"Bogon" filters
Probing the Edge of the Internet

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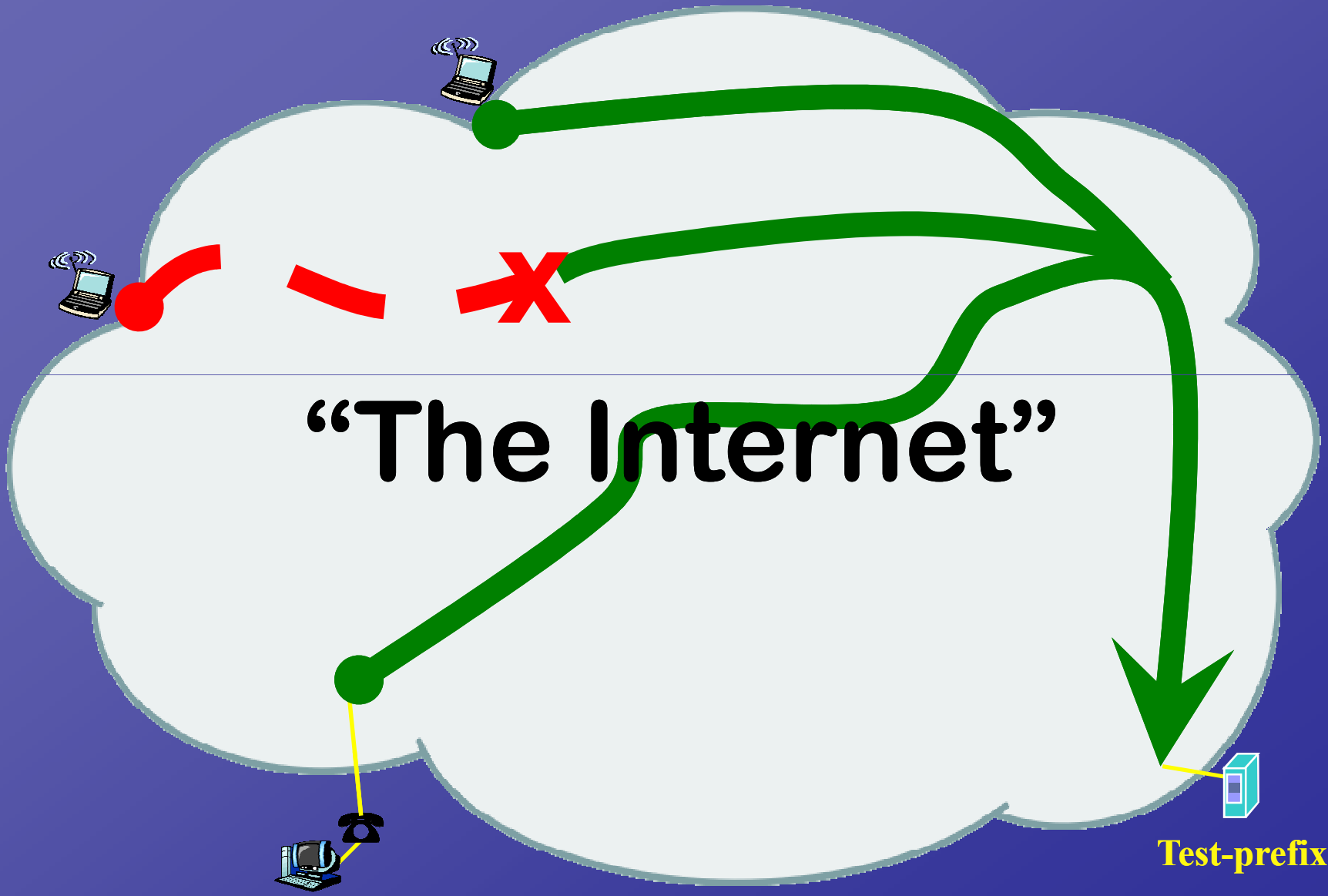
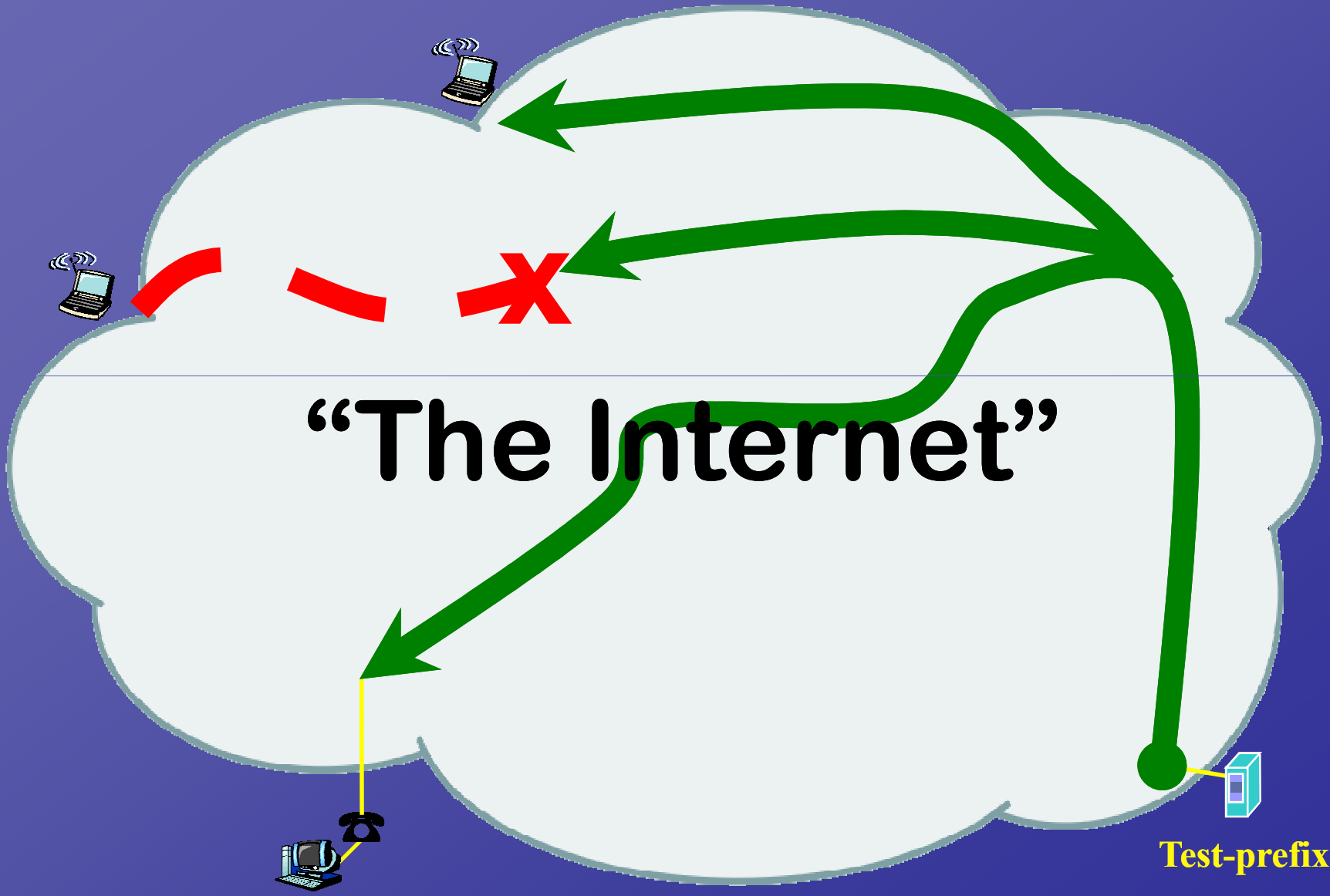
Problem Statement

- We can not see routing (control plane) at the edge
- In "Happy Packets" we showed that the control plane is a poor predictor of the data plane, is the reverse true?
- Bogon Routing Filters do not get removed and make new address space hard to use
- You do not know if the pingee should have answered or not

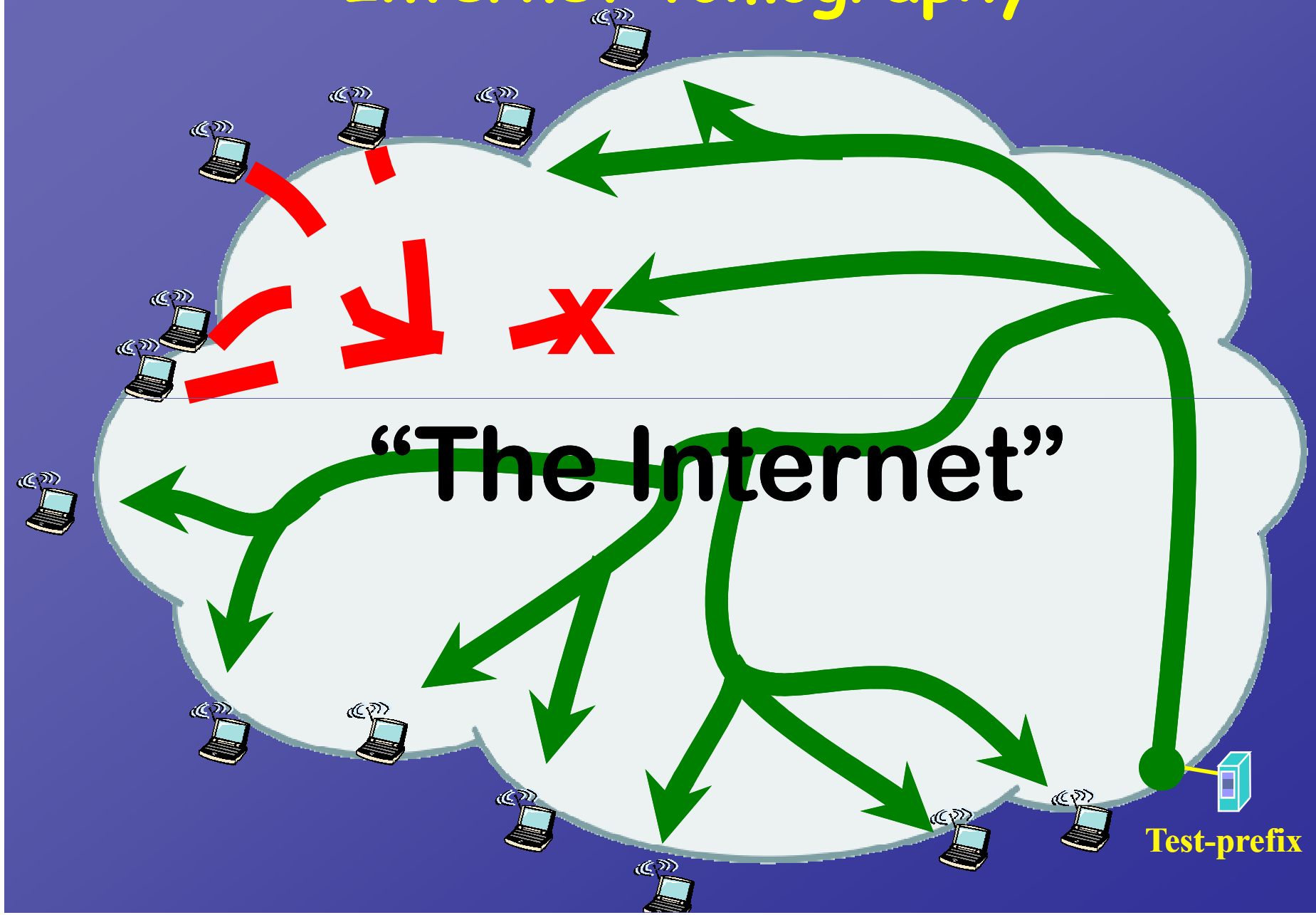
Reachability



Reachability & trace-route servers



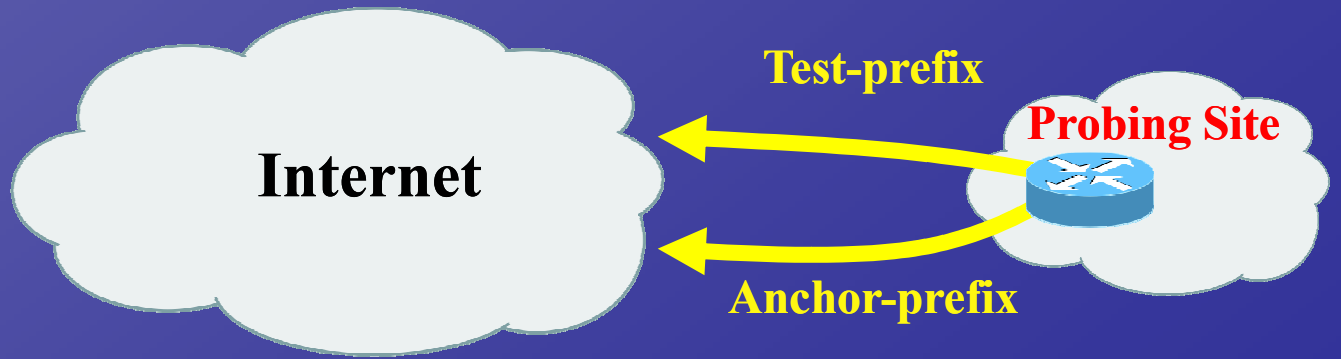
Internet tomography



Experiment

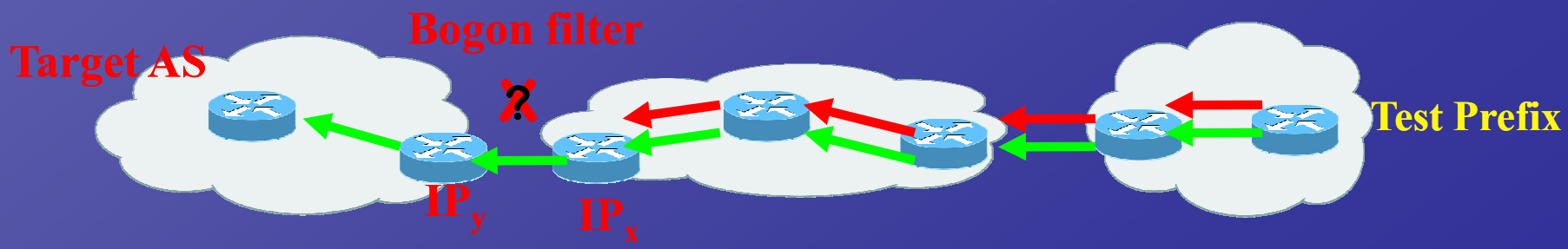
- Probe as much of the Internet as possible: 306,780 IPs within154,683 prefixes in ***25,780*** ASes. Roughly speaking: **≈96%** of transit ASes and **≈77%** of the 'edge'.

test prefix	Test-site location	Origin ASN	Test-IP	Anchor-IP
173.0.0.0/20	Seattle	3130	173.0.0.42	147.28.0.5
174.128.32.0/20	Ashburn	3927	174.128.32.42	198.180.150.120
173.0.16.0/20	Tokyo	3130	173.0.16.42	210.130.133.42
174.128.0.0/20	Muenchen	5539	174.128.0.1	194.97.144.209
174.0.16.0/20	Wellington	23754	174.128.16.42	202.8.44.44

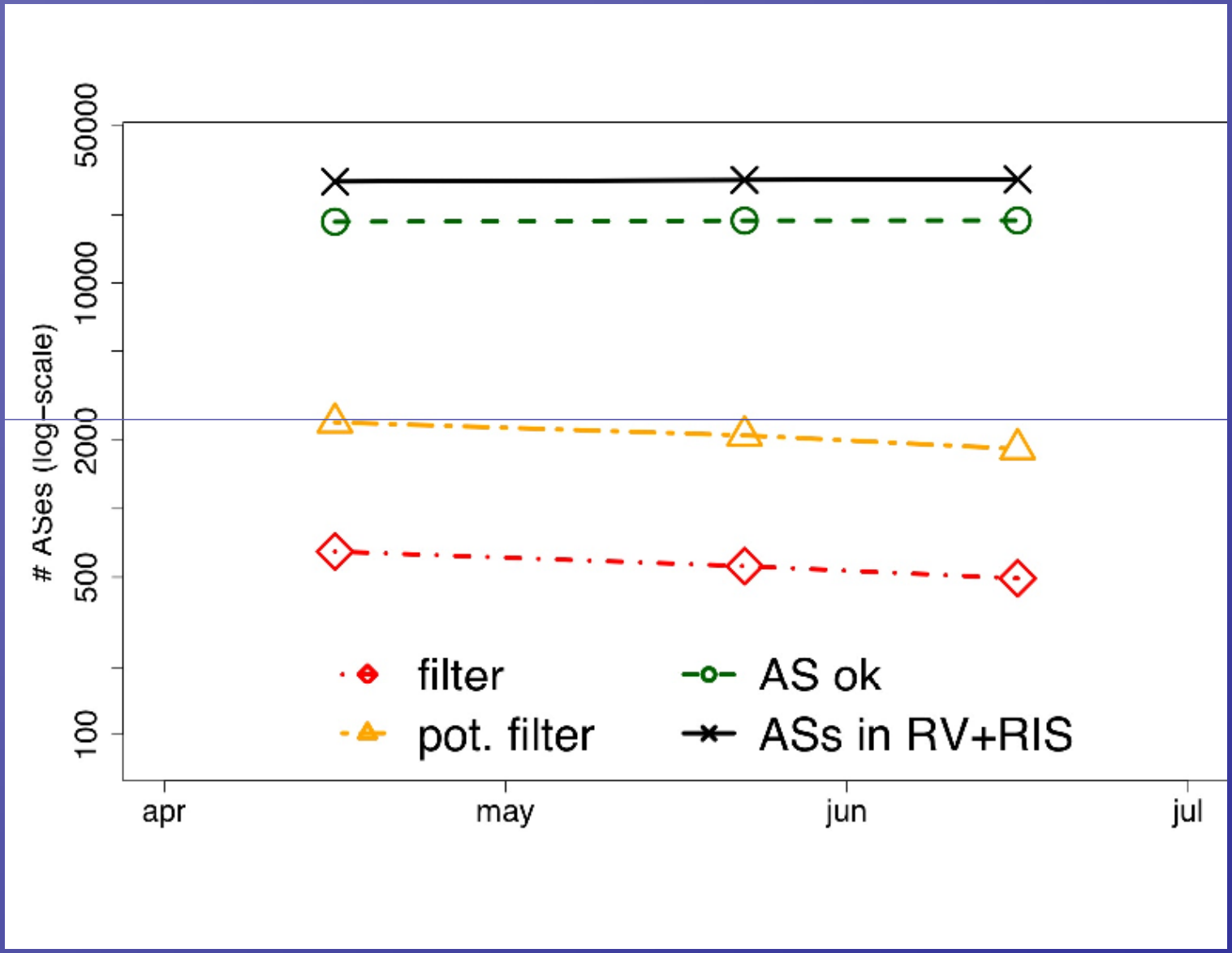


Out-probes

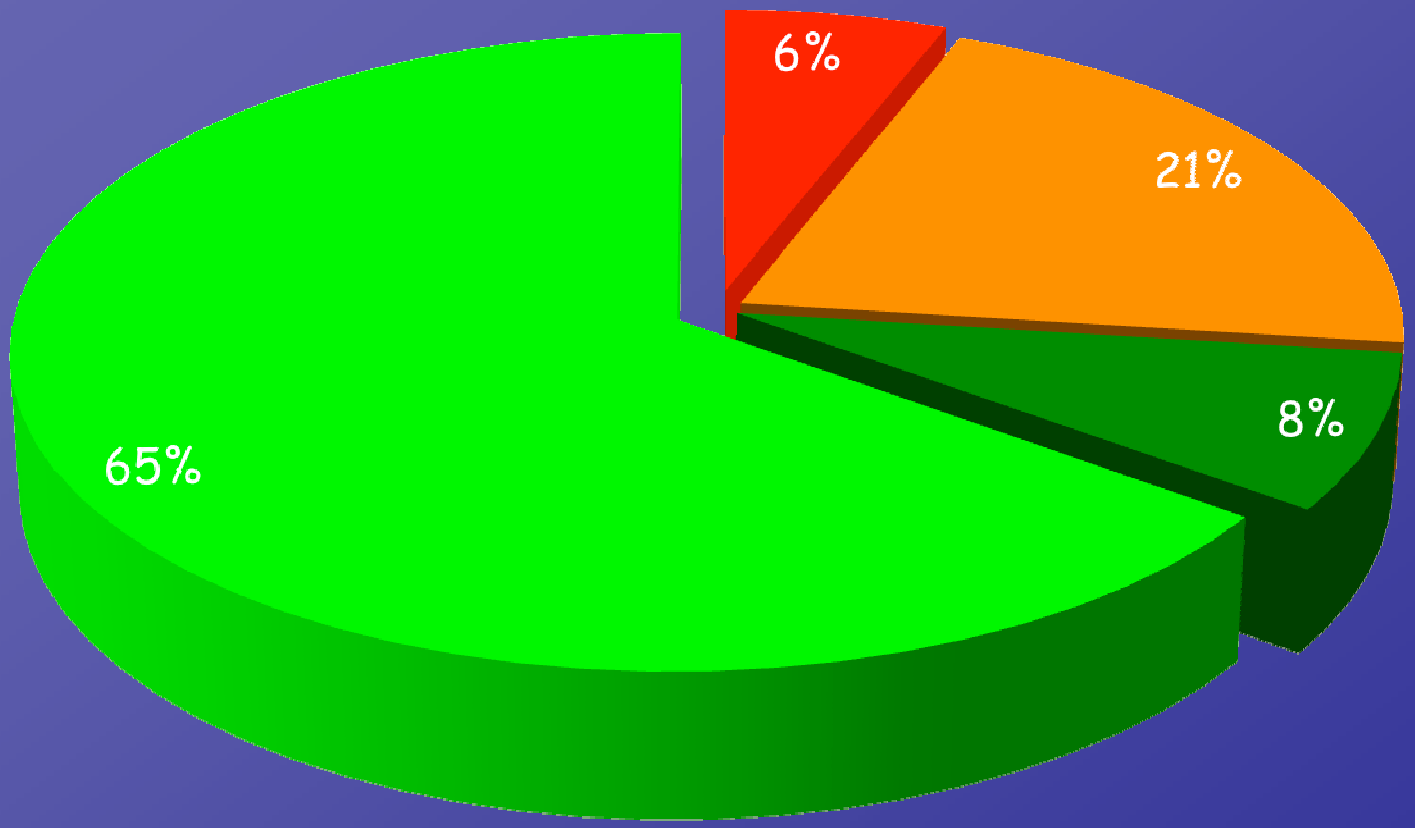
- Out-probe : probes performed FROM test-IP and anchor-IP TOWARDS external IP addresses
- If probes comes back
  => reachability exits
- If probes do not come back
  => reachability does NOT exit :-(
  cross-correlate to locate filter.



Out-Probes: Initial Results

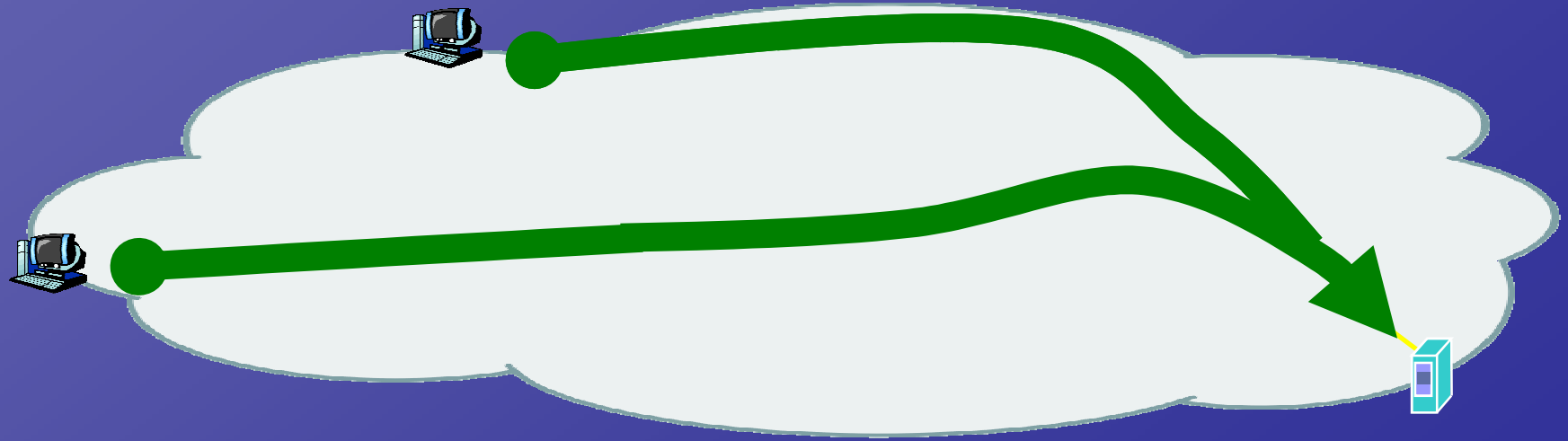


Out-Probes: Edge vs. Core



Traceroutes filtered/non-filtered

Bogon filter blocks path; BGP routes traffic around.



Well-establish prefix, no filter. Compare path differences.

In-Probes: results

- Raw results:
  - 66.9% good (anchor and test take exactly same path)
  - 20.6% diverging (anchor/test use different paths)
    P.S.: Remember Randy's presentation earlier?
  - 8.6% test stops, but anchor ok (***bogon filter?***)
  - 3.9% failure (either anchor or anchor and test failed)

Conclusion & Future Work

- We can identify regions in the Internet that do not have reachability
- It is possible to achieve a reasonable coverage of the Internet

- Future work:
  - Many operational problems in IPv6
  - Use tomography approaches to detect operational issues

Thanks To

- ARIN for IP space and commissioning research
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