Root Zone KSK Rollover update

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The KSK rollover has happened!

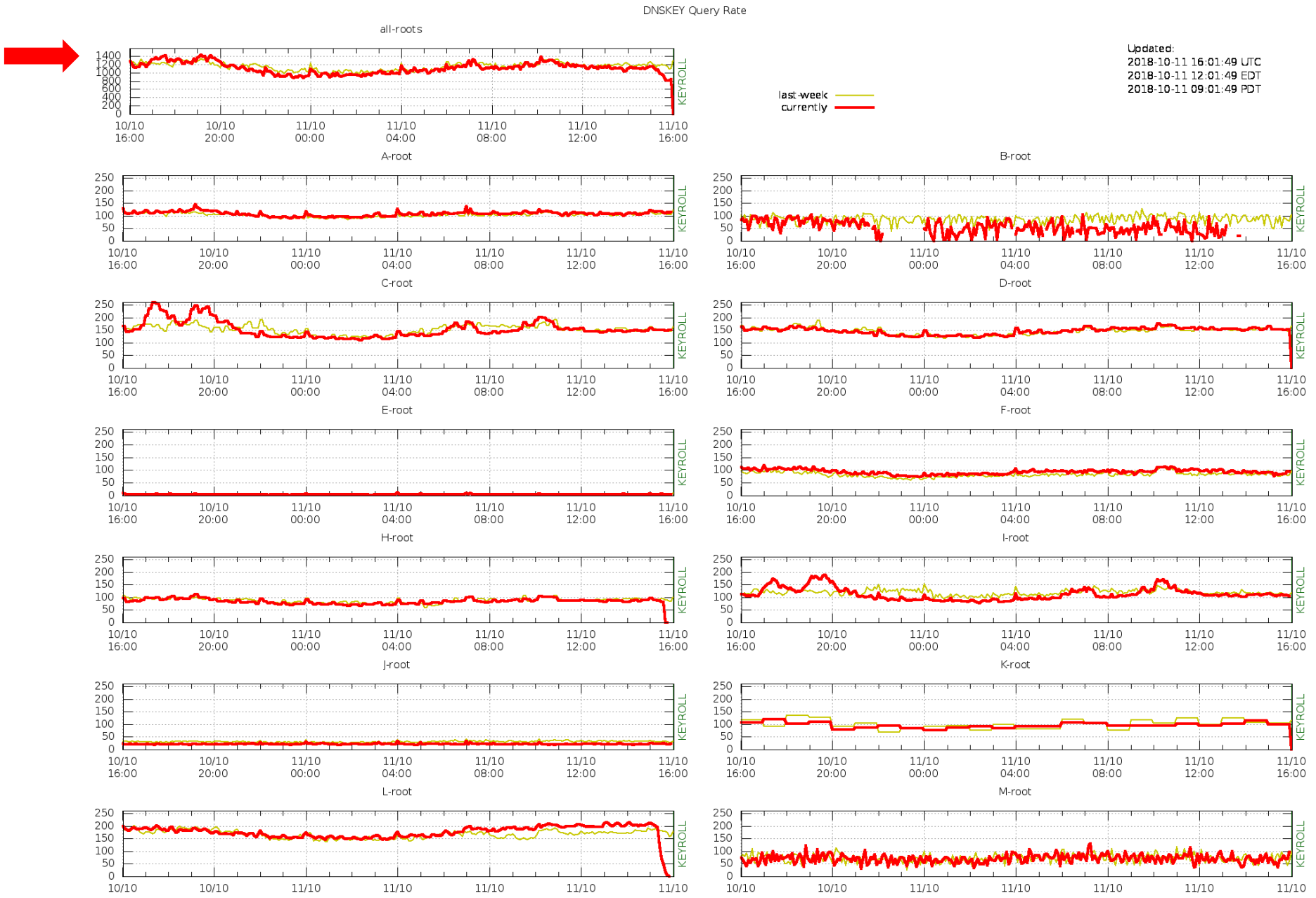
- The KSK rollover occurred on time as planned at 1600 UTC on 11 October 2018 with the publication of a root zone with KSK-2017 signing the root zone DNSKEY RRset for the first time.

Timeline of events (UTC)

- 13:00 Root Zone Management Partners join conference bridge
- 13:00 Verisign generates root zone file
- 13:15 Verisign inspects root zone file
- 13:30 Verisign sends root zone file to ICANN
- 13:30 ICANN inspects root zone file
- 15:30 ICANN Go/No-go call
- 15:45 ICANN approves the zone for publication
- 15:45 Verisign reminds root server operators of scheduled zone push
- **16:00 Verisign approves root zone file push**
- 16:05 Verisign informs root server operators zone file has pushed

Amsterdam team

Monitoring: ./IN/DNSKEY queries at the root (just before the roll)



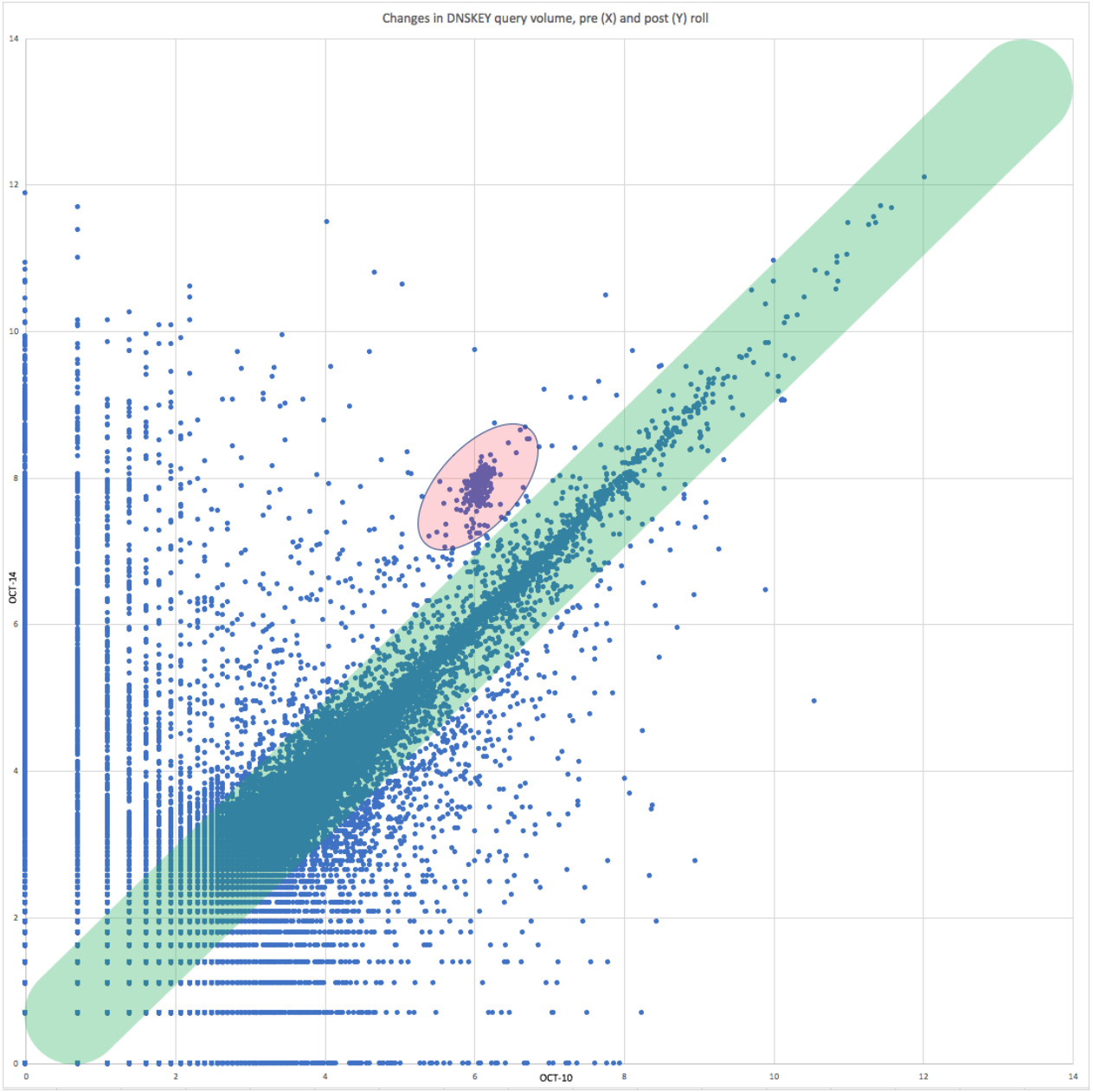
Monitoring: ./IN/DNSKEY queries at the root (48 hours after the roll)

Monitoring: ./IN/DNSKEY queries at the root

Analysis of DNSKEY queries

- Testing proved that stale trust anchors cause an increase in DNSKEY queries
- OCTO compared DNSKEY query behavior before and after the roll
  - October 10 and 14
- We've observed a total of 1,091,215 unique resolvers asking for a DNSKEY over four days
- 155,117 unique resolvers observed on both 10 October and 14 October
  - 85,531 resolvers sent a DNSKEY request at least once a day between the 10 October and 14 October
  - Vantage point was IMRS/L-root
  - Resolvers might talk to other root letters
- OCTO tracked each of the 155,117 resolvers for change in query behavior

DNSKEY queries (10 October vs. 14 October)



DNSKEY scatter plot

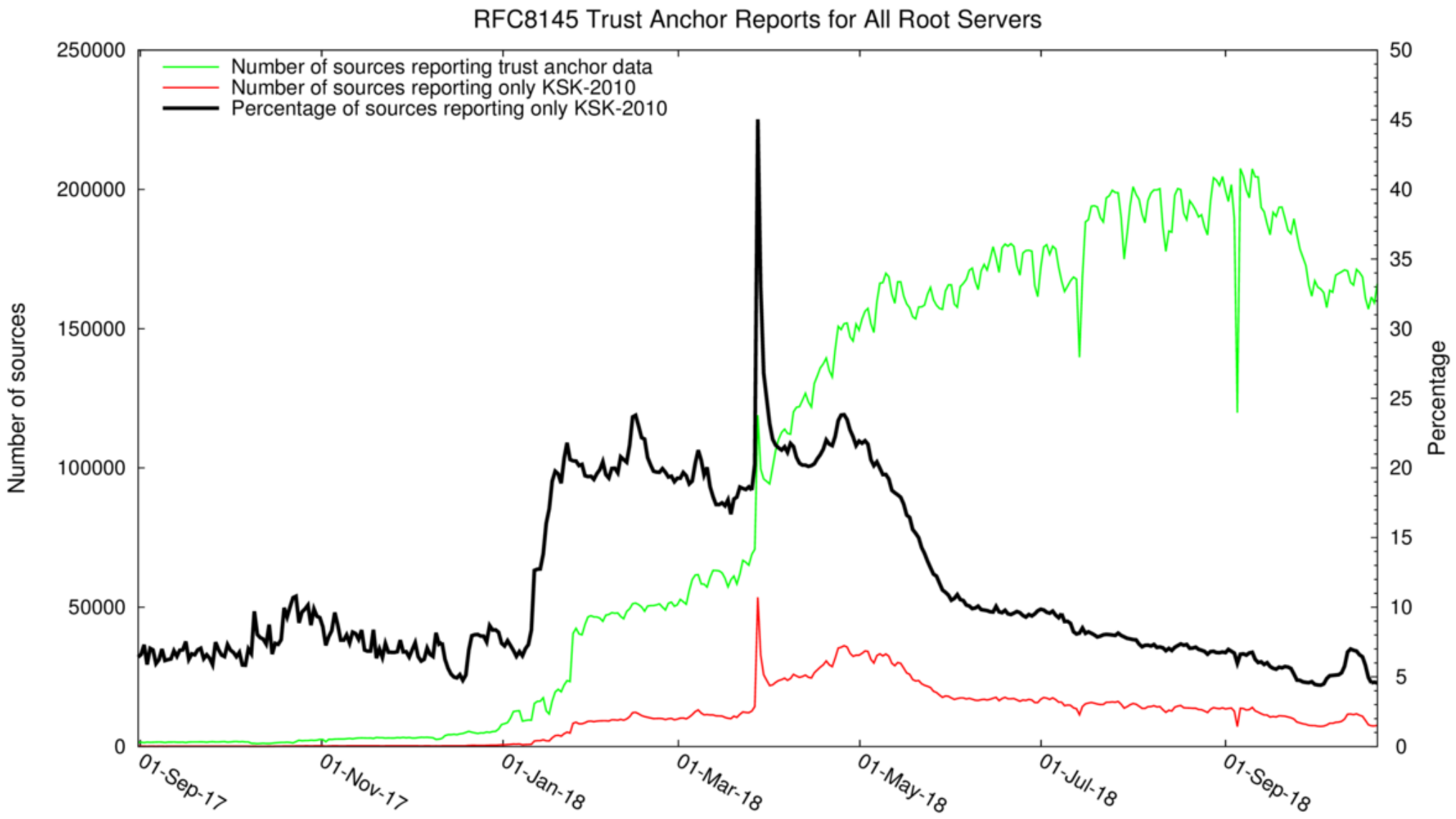
- The X axis represents query volume on 10 October in log scale
- The Y axis represents query volume on 14 October in log scale
- Each blue dot represents an observed resolver, plotted (X,Y) on the graph
- Expected behavior is in the green diagonal band, showing changes within the same order
- Anything above the green band is O(1) increased query volume
- Anything below the green band is O(1) decreased query volume
- The red represents an unexpected clustering that we're actively investigating

Resolvers per order change

Resolvers per order change

- The X axis represents buckets of “volume order change”
- The Y axis represents the number of resolvers in a bucket
- The bulk of resolvers lie between -1 and 1
  - Less than an order of magnitude change in the number of queries issued
- Between -1 and 1: 148,502 resolvers or 95.7% of the total observed
  - Relatively little change in volume
- Great than 1: 2,084 resolvers or 1.34% of the total observed
  - They see their volume increase significantly
- Less than -1: 4,531 or 2.92% of the total observed
  - They see their volume decrease significantly

root-trust-anchor-reports.research.icann.org



Known issues

- Only one very minor report of trouble to ICANN
- A small number of reports of issues (<10) via Twitter, mailing lists and operational forums
  - Mostly individual administrators relating minor issues
  - No reports of significant number of issues affected
- Two outages may potentially be the result of the KSK rollover. We are trying to reach the ISPs involved to get more information.
  - eir (Irish ISP): https://www.rte.ie/news/2018/1013/1002966-eir-outage/
  - Consolidated Communications (Vermont, US ISP): https://www.wcax.com/content/news/Consolidated-Communications-scrambles-to-fix-Vt-internet-outage-497030071.html

Upcoming milestones

- Q4 Root KSK Ceremony
  - Signatures are generated in advance that, when published, will revoke KSK-2010 via the RFC 5011 automated update protocol
- 11 January 2019
  - The root zone is published with the RFC 5011 revoke bit set on KSK-2010
- 22 March 2019
  - The root zone is published without KSK-2010 for the first time
  - Only KSK-2017 remains published
- Q3 Root KSK Ceremony
  - KSK-2010 is deleted from the HSMs in the U.S. East Coast Key Management Facility
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