

The Root Canary

measuring and monitoring the impact of the KSK rollover

Project partners

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RIPE NCC
RIPE NETWORK COORDINATION CENTRE



<https://rootcanary.org/>

Canary in the coalmine



picture from academia.dk

<https://rootcanary.org/>

Canary in the virtual coalmine

- Goals:
 - **Track operational impact** of the root KSK rollover, act as a warning signal that validating resolvers are failing to validate with the new key
 - **Measure validation during the KSK rollover** from a global perspective **to learn from this type of event**

Operational actions

- If the **canary** starts to sing, or keels over and **dies**: an **operator** of a validating resolver may be in **trouble**! This type of monitoring gives us **immediate insight** into **which operators have problems**
- **Notify** (large?) **operators** that they need to take action — while most likely all resolving will fail, it may not affect all of their resolvers, etc. etc.

Measurement goals

- This is the **first time** the root KSK is rolled
- Unique **opportunity** to record measurement data that can **provide insight into the impact** on the global Internet of such a rollover
- Goal is also to **establish an observatory** that covers the state of DNSSEC validation **from multiple angles**

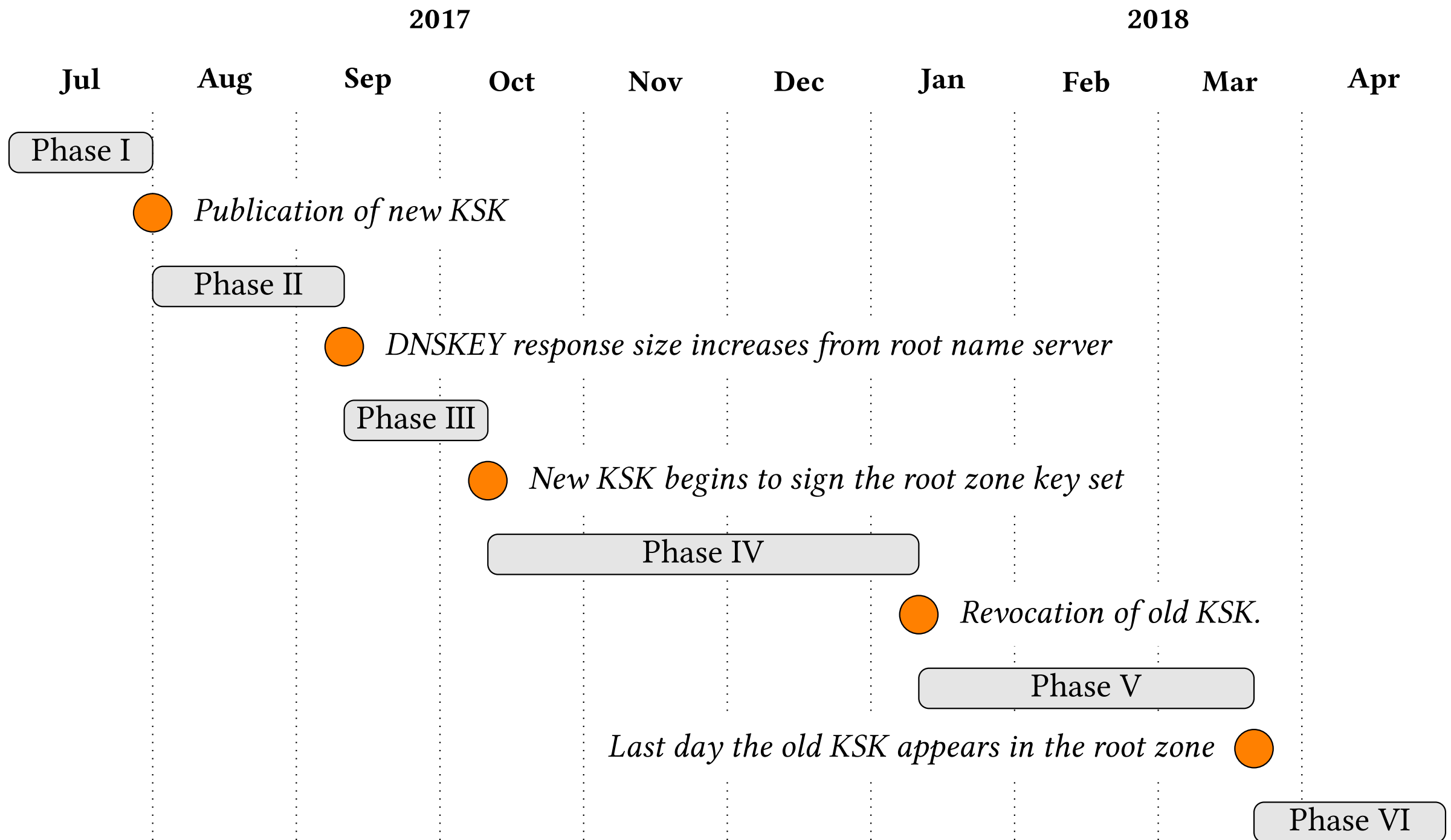
Measurement methodology

- Use four perspectives:
 - Online perspectives:
 - RIPE Atlas
 - Luminati
 - APNIC DNSSEC measurement
(current thinking: use data during evaluation)
 - “Offline” perspective (analysed after measuring)
 - Traffic to root name servers (multiple letters)

Measurement methodology

- We have **signed and bogus** records for **all algorithms** and **most DS algorithms**
- **Side-effect**: measure support for algorithms
- This gives us one of three outcomes:
 - Resolver **validates correctly**
 - Resolver **fails to validate** (SERVFAIL)
 - Resolver **does not validate**
 - (yes, there are **corner cases** probably **not covered** by these three options) ;-)

Measurement phases

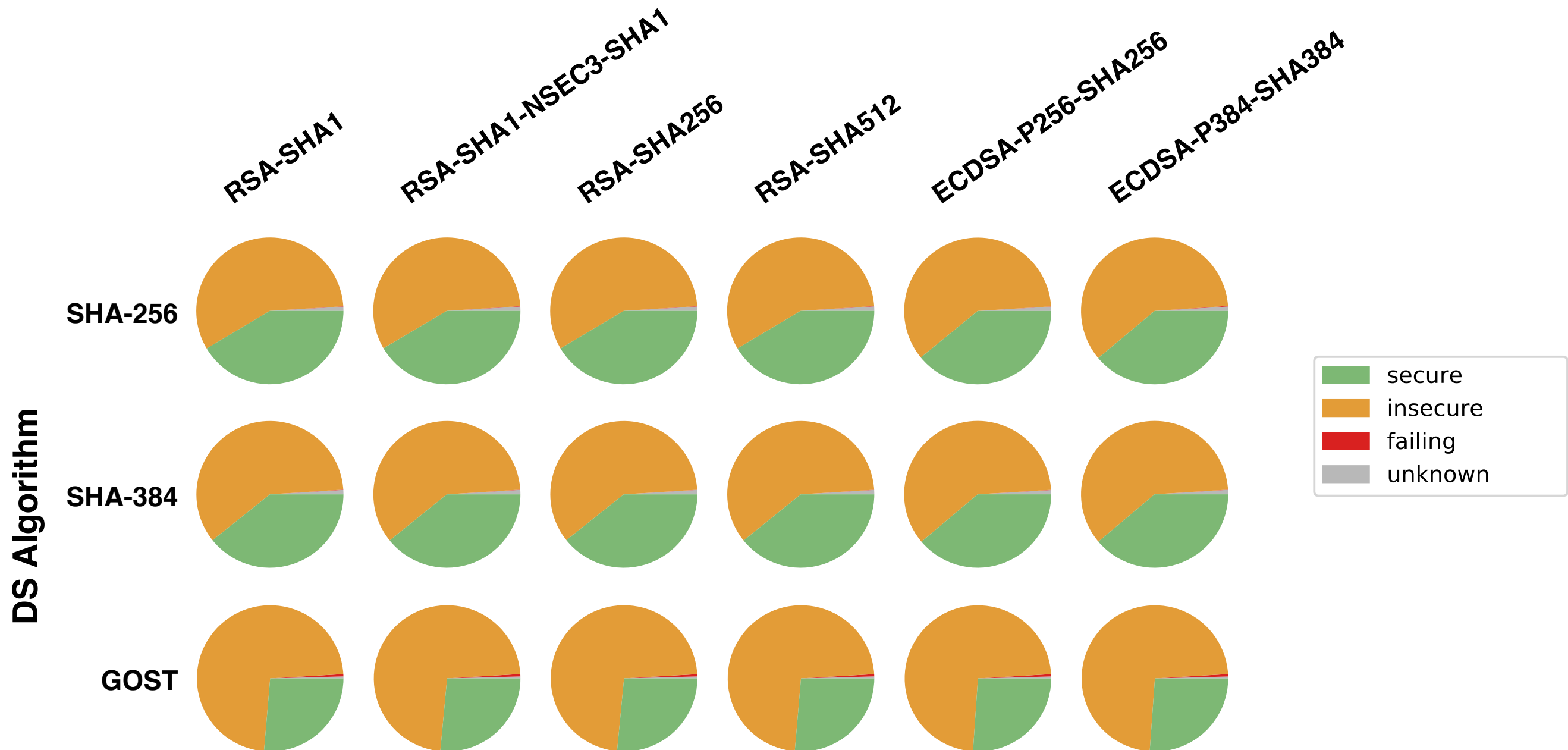


(picture courtesy of Taejoong “tijay” Chung, Northeastern University)

<https://rootcanary.org/>

First results

- For common signing algorithms:

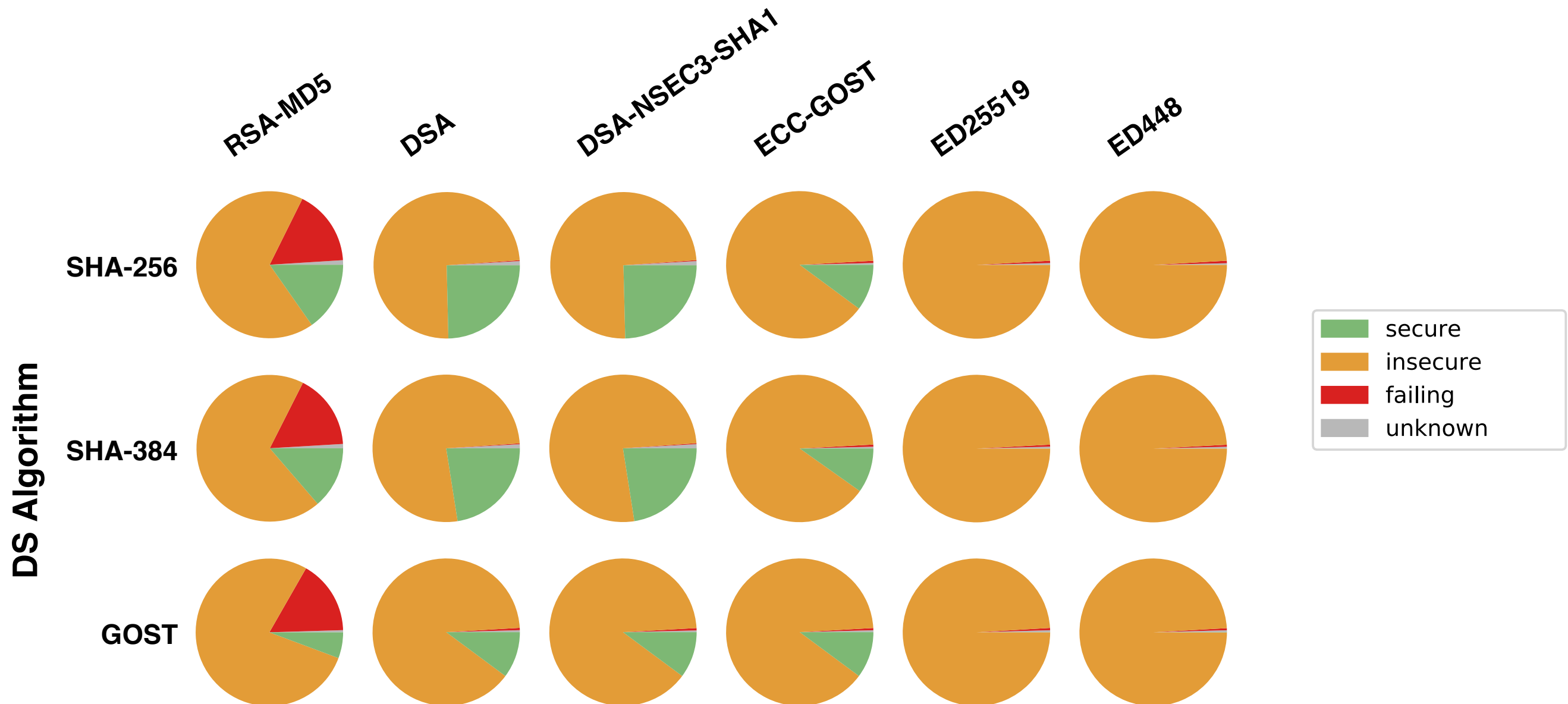


Last updated 2017-07-14 06:48:47.228925 UTC

<https://rootcanary.org/>

First results

- For deprecated and brand new algorithms:

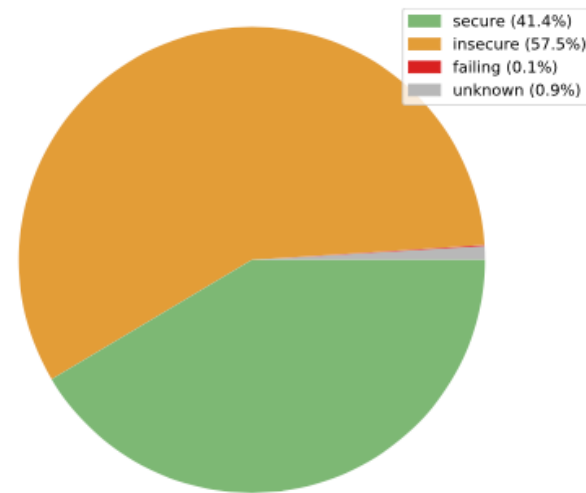


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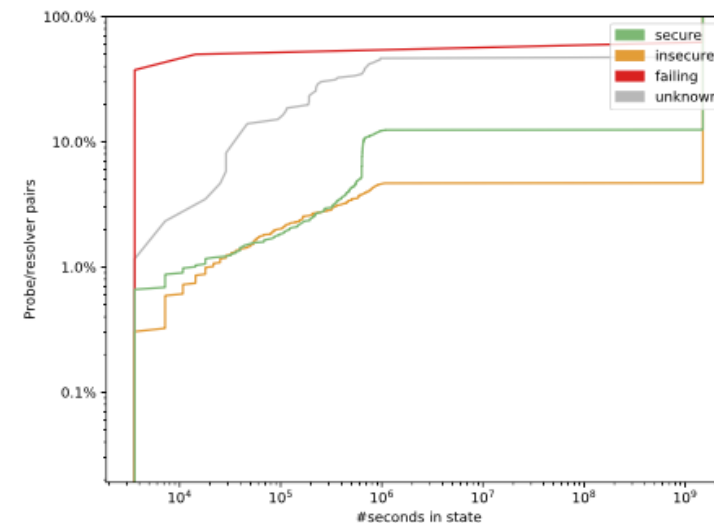
<https://rootcanary.org/>

First results (details)

current state
of probe
population

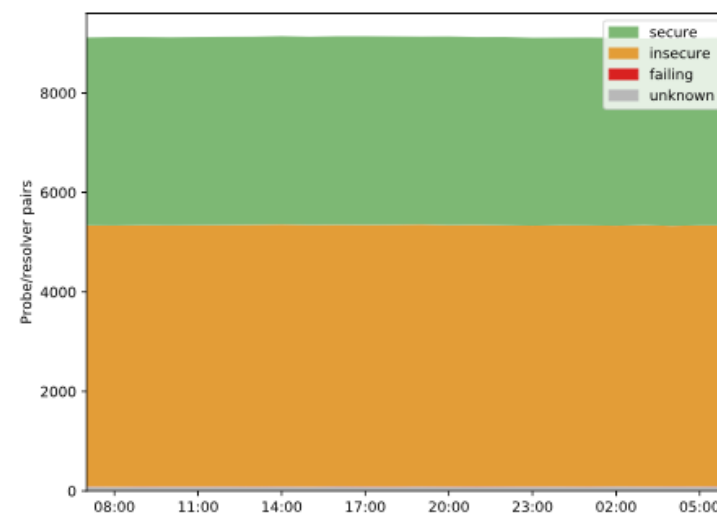


Current probe status for all probes

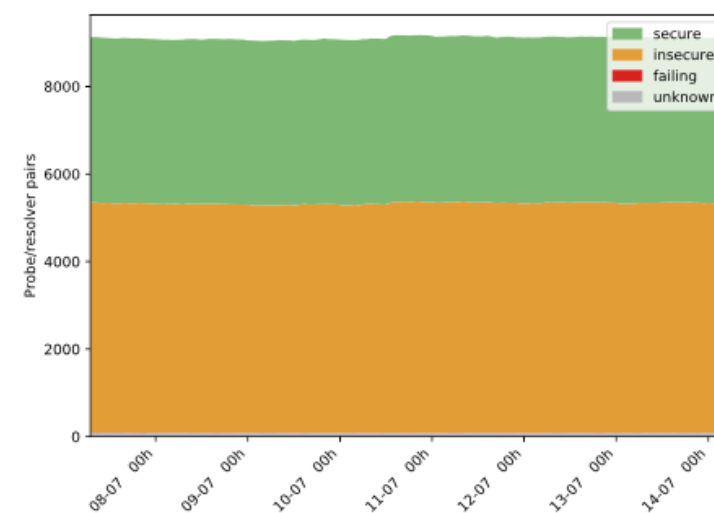


CDF for current time in state

CDF for time
probes are
in a state
(shorter ==
many state
changes)



All probes (24h)



All probes (7 days)

total probe population state (24h and 7 days)

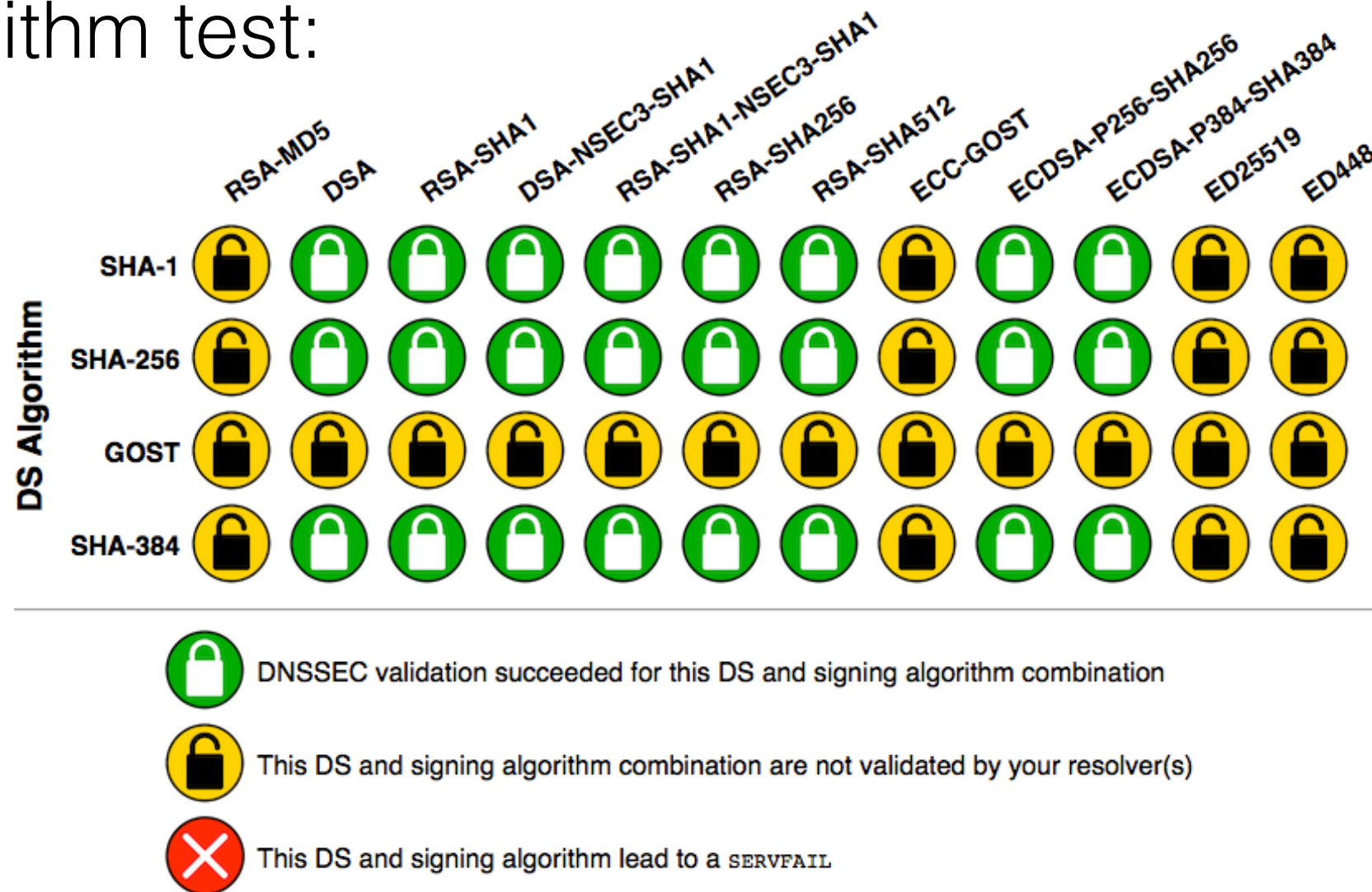
<https://rootcanary.org/>

Takeaways from first results

- **Introduction** of the **new key** on **July 11th** has **not led to** noticeable **problems** on resolvers
- Significant proportion of **RIPE Atlas probes** are **behind *stable* validating resolvers**
- **Google** Public DNS **returns SERVFAIL** for **RSA-MD5** (why not simply “insecure”?!)
- **Support** for **ECDSA P-256 and P-384** almost **at the same level** as support for **RSA-SHA256**
- Support for **Ed25519** and **Ed448** is **non-existent**

Spin-off result

- Some of you may have already seen our DNSSEC algorithm test:



- Online test checks DS- and signing algorithms supported by configured resolvers

<https://rootcanary.org/>

Spin-off result

- Algorithm **test** has **already led to fixes** in:
 - **PowerDNS** —> test showed it returned SERVFAIL for domains signed using algorithms it didn't support, and faulty Ed25519 signatures
 - **Knot Resolver** —> test also showed SERVFAIL returns for unsupported algorithms [1]

[1] <https://gitlab.labs.nic.cz/knot/knot-resolver/issues/210>

Work in progress

- Live feed of state changes for observed resolvers
- Portal environment that shows measurement state for DNS resolvers covered by RIPE Atlas probes
- Next upcoming major change: **size of DNSKEY response for the root grows on September 19th**
- ...

More info

- Project webpage:
<https://rootcanary.org/>
- Online algorithm test:
<https://rootcanary.org/test.html>
- Current results for RIPE Atlas-based measurement:
<https://portal.rootcanary.org/rcmstats.html>

<https://rootcanary.org/>