DNSSEC in ORG with a dash of COVID

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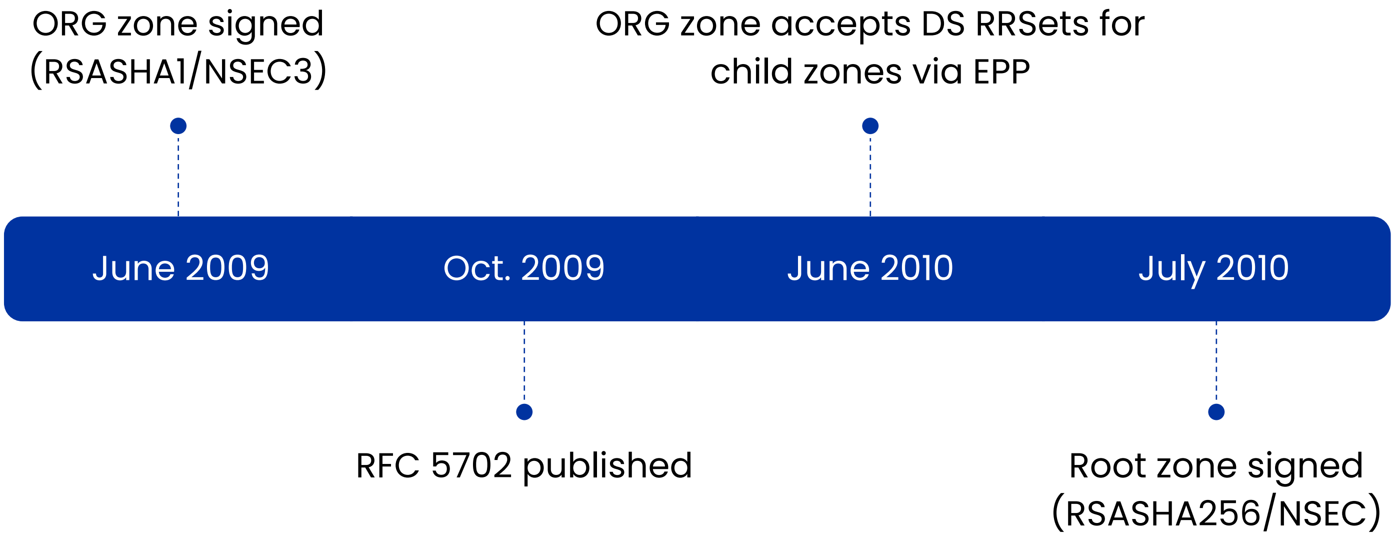
ccNSO Tech Day

Virtual ICANN 68

22 June 2020

IN OUR LAST EPISODE...



June 2009

ORG zone signed (RSASHA1/NSEC3)

Oct. 2009

RFC 5702 published

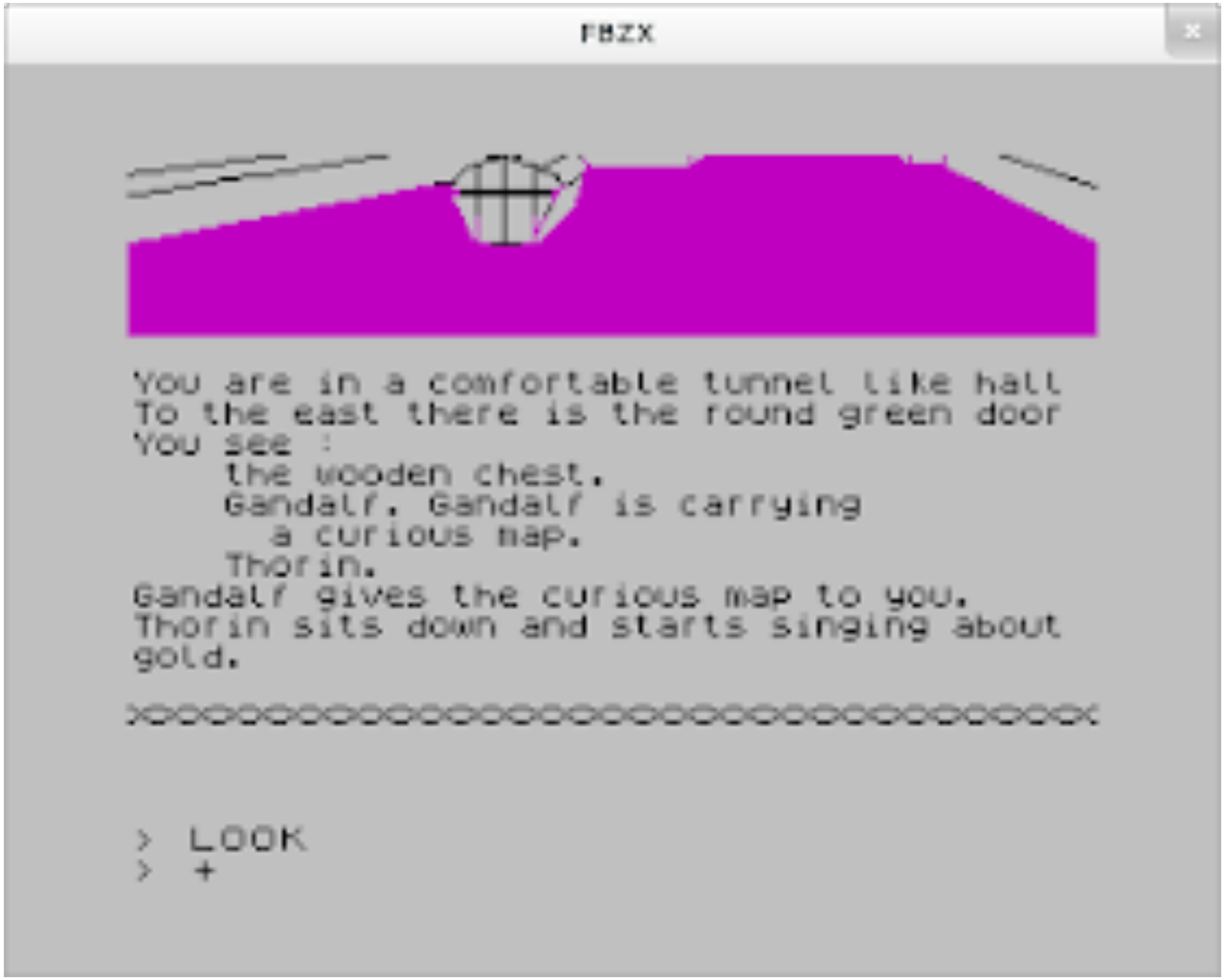
June 2010

ORG zone accepts DS RRSets for child zones via EPP

July 2010

Root zone signed (RSASHA256/NSEC)

TIME PASSES



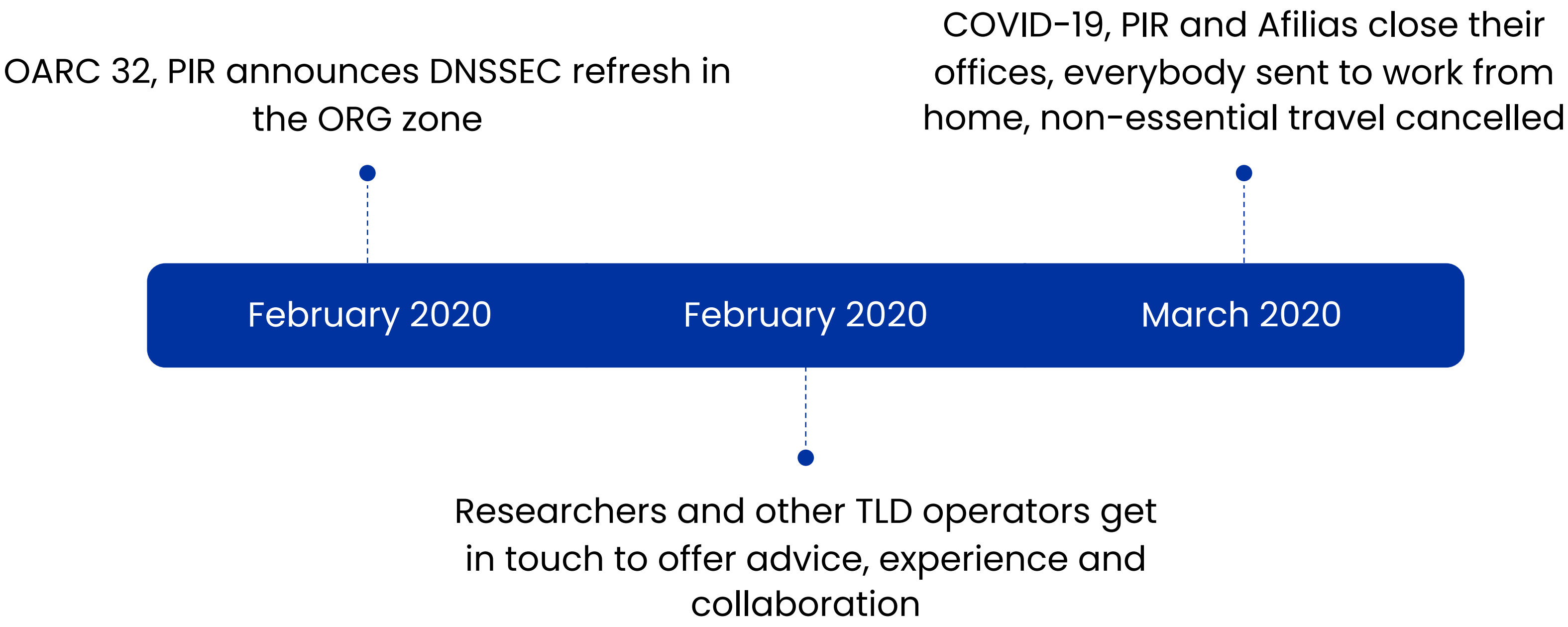
```
You are in a comfortable tunnel like hall
To the east there is the round green door
You see :
     the wooden chest.
     Gandalf. Gandalf is carrying
        a curious map.
     Thorin.
Gandalf gives the curious map to you.
Thorin sits down and starts singing about
gold.

XOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOX



> LOOK
> +
```

IN OUR LAST EPISODE...



OARC 32, PIR announces DNSSEC refresh in the ORG zone

February 2020

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Researchers and other TLD operators get in touch to offer advice, experience and collaboration

March 2020

COVID-19, PIR and Afilias close their offices, everybody sent to work from home, non-essential travel cancelled

WHAT DID WE WANT TO ACHIEVE?

- **ORG had an enormous DNSKEY RRSet**
  - Enormous enough that some guy called Geoff Huston once wondered aloud on stage in various conferences how .ORG even worked at all *for an entire year* to see if we would react
  - We should really make that smaller…
  - … but we'll wait because we wouldn't want to deprive Geoff of comedic material

- **ORG is signed using algorithm 7 (RSASHA1)**
  - Rijmen, Oswald, "Update on SHA-1" January 2005
  - Wang, Yin, Yu, "Finding Collisions in the Full SHA-1" August 2005
  - Wang, Yao, Yao, "Notes on the Wang et al. 2^{63} SHA-1 Differential Path", August 2005
  - … and many other old-time favourites, including…
  - Leurent, Peyrin, "From Collisions to Chosen-Prefix Collisions – Application to Full SHA-1" April 2019
  - Leurent, Peyrin, "SHA-1 is a Shambles First Chosen-Prefix Collision on SHA-1 and Applications to the PGP Web of Trust" January 2020

- **ORG is signed using NSEC3**
  - Negligible and increasingly unimportant protections against zone-walking
  - Opt-out sections make aggressive negative caching difficult
  - Complicates provisioning since zone size depends on DNSSEC uptake in children

WHERE WERE WE HEADING?

- **ORG had an enormous DNSKEY RRSet**
  - Identify operationally incomplete KSK rolls and complete them
  - Review pre-publication parameters for as-yet unused keys
  - Start lab testing different signer parameters to find out what else we could improve on

- **ORG is signed using algorithm 7 (RSASHA1)**
  - Plausible targets are algorithm 8 and 13
  - All the cool kids are doing algorithm 13 though, and that will help with the DNSKEY response size. Let's do that, we're cool. Algorithm 8 is lame, etc.
  - Start lab testing to find the performance implications of algorithm 7 vs. 8 vs. 13

- **ORG is signed using NSEC3**
  - NSEC is operationally less complicated
  - We're fairly sure we are no longer concerned with the zone-walking problem
  - With 10,000,000 delegations, most of which are insecure, adding NSEC + RRSIG to each one means something like 20,000,000 additional resource records and 10,000,000 additional signatures
  - Start lab testing to find the performance implications of signing the NSECs
  - Start reviewing the edge capacity forecasts for memory footprint

WHO SHOULD WE WORK WITH?

- **Community Engagement**
  - We want to make sure resolver operators are well aware of our plans
  - Let's review the relative differences in the validator population when it comes to 8 vs. 13
  - We should do a bunch of lab testing, and if we're going to do lab testing, we may as well make it a public lab

- **Research Opportunities**
  - ORG might have a more widespread base of dependent validators than the ccTLDs that have rolled to 13; perhaps there are interesting differences, there
  - We don't know for sure, but we think that possibly there hasn't been a production TLD roll from NSEC3 to NSEC, so perhaps that is new and exciting

- **Communications and Data Collection Partners**
  - Started talking to the good people at DNS-OARC about our plans
  - Keith and Matt offered to host a mailing list
  - We started talking about how we might contribute funds to help with data collection exercises, if researchers suggested they were interested in data

BUT THEN OF COURSE

- **Huge performance impact of Algorithm 13 on Existing Signers**
  - The current signing platform in use for .ORG has unoptimized support for ECDSA, and it shows
  - The new signing platform under development for other TLDs that would very likely not have this problem is still, well, under development

- **No Travel**
  - Setting up a lab with new hardware is suddenly much more difficult
  - Crossing borders to increase edge capacity, memory footprints, etc suddenly seems difficult
  - Changes to key management that involve people handling credentials seem unwise, even if they are practical

- **No Universities**
  - Universities all over the planet start closing down and sending their students home
  - Campuses close, courses are suspended
  - Some regional universities have already cancelled lectures through the end of 2021

- **Everybody Suddenly Depends on the DNS Even More than they Used To**
  - Let’s face it, this would be a particularly terrible time for anything to go wrong
  - Critical Critical Infrastructure

THAT WAS MARCH. SURELY APRIL WOULD BE FINE.

keep-calm.net

WHAT *CAN* WE DO THIS YEAR?

- **We can review relevant parameters in the existing signers, like**
  - Key pre-publication strategy
  - Signature lifetimes and zone-wide re-sign intervals
  - ZSK rollover policies
  - TTLs

- **We can test the performance implications of a roll to algorithm 8**
  - We've already done most of this, in fact, and the differences are negligible

- **We can test the robustness of the algorithm rollover in the current signer**
  - We could do this in private and publish the results
  - We could run a public testbed

- **We could do a dry run in some smaller TLDs**
  - While we would take full precautions with *any* TLD, no matter how small, the impact of a problem in a much smaller TLD would be easier to mitigate and would affect far fewer end-users

- **We can do communications, outreach and coordination with researchers**

WHAT *SHOULD* WE DO THIS YEAR?

- **You tell us what you would like to see**
  - If you have experience to share, or
    - Interesting research questions to answer, or
    - Ideas about other things we could do, or
    - Observations about weirdness that you can't explain
  - Please talk to us!

https://lists.dns-oarc.net/mailman/listinfo/org-algorithm-roll

- **Complete a feasibility study for a roll to algorithm 8**
  - This is a much more incremental change than we were anticipating, but perhaps it's a reasonable piece of work that other people considering a move away from SHA-1 might benefit from
  - It's not often that this kind of planning work has such a direct and practical reason to include the kind of disaster scenarios that exist outside the window right now

- **If feasible, complete the roll**
  - We would still love to get this done in 2020
  - We're going to prioritise stability, however, and it's always possible that the risk analysis will indicate that we are better off waiting

STATUS, DRAFT NEXT STEPS

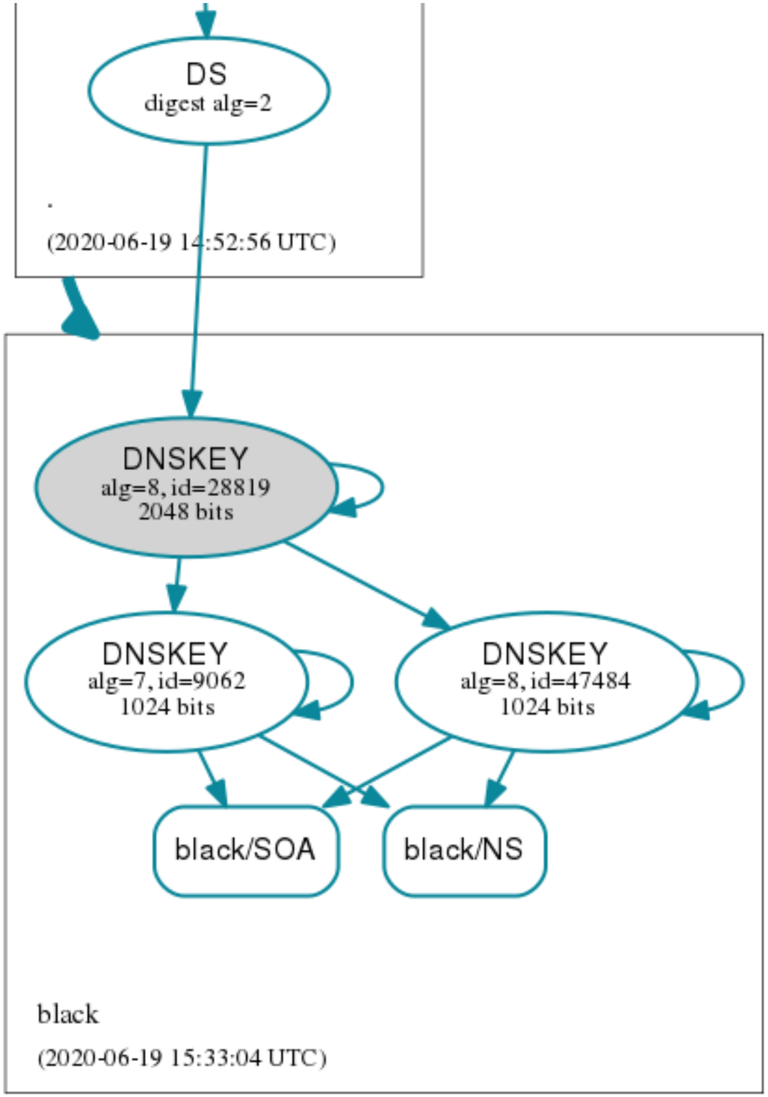
- **We have delivered presentations of this presentation to various audiences**
  - RIPE dns-wg, May 2020
  - DNS-OARC, June 2020
  - ccNSO Tech Day, ICANN 68, June 2020

- **Preparatory Work carried out by our Back-End Registry Services Provider**
  - Indicative results suggesting that a roll from 7 to 8 is feasible
  - Successful Lab testing of a roll from 7-8 using the same signer platform
  - Production roll from 7 to 8 using the same signer platform but for a different, small new gTLD is ongoing but results to date are very encouraging

- **We have around 40 people subscribed to our org-algorithm-roll list**
  - Mainly subscribed following each of the two presentations preceding this one
  - Substantially technical audiences
  - Once the preparatory work described above is complete we expect to start a public conversation about choice of technical parameters, timeline and future outreach efforts

- **We continue to have reasonable confidence that we can complete a roll in 2020**
  - Surely no other global problems can emerge this year, right?

OBLIGATORY DNSVIZ OUTPUT



Questions?

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