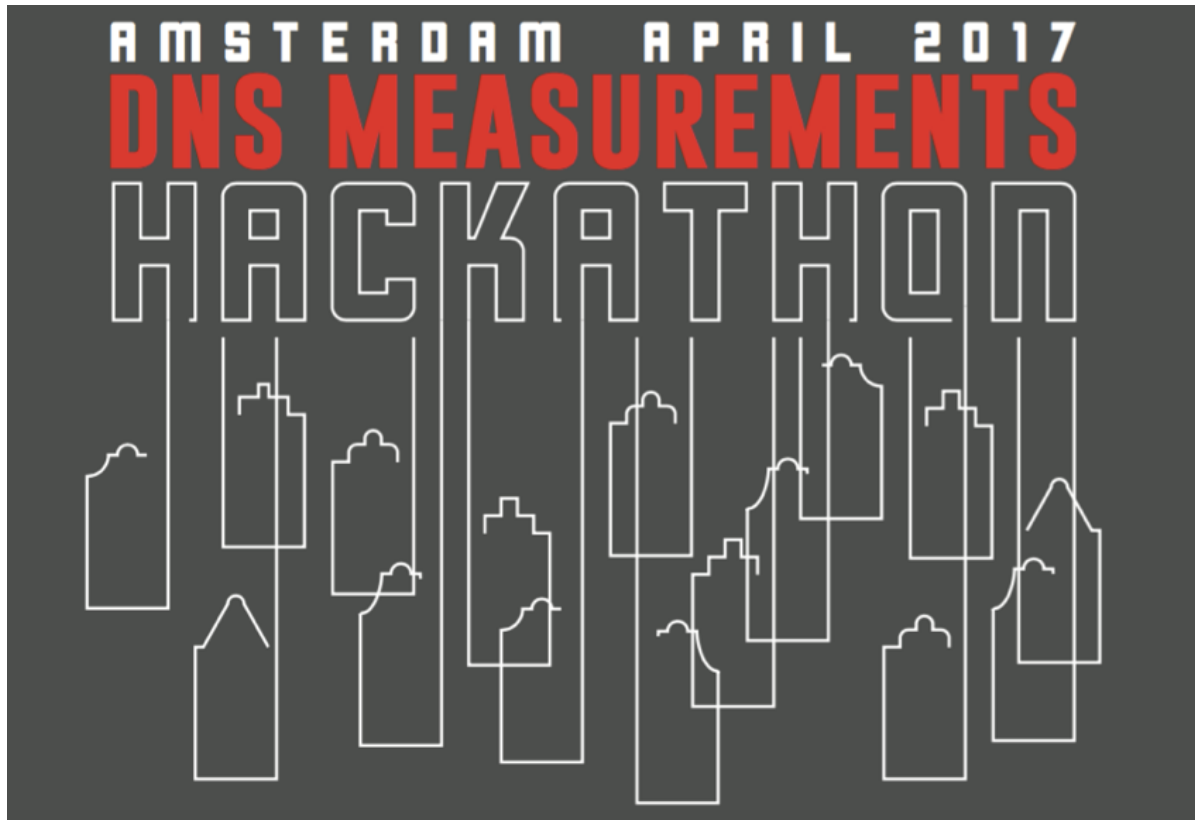
Emile Aben

Jasper den Hertog



RIPE NCC

RIPE NETWORK COORDINATION CENTRE



*Andrea Barberio, Petros Gigis, Jerry Lundström,
Teemu Rytlahti, Willem Toorop*



DNSThought

*Everything you ever wanted to know
about caching resolvers but were afraid to ask*

AMSTERDAM APRIL 2017
DNS MEASUREMENTS
HACKATHON

Capabilities & properties

Basic : IPv6, TCP, TCP over IPv6

Security: DNSSEC validation, Algorithm support,
TA's Root KSK Sentinel, NXdomain rewrite

Privacy : Qname minimization, EDNS Client Subnet

AMSTERDAM APRIL 2017
DNS MEASUREMENTS
HACKATHON

Some msms need just a zone

IPv6, DNSSEC validation, NXdomain rewriting

Some need authoritative perspective

TCP, Qname minimization, EDNS Client subnet

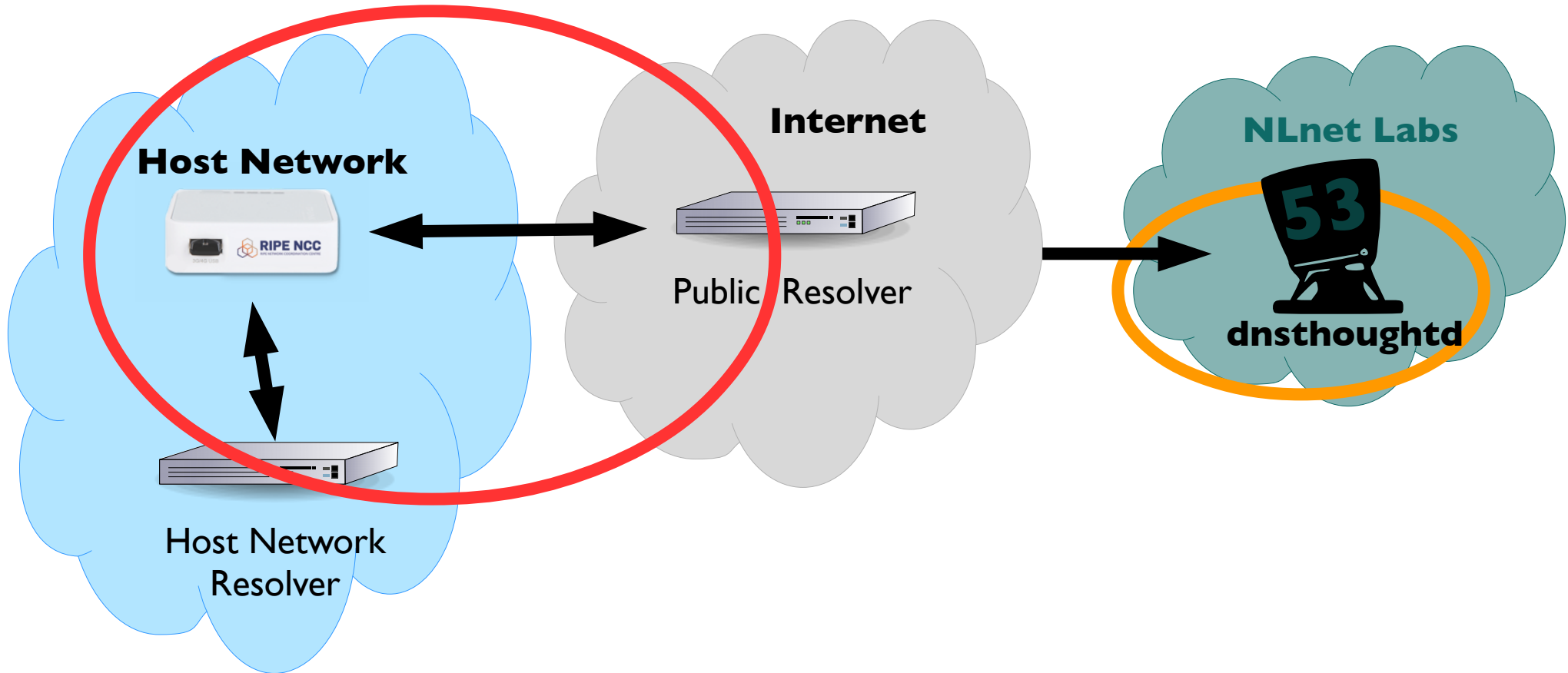
dnsthoughtd

dnsthoighd

```
willem@makaak: ~  
willem@makaak:~$ dig @9.9.9.9 tc.ripe-hackathon6.nlnetlabs.nl AAAA  
; <<>> DiG 9.11.0-P2 <<>> @9.9.9.9 tc.ripe-hackathon6.nlnetlabs.nl AAAA  
; (1 server found)  
;; global options: +cmd  
;; Got answer:  
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 61711  
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1  
  
;; OPT PSEUDOSECTION:  
; EDNS: version: 0, flags:; udp: 4096  
;; QUESTION SECTION:  
;tc.ripe-hackathon6.nlnetlabs.nl. IN      AAAA  
  
;; ANSWER SECTION:  
tc.ripe-hackathon6.nlnetlabs.nl. 0 IN      AAAA      2620:171:f9:f0::8  
  
;; Query time: 15 msec  
;; SERVER: 9.9.9.9#53(9.9.9.9)  
;; WHEN: Mon Oct 08 15:10:12 CEST 2018  
;; MSG SIZE rcvd: 88  
  
willem@makaak:~$ dig -x 2620:171:f9:f0::8 +short  
res110.ams.rdns.pch.net.  
willem@makaak:~$
```

I

The RIPE Atlas perspective



The RIPE Atlas perspective

	Probe ASN	Resolver Enter Internet ASN	Authoritative Out of Inet. ASN
Internal	X	=	X
Forwarding	X	X	Z
	X	Y	Z
External	X	Z	Z

AMSTERDAM APRIL 2017

DNS MEASUREMENTS

Measurements for all probes every hour

query	msm ID
<prb_id>.<time>.ripe-hackathon6.nl netlabs.nl AAAA	8310366
<prb_id>.<time>.tc.ripe-hackathon4.nl netlabs.nl A	8310360
<prb_id>.<time>.tc.ripe-hackathon6.nl netlabs.nl AAAA	8310364
qnamemintest.internet.nl TXT	8310250
nxdomain.ripe-hackathon2.nl netlabs.nl A	8311777
whoami.akamai.net A	8310245
o-o.myaddr.l.google.com TXT	8310237
secure.ripe-hackathon2.nl netlabs.nl A	8311760
bogus.ripe-hackathon2.nl netlabs.nl A	8311763

Thank you Emile Aben! ❤️

Enter probe id...

MAIN NAVIGATION

- Home
- Per probe
- Per resolver
- QNAME Map
- Global Map
- About

Per probe | Overview of probe 31568 Prototype

Home > Per probe

Overview: — x

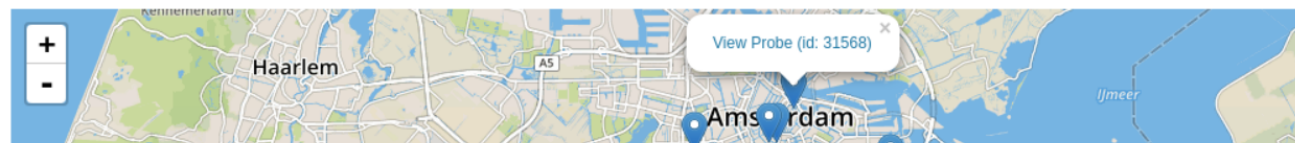
- The probe can connect to a name server ✓
- The probe resolver is able to perform DNS IPv4 TCP ✓
- The probe resolver is able to perform DNS IPv6 TCP ✓
- The probe resolver have IPv6 capability ✓
- The probe resolver offers QNAME minimization ✓
- The probe resolver does not deliver edns subnet info ✗

Availability per DNS Resolver — x

Resolver IP	Last Hour	Last 6h
192.87.36.36	1	1
195.169.124.124	1	1

Capabilities per DNS Resolver — x

resolver IP	resolver net	resolver ASN	edns0 client subnet	IPv6 capability	IPv4 TCP	IPv6 TCP	QNAME minimization
195.169.124.124	195.169.0.0/16	1103	No	Yes	Yes	Yes	Yes
192.87.36.36	192.87.0.0/16	1103	No	Yes	Yes	Yes	Yes

Probe Map of AS v4: 1103 | v6: 1103 — x

Root Canary Project



- Participation with Roland van Rijswijk - Deij
- Measurements started 20 June 2017



More measurements

- Moritz Muller joined too
- Root KSK Sentinel msms since 19 July 2018



query		msm ID
root-key-sentinel-not-ta-19036.d2a8n3.rootcanary.net	A	15283670
root-key-sentinel-not-ta-20326.d2a8n3.rootcanary.net	A	15283671

With validating resolvers we have three situations:

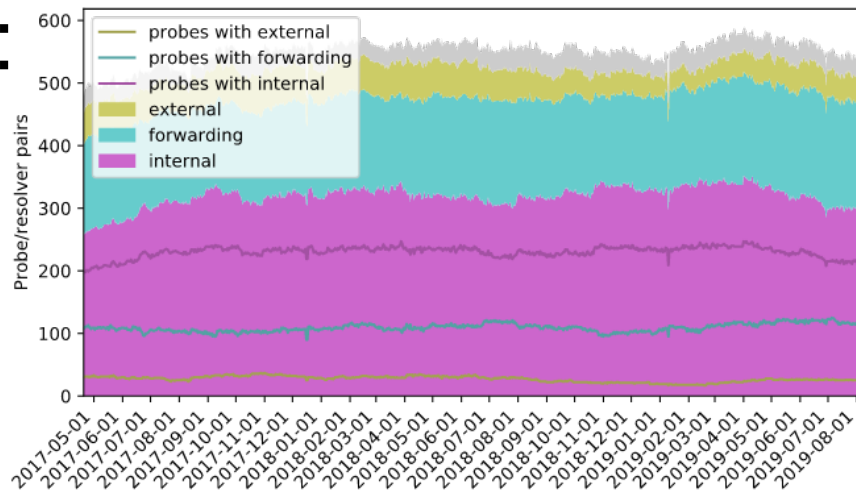
- 1. Key 20326 has not been picked up (yet)*
- 2. Key 20326 is a valid TA, and key 19036 is still a valid TA*
- 3. Key 20326 is a valid TA, and key 19036 is removed*

For these situations (1, 2,3), measurements for:

- (not-ta-19036 is-ta-20326) results in 1: (S S), 2: (S A), 3: (A A)*
- (is-ta-19036 is-ta-20326) results in 1: (A S), 2: (A A), 3: (S A)*
- (not-ta-19036 not-ta-20326) results in 1: (S A), 2: (S S), 3: (A S)*
- (is-ta-19036 not-ta-20326) results in 1: (A A), 2: (A S), 3: (S S)*

Current status

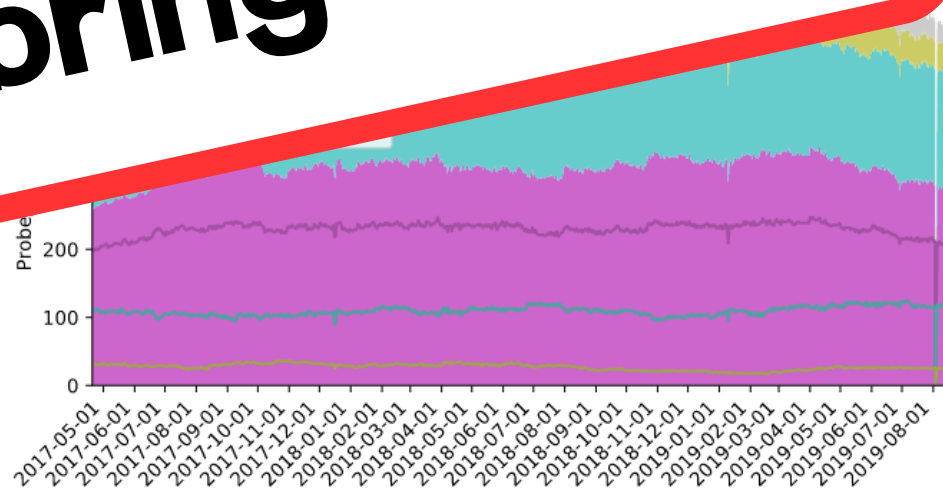
- 88 measurements and growing references: <https://dnsthought.nlnetlabs.nl/raw/>
- Processed results in plots: <https://dnsthought.nlnetlabs.nl/>
- Used in scientific papers
 - de Vries, Wouter B., et al. "A First Look at QNAME Minimization in the Domain Name System." PAM 2019.
 - Müller, Moritz et al. "Roll, Roll, Roll your Root: A Comprehensive Analysis of the First Ever DNSSEC Root KSK Rollover", IMC 2019



Current status

- 88 measurements and growing references: <https://dnstb>
- Processes

What does it bring me???



- Müller, Moritz et al. "A First Look at DNSSEC Root Key Rollout in the Domain Name System." PAM 2019.
- Müller, Moritz et al. "Roll, Roll, Roll your Root: A Comprehensive Analysis of the First Ever DNSSEC Root KSK Rollover", IMC 2019

What does it bring you?

- RIPE Atlas community tags
 - dnsthought:all_ed448
 - dnsthought:one_qnamemin
 - dnsthought:resolver_exit_asn: 16159,1103

What does it bring you?

- RIPE Atlas community tags
 - dnsthought:all_ed448
 - dnsthought:one_qnamemin
- **What do these properties mean?**

What does it bring you? What do these properties mean?



Security 60% for rsa-256 +
3% for each additional algorithm (20% max.)
10% for trust anchor sentinel support
10% for no NX domain rewriting

What does it bring you?

What do these properties mean?

- Security 60% for rsa-256 +
 - 3% for each additional algorithm (20% max.)
 - 10% for trust anchor sentinel support
 - 10% for no NX domain rewriting
- Privacy 25% for qname minimization
 - 25% for not doing EDNS Client Subnet
 - 25% for respecting ECS Privacy option
 - 25% for DNS over TLS, -15% cloud DoT
- Performance: < 10ms to entry-point: 0% – 100% for > 300ms
- Compliance : Flagday, TCP, DNSSEC, IPv6, Fragments (20%)

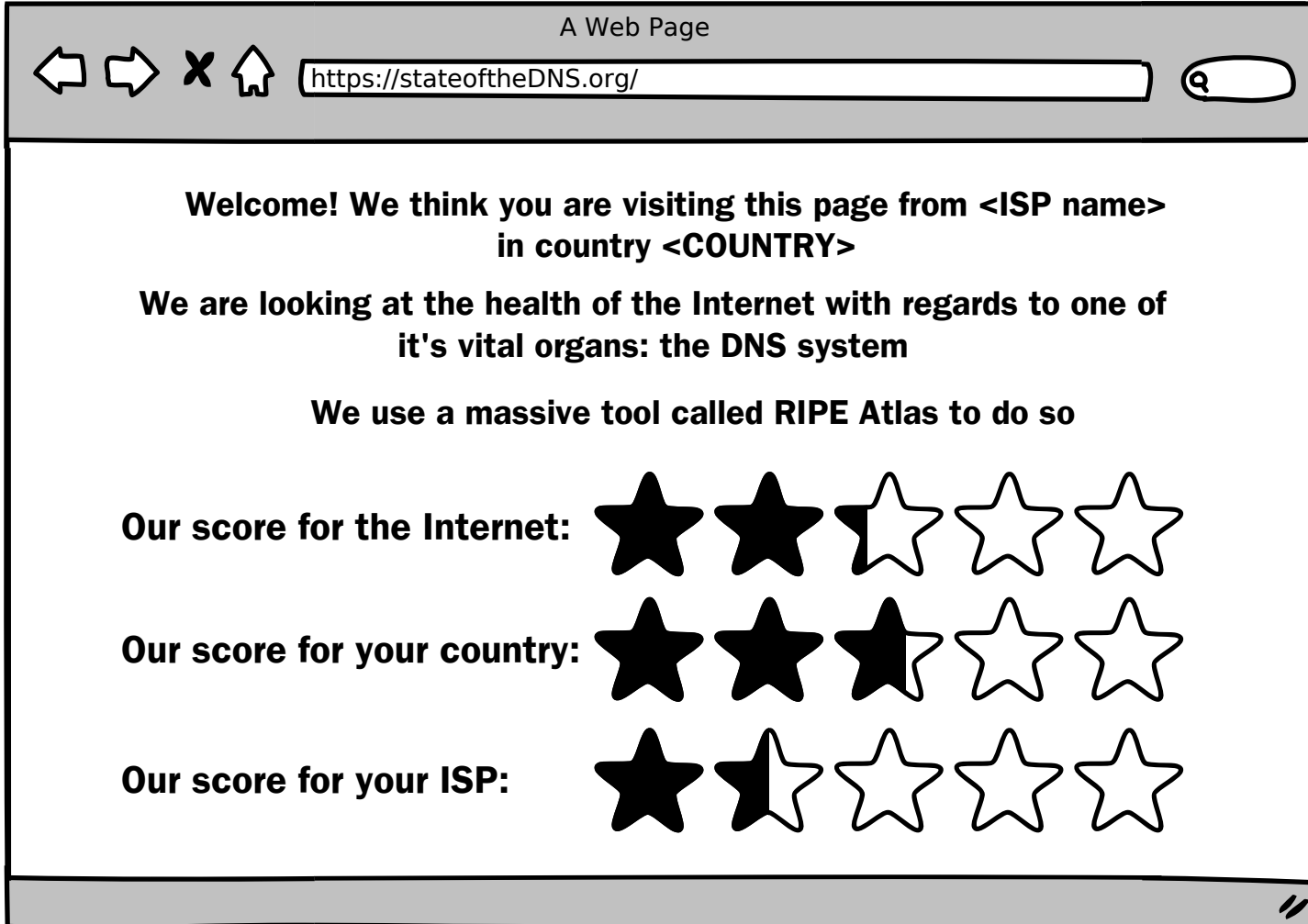
What does it bring you?

What do these properties mean?

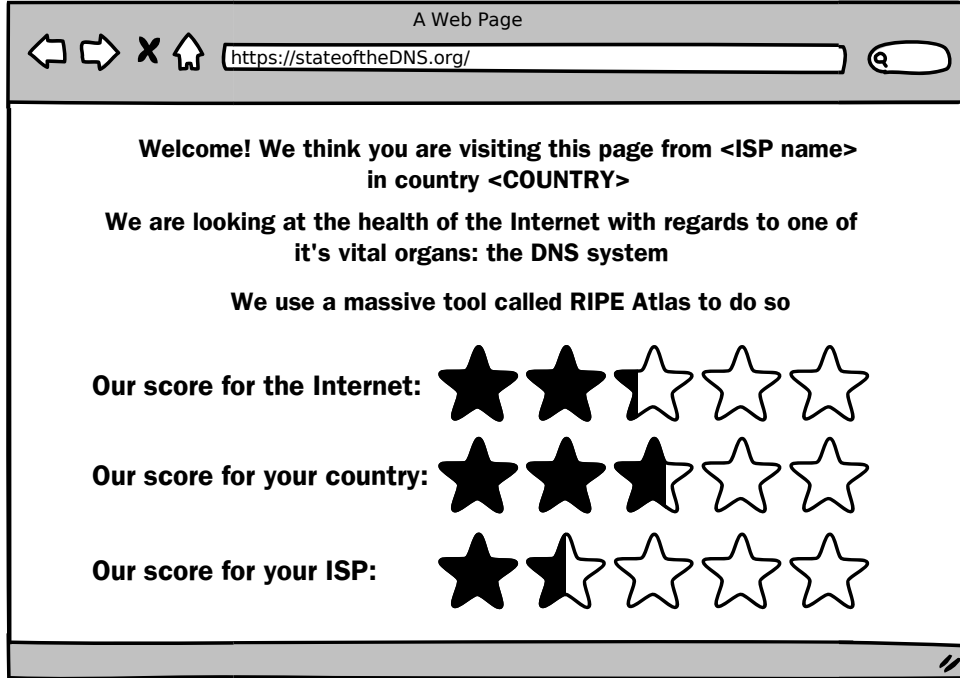


- PoC scoring code: <https://github.com/emileaben/dnstthought-rating-cli>
- Make your own scoring weights, categories
 - For example: Greenness (i.e. environmental friendliness.)

State of the DNS portal



State of the DNS portal



Feedback please!

- Good idea? Bad idea?
- Different ways for providing access
- Scoring weights
- Understandable text...



Thank you!