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HAW HAMBURG

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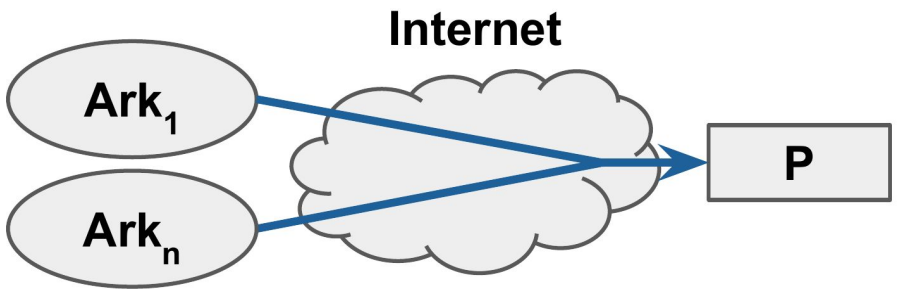
# Measuring Propagation Time of RPKI Validity Changes on the Dataplane

IETF 126 | SIDROPS, Vienna // July 18-24, 2026

# Research Question

**RQ:** How fast does the dataplane react on RPKI ROA changes? Requires traceroutes before and after a ROA change.

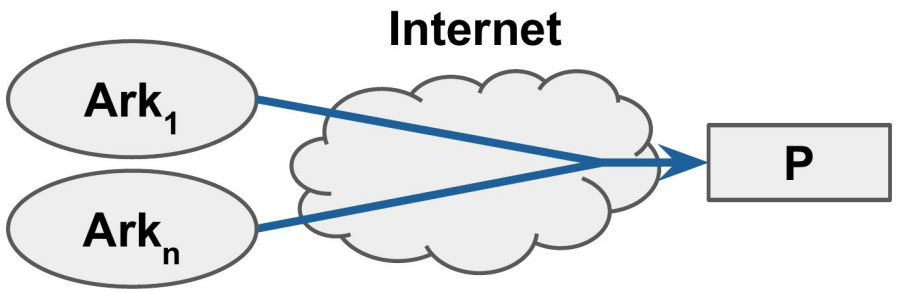
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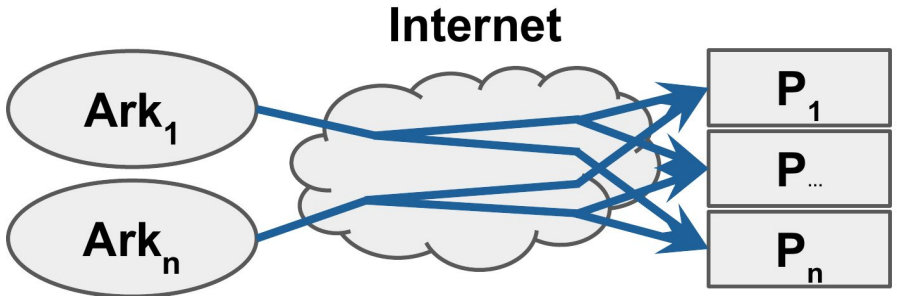



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Prior work combined RPKI beacons and traceroutes, limiting their topological coverage to few upstreams.

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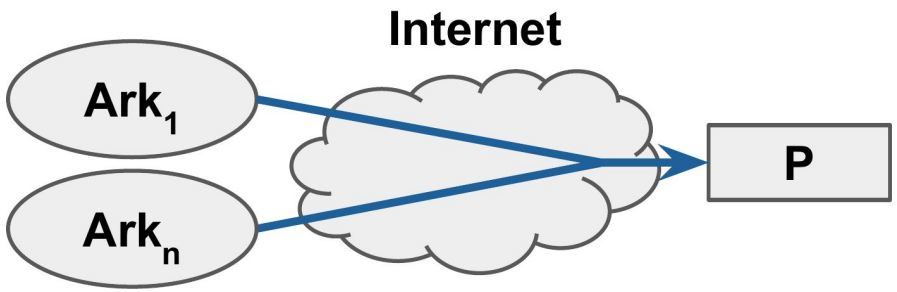



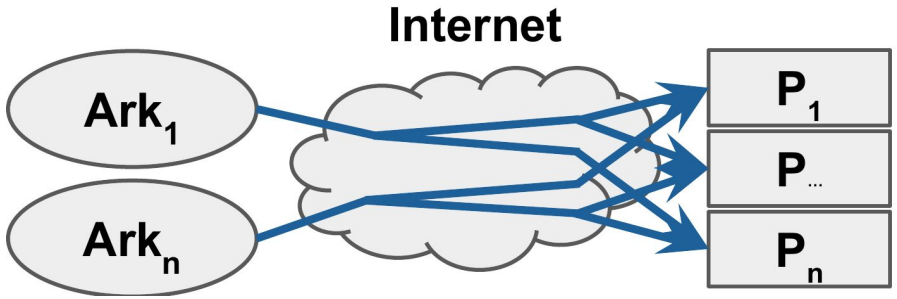

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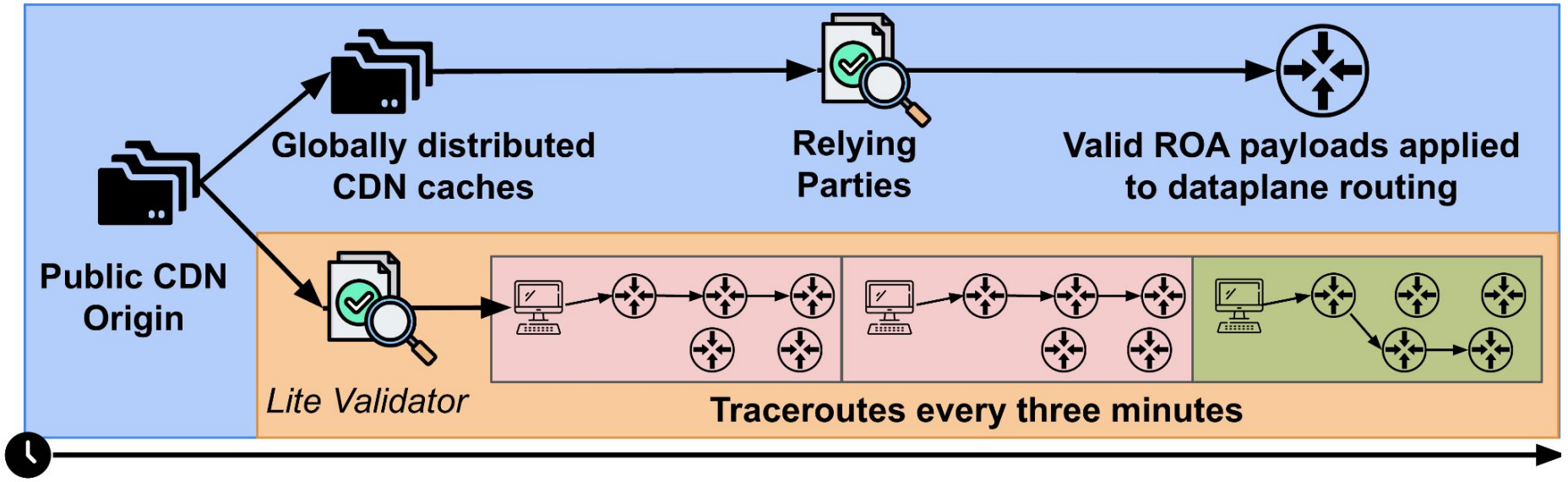

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Which signal can we use to **start measuring dataplane before the RPKI ecosystem reacts to a ROA change?**

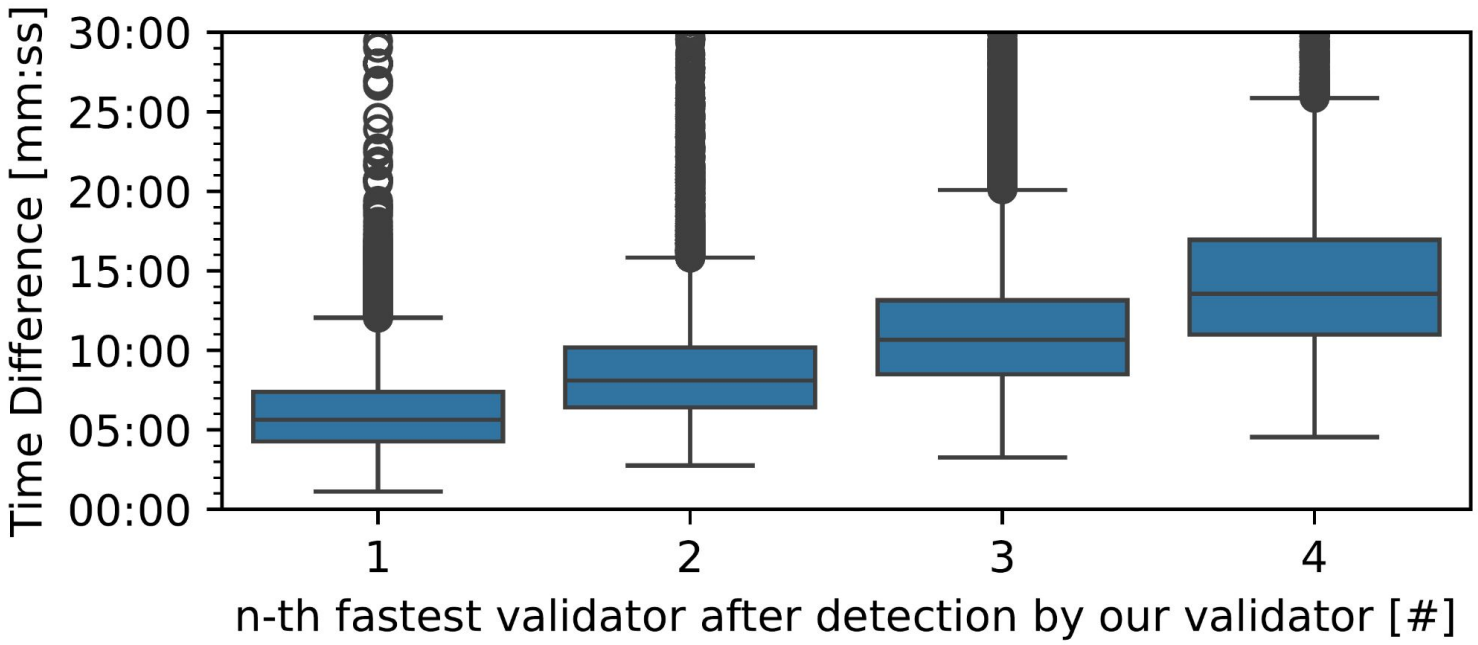
# Measurement Setup




We use the CDN origin of the RIPE RRDP repository and an optimized validator to detect ROA changes slightly earlier than the rest of the RPKI ecosystem.

When a VRP changes, we perform **traceroutes from 300+ CAIDA Ark vantage points** towards the impacted prefix for one hour every three minutes.

# How much faster do we observe changes?




We are at least 57 seconds quicker with a median time of 5:07 minutes until the fastest public validator publishes the same change (n=24886).

# Number of Observed RPKI Transition Events

We ran our measurements for three months from 1 November 2025 to 31 January 2026.

Overall, we observed 24,886 ROA transitions that affected the VRPs.

| Transition | Count(#) | Share (%) | IPv4 (%) |
|---|---|---|---|
| *No BGP* | 8094 | 32.52 | 70.90 |
| *Single AS* | 14651 | 58.87 | 86.29 |
| V →V | 5508 | 22.13 | 88.51 |
| U →V | 3427 | 13.77 | 85.59 |
| V →U | 2267 | 9.11 | 74.11 |
| V →U →V | 697 | 2.80 | 90.24 |
| V →I | 554 | 2.23 | 92.42 |
| I →V | 393 | 1.58 | 94.66 |
| V →U →I | 306 | 1.23 | 93.46 |
| U →I | 294 | 1.18 | 86.73 |
| Other | 1205 | 4.84 | 91.37 |
| *MOAS* | 2141 | 8.60 | 90.61 |
| V →V, V →I | 274 | 1.10 | 98.18 |
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| *Total* | 24886 | 100.00 | 81.66 |

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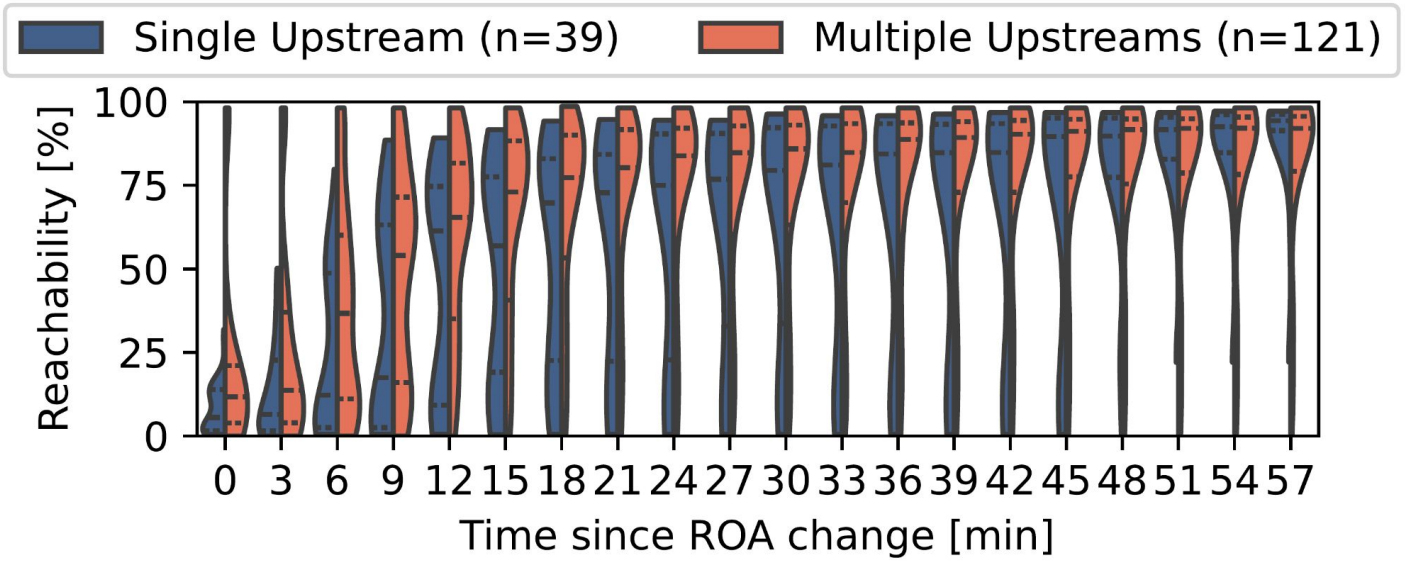
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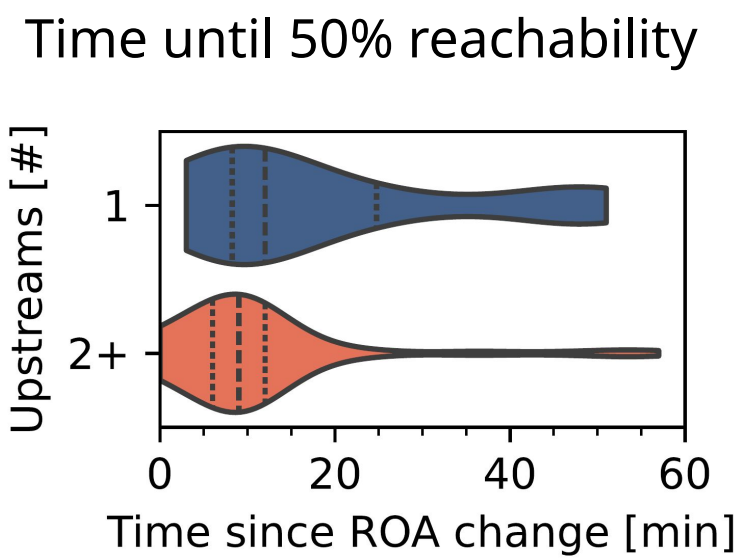
Overall, we observed 24,886 ROA transitions that affected the VRPs.

**1493 transitions from or into INVALID (excl. MOAs).**

| Transition | Count(#) | Share (%) | IPv4 (%) |
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# Transition: Invalid → Valid/Not-Found



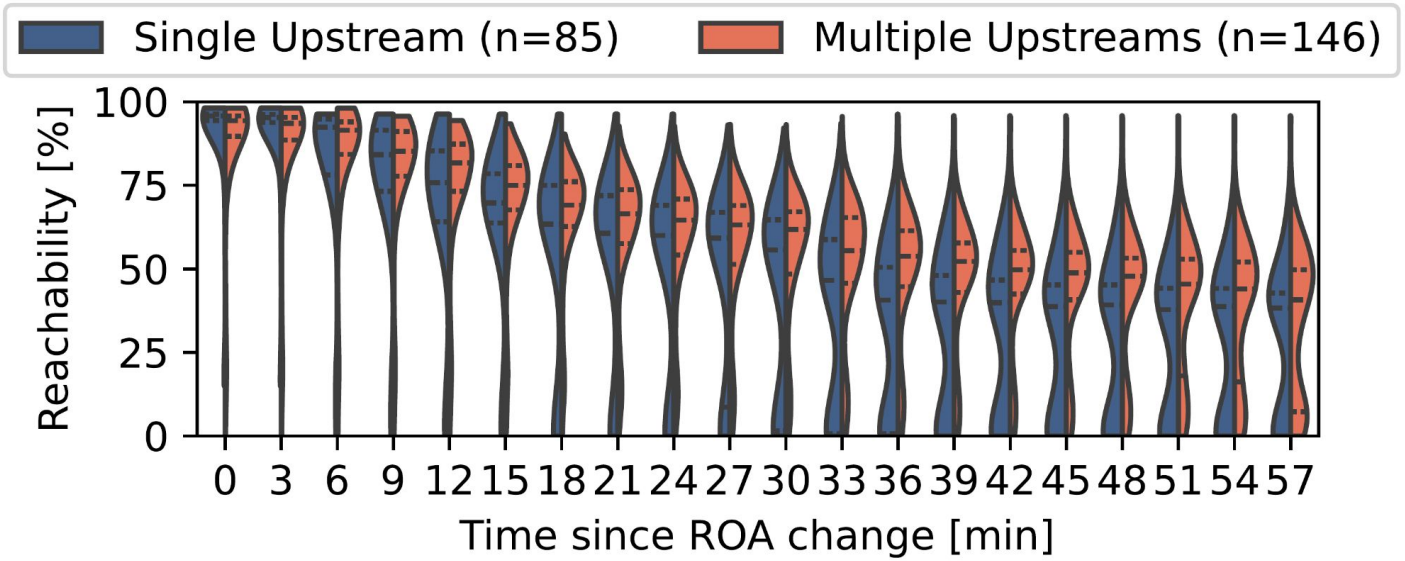



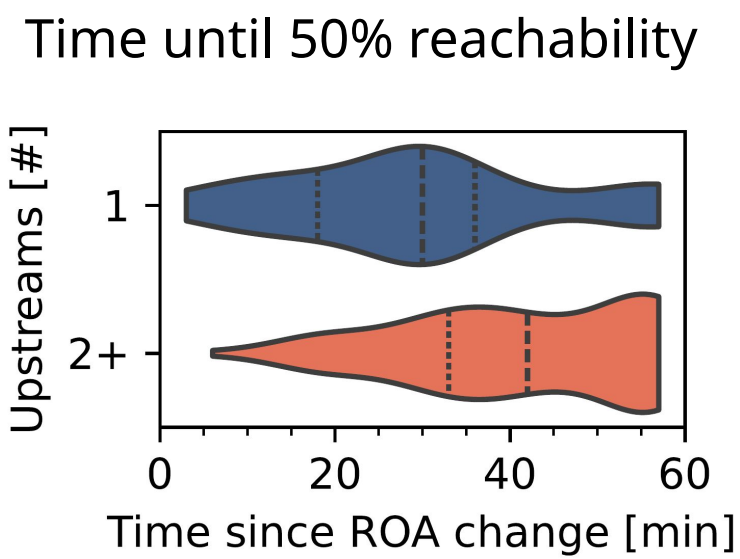

For single-homed networks, median time is 12 minutes for 50% of our vantage points.

For multi-homed networks, median time is 9 minutes for 50% of our vantage points.

The number of upstreams is derived from RIPE RIS data, so it will overestimate single upstreamed networks.

# Transition: Valid/Not-Found → Invalid



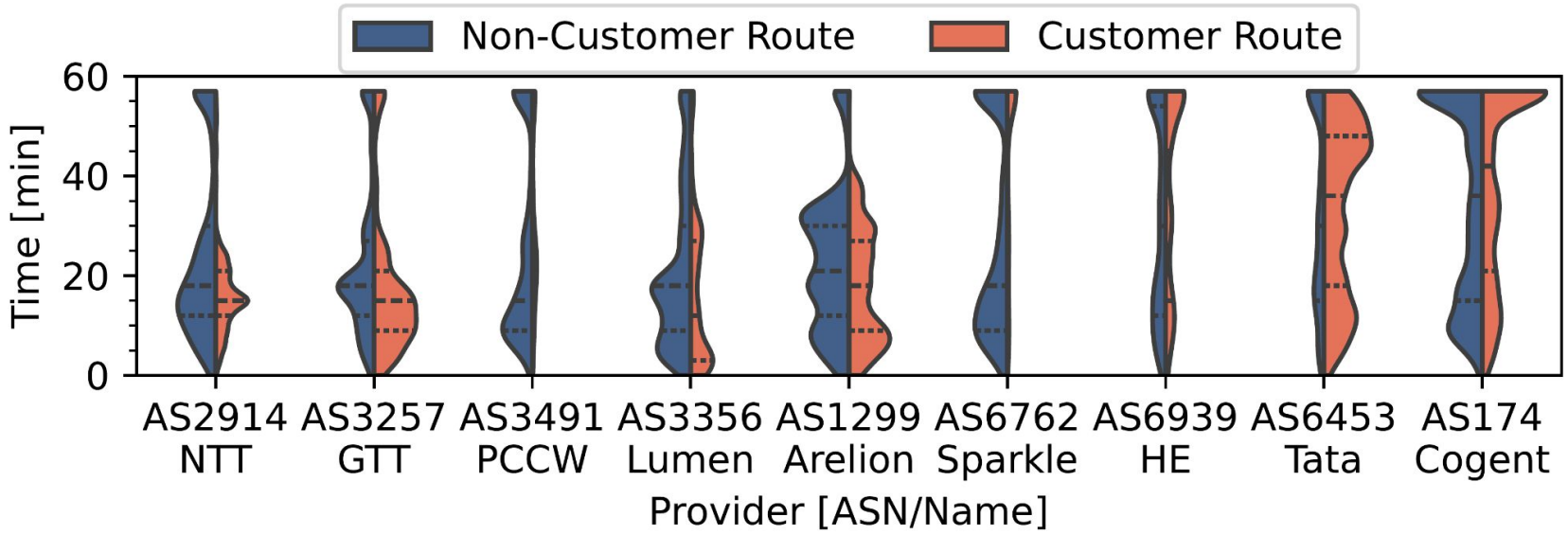




For single-homed networks, median time is 30 minutes for 50% of our vantage points.

For multi-homed networks, median time is 42 minutes for 50% of our vantage points.

**Note:** We only ran traceroutes for one hour.

# How fast do large networks withdraw invalid routes?




**This graph shows the last time a probe observes this network in traceroutes for Not-Found/Valid → Invalid events. (excl. default routes).**

**Caveats:**
The selection of providers is biased by the locations of the CAIDA Ark vantage points. Slower networks appear quicker during some events if they only receive the announcement from a quicker network.

# What does this mean for you? You can speed up!

Is RPKI too slow to combat an ongoing hijack?

- The Amazon Route53 hijack lasted almost two hours
- After 42 minutes, 50% of our vantage points could still reach INVALID prefixes.

There is still room for improvement!

- Create ROAs for your prefixes now!
- Have your validators refetch in shorter intervals (<= 10 minutes)