ANATOMY OF DNSSEC KEY TRANSITIONS

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- In 2005, we started monitoring DNSSEC with SecSpider (https://secspider.net/)
  - Not presuming we knew everything we wanted to analyze

- Recently, interest in key rollovers has emerged
  - Root zone KSK has spawned publicity and research

- But, key "rollovers" do not fully describe what we have seen in the wild for the last 15 years

- "To know the path ahead, ask those coming back"
  – Chinese proverb

- What can we learn about key rollovers by looking at how they have been conducted, and what should we formalize about *how* to conduct them going forward?

- Our first observation has been that keys often change in sets that are larger than 1:1

- Example, in a zone with n keys (some used to sign data):
  - If transitioning to m keys (some used to sign), which key(s) rolled over to which other keys?
  - Did all of departing keys rollover to each/all remaining?
  - If some keys persisted, did they also get rolled over to?

- We define changing of keys as "key transitions"
  - May be composed of multiple [simultaneous] "rollovers"
- We also defined an "anatomy" of what should be *measured* in order to quantify transitions
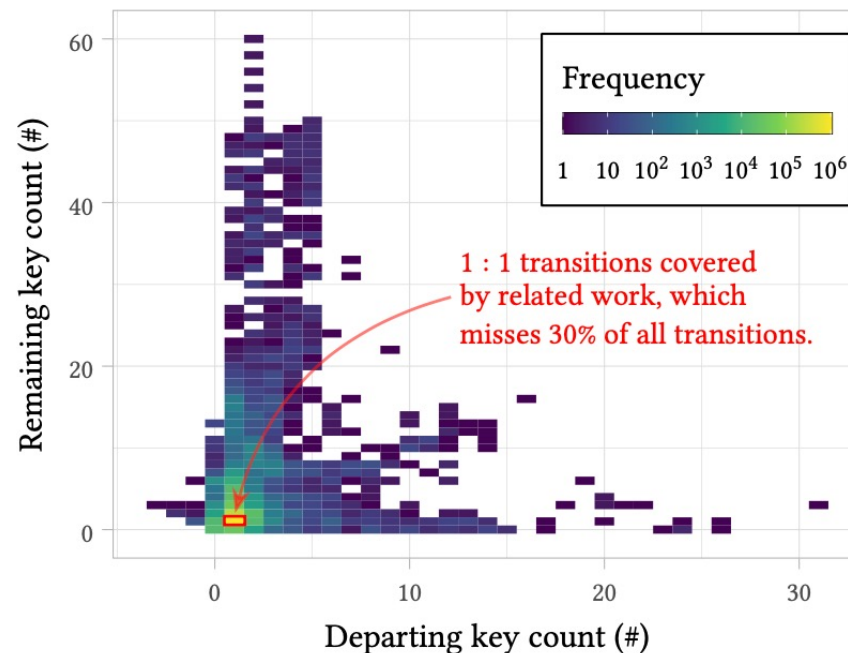
- We defined the measurable properties of timing between keys
  - We include counts of how many keys
  - if/when they were in use
  - what their relative ages are
  - etc.
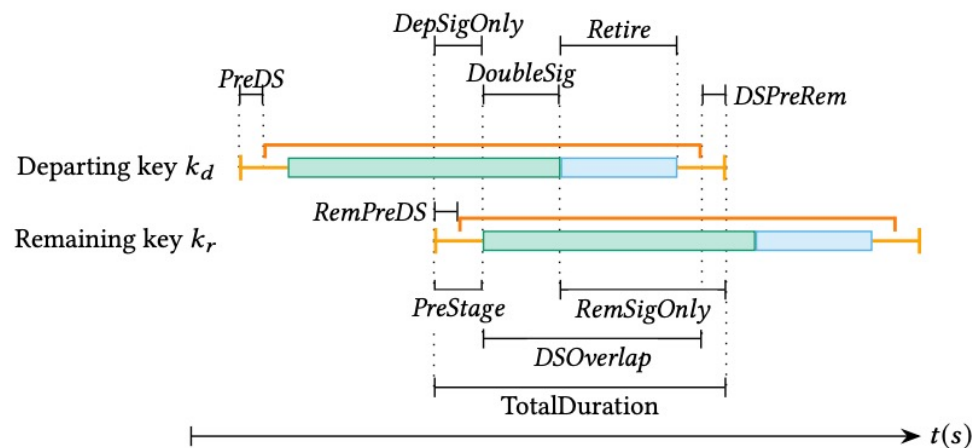
- We used this to measure where keys did/did not adhere to guidance
  - RFC-5011 and RFC-7583
  - A proposal for conducting emergency key rollovers (transitions) [1]
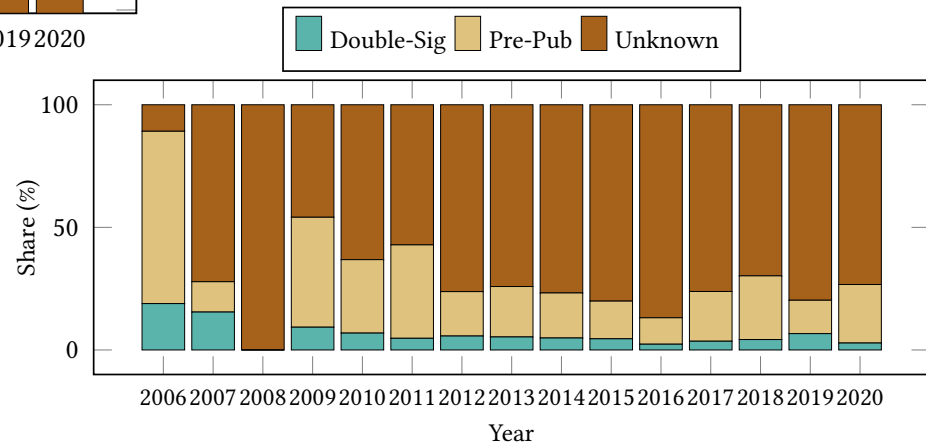 - Plan to use it to measure RFC-8901 (Multi-Signer)

[1] Zheng Wang and Liyuan Xiao. Emergency key rollover in dnssec. In 2014 IEEE 13th International Conference on Trust, Security and Privacy in Computing and Communications, pages 598–604. IEEE, 2014.

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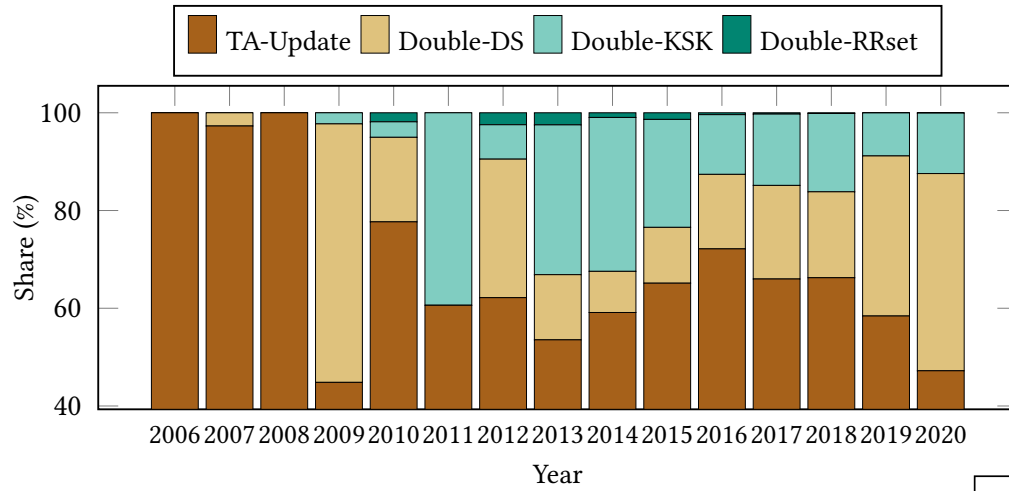
KSK transitions

ZSK transitions

- As operations are becoming more familiar/comfortable with DNSSEC (and as tools continue to mature), *popular* key transition processes are emerging

- With a formal anatomy, want to provide input into future key transition guidance

- Full paper of these results is under submission, but available upon request

THANK YOU