Implementing a “bogon” filter detection service

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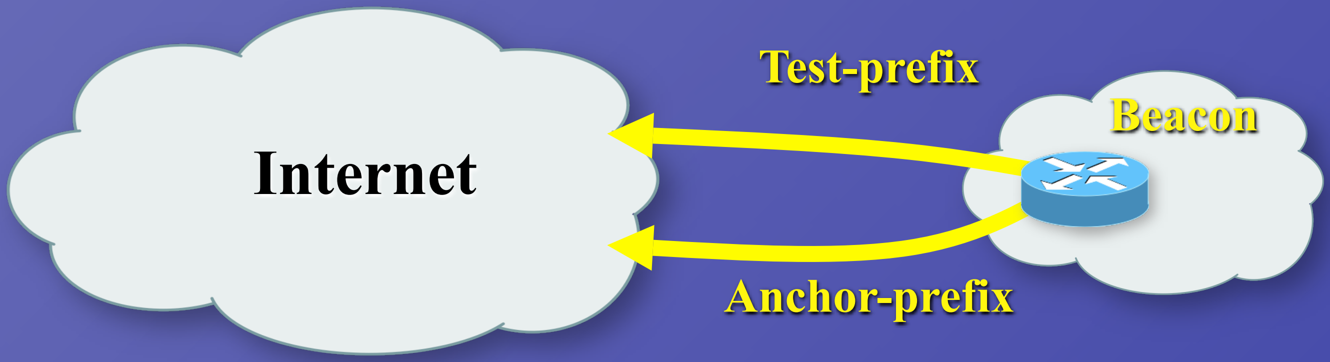
Bogon Filters

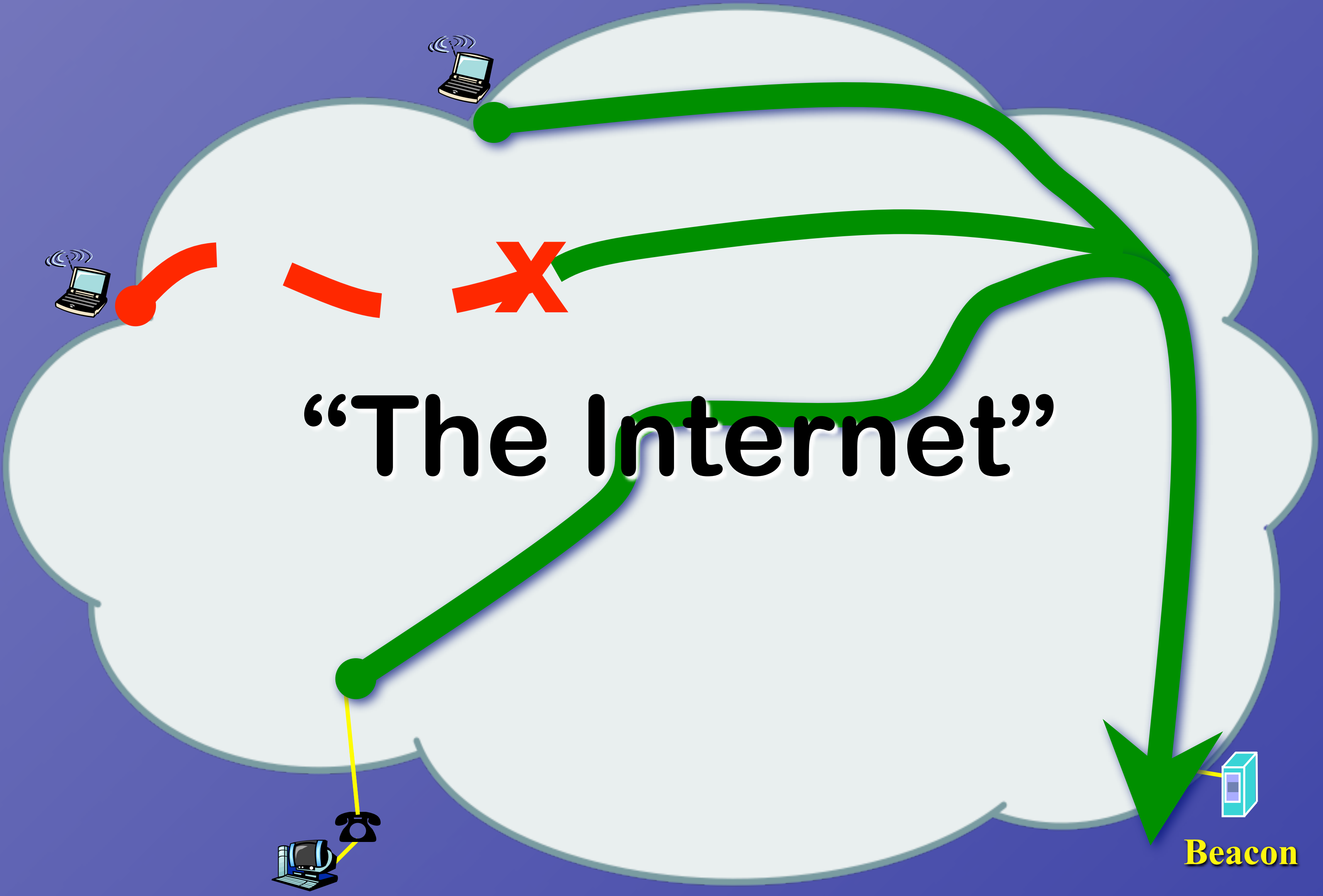
- ISPs often filter unallocated address space to protect themselves from malicious attacks
- However, over time unallocated address space becomes allocated and legitimately announced address space...
- Problem: Filters need to be updated timely, but seem often not to be
- Goal: Develop a tool that is capable of detecting and locating bogon filters, filters that are blocking newly allocated address space

Experiment

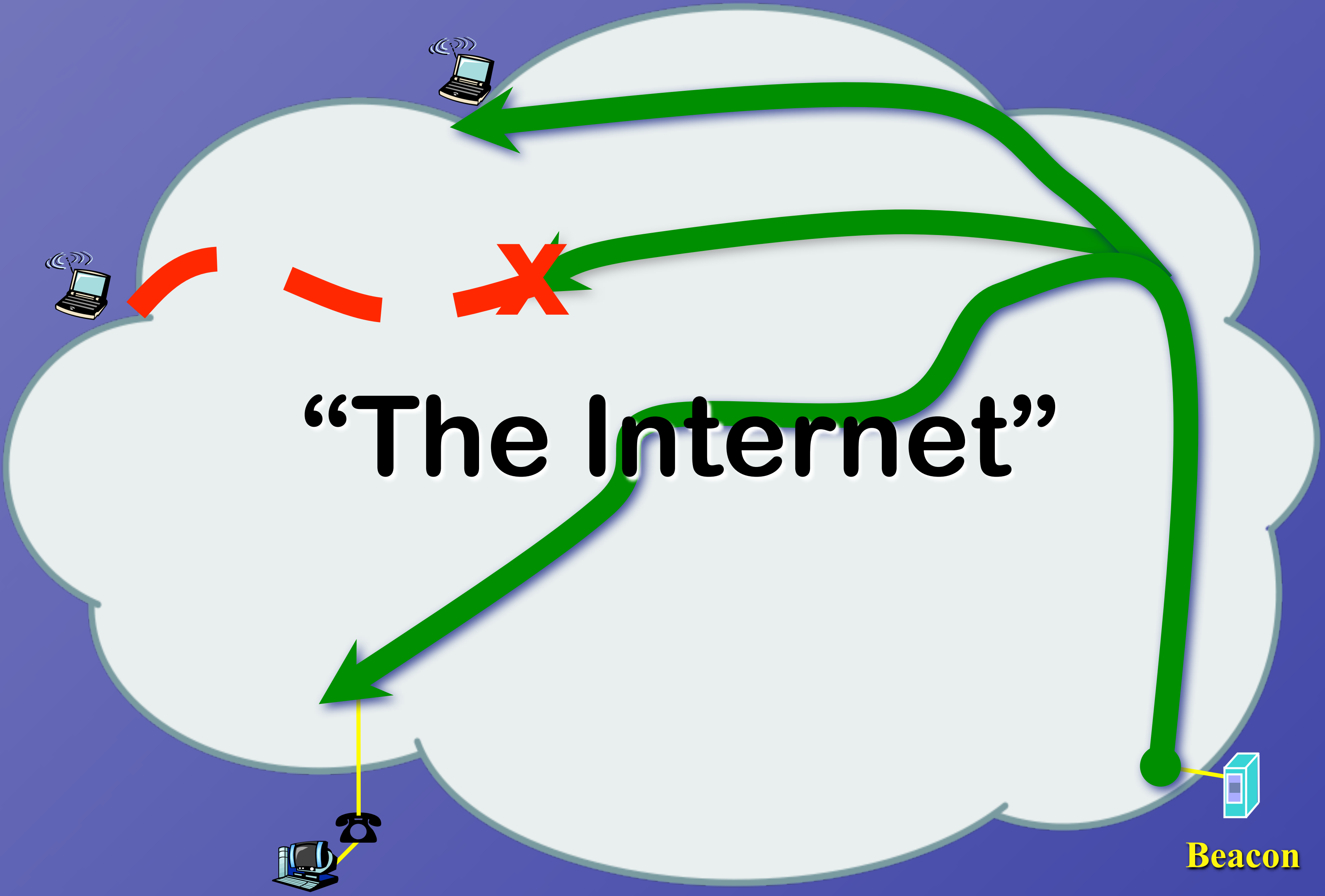
- Advertise test and anchor prefixes from 4 probe-sites: Seattle (USA), Munich (DE), Wellington (NZ), Tokyo (JPN)
- Probe as much as possible of the Internet
- Analyze reachability status of test prefix



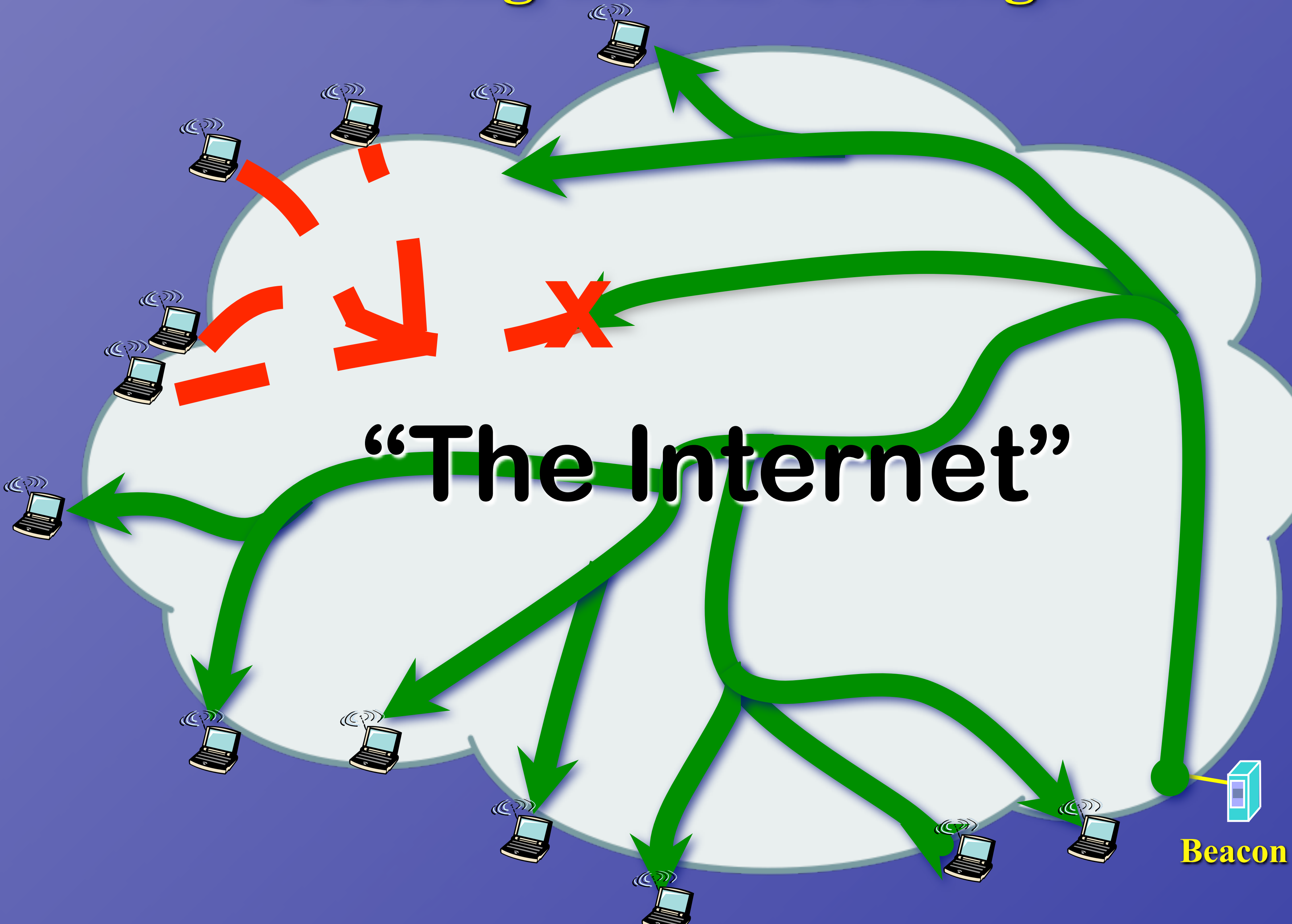
Reachability



Probing and AS Coverage

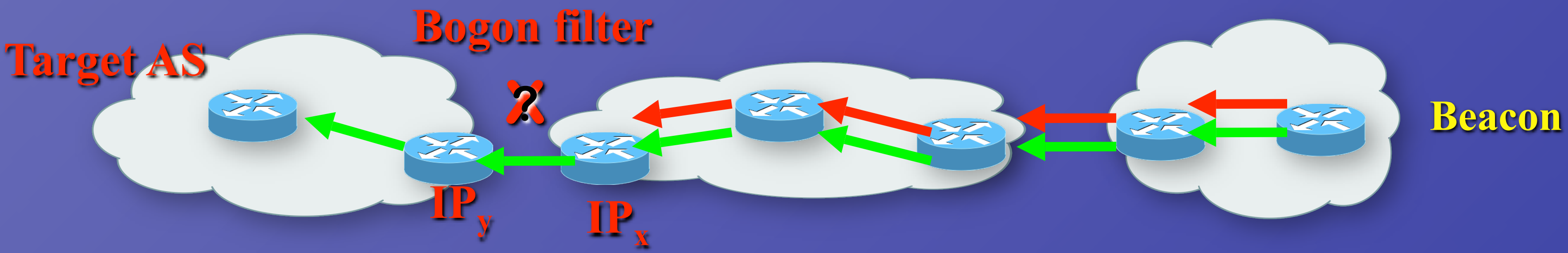


Probing and AS Coverage



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 exist :-(
  cross-correlate to locate bogon filter



Out-Probes: measurements

- Sent probes from beacons (test-IP and anchor-IP) towards a large set of pingable-IP addresses (46,569) in 18,574 different ASs
- If probe comes back => reachability exists
  - ~85% of all probes
- If probe does not come back => find out ASs that contain bogon filter
  - ~10% of all probes
  - ~5% not pingable anymore (e.g. dial-up)

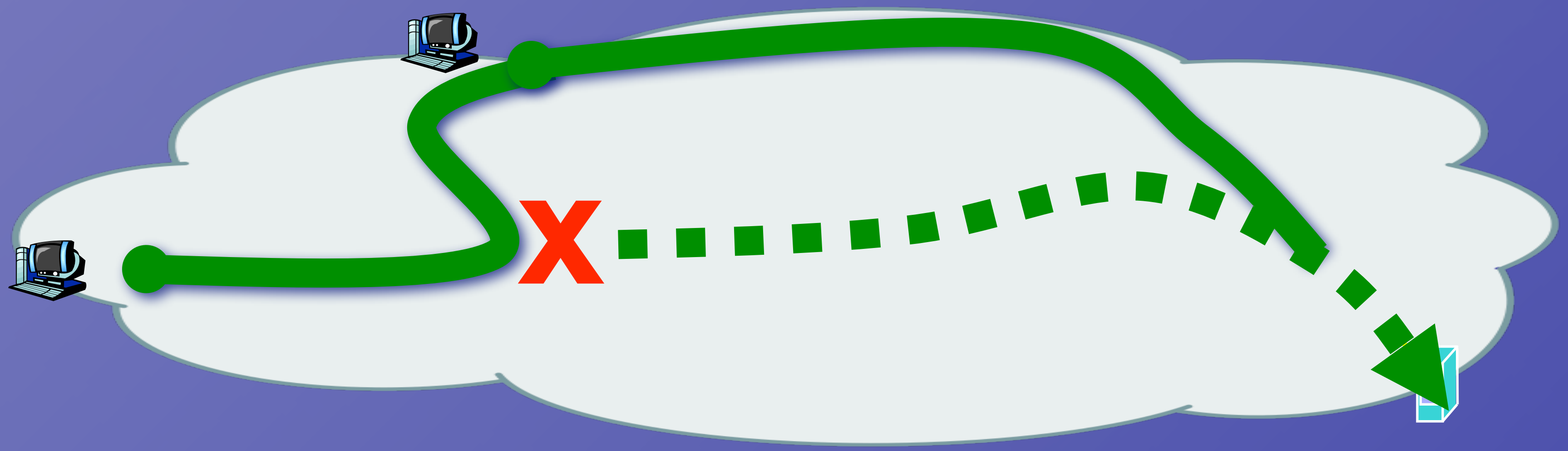
Out-Probes: Initial validation

- Derived 443 candidate ASs that are likely to filter
- Found 15 traceroute servers within those 443 candidate ASs:
  - 7 filter
  - 5 do not filter themselves, but had no usable connectivity [upstream filtered].

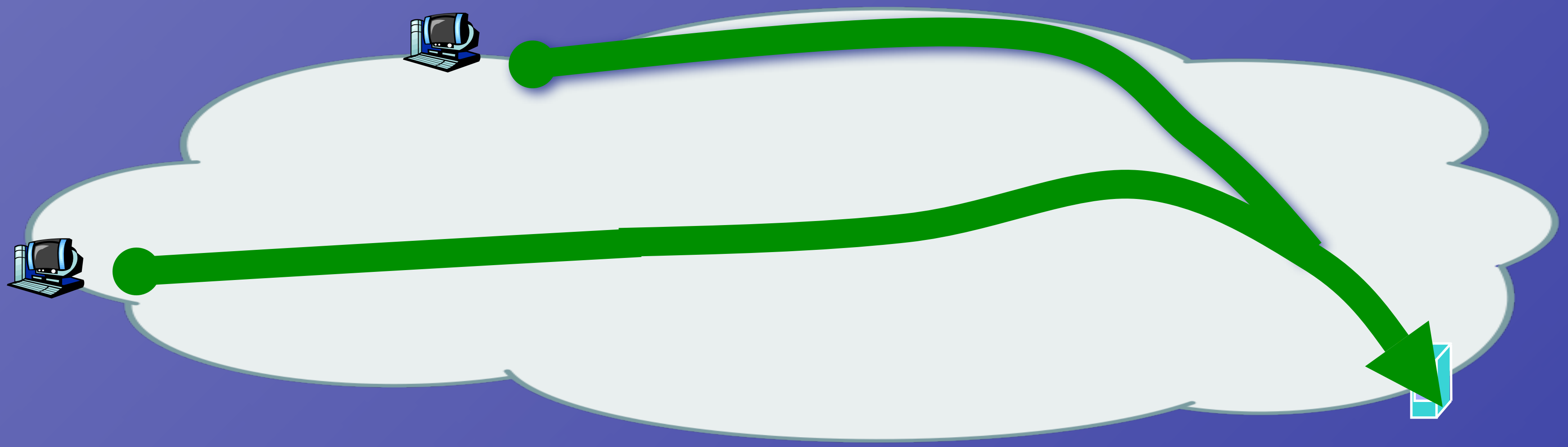
=> 12 out of 15 (80%) correctly identified

- 3 failed, but validation was done a month later. ASs might have updated filters in the meantime

Traceroutes filtered/non-filtered



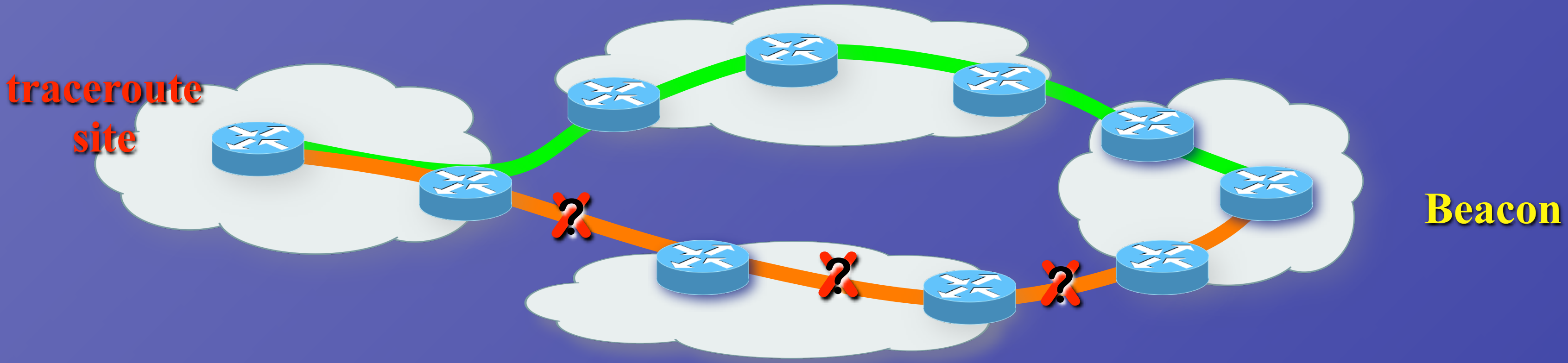
Bogon filter blocks path; BGP routes traffic around.



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

In-probes: Principles

- **In-probe** : traceroute performed from external IP addresses towards the test and anchor prefixes
- If traceroute towards test-prefix address diverges at some point, some bogon filter might be responsible



In-Probes: results

- Raw results:
  - 66.9% good (anchor and test take exactly same path)
  - 20.6% diverging (anchor/test use different paths)
  - 8.6% test stops, but anchor ok (bogon filter)
  - 3.9% failure (either anchor or anchor and test failed)

- Derive candidate links, eliminate unlikely candidates, then based on remaining candidate links:
  - ~ 34 ASs that may contain incorrectly configured filters

    http://psg.com/filter-candidates.txt

Conclusion

- We can identify regions in the Internet that do not have reachability
- It is possible to achieve a reasonable coverage of the Internet
- It does not only check reachability, it also detect places where there is "non-optimal" connectivity

Thanks To

- ARIN for IP space and commissioning research
- CityLink – NZ, a test site
- IIJ - JP, a test site
- SpaceNet - DE, a test site
- PSGnet – US, a test site
- Universities of Adelaide & Delft
- NSF award ANI-0221435
- Australian Research Council grant DP0557066