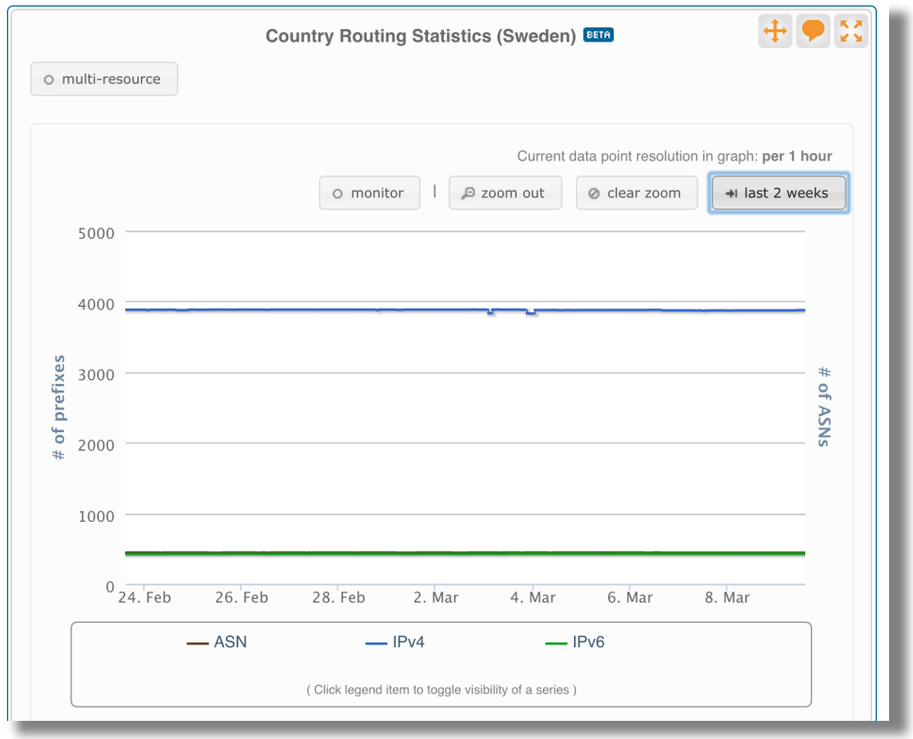
Measuring Countries and IXPs with RIPE Atlas

emile.aben@ripe.net

NETNOD - Stockholm,SE | early 21th century

To Measure is To Improve

- Measure countries?
  - BGP data
- Measure IXPs?
  - Traffic stats



https://stat.ripe.net/SE

- Peering at an IXP can improve things
  - Short paths
  - Low latency
- How to measure IXPs and countries with RIPE Atlas?

RIPE NCC

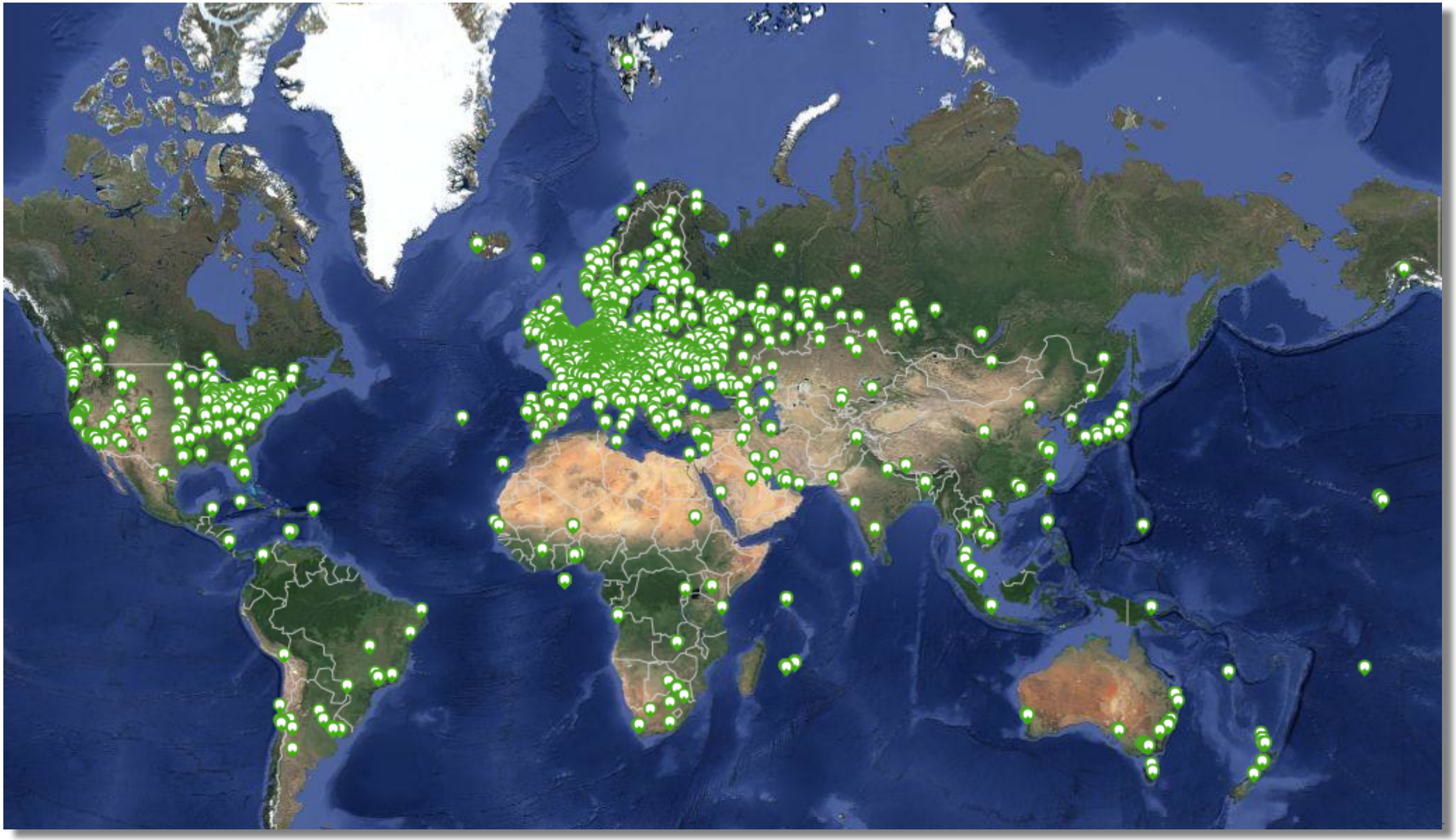
RIPE NCC

Measurement Components

NETNOD - Stockholm,SE | early 21th century

RIPE Atlas

https://atlas.ripe.net



RIPE NCC

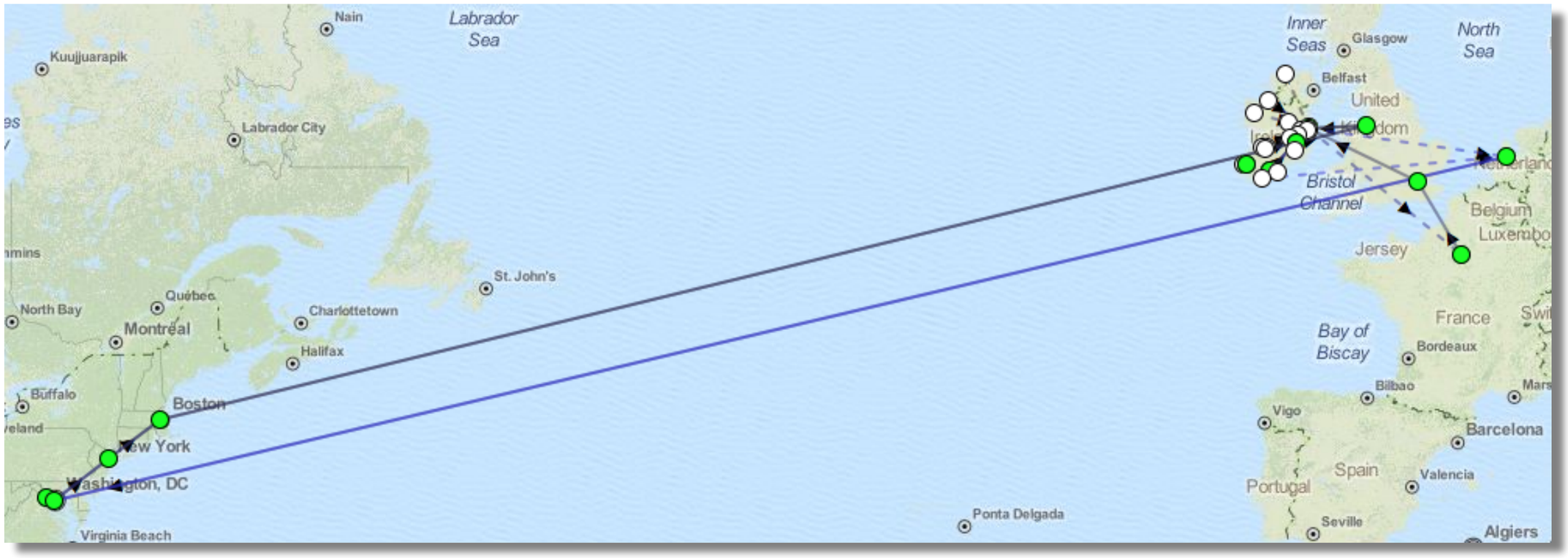
Traceroute

- Useful troubleshooting tool for operators
- http://cluepon.net/ras/traceroute.pdf
- Traceroutes contain clues on the forward path packets traverse
  - Latency
  - Location in hostnames

```
1 (AS1653) v16-11.hig.se [0.418, 0.467, 0.552]
2 (AS1653) m1fre-ge-8-3-4.sunet.se [4.088, 4.112, 4.135]
3 (AS1653) t1fre-ae5-v1.sunet.se [4.167, 4.207, 4.252]
4 () netnod-ix-ge-a-sth-4470-2.bredband.com [4.214, 4.228, 4.355]
5 (AS2119) tunet-5.ti.telenor.net [4.418, 4.448, 4.455]
6 (AS33885) 10ge-1-1-cr1.a1.sth.ownit.se [4.557, 4.569, 4.606]
7 (AS33885) 10ge-1-1-dr1.a1.sth.ownit.se [9.432, 14.832, 15.46]
8 (AS33885) 10ge-1-1-dr1.a4.sth.ownit.se [14.621, 14.801, 14.824]
```

OpenIPMap

- Geolocating Internet infrastructure IPs by crowdsourcing
- “OpenStreetMap for IPs in traceroute”
- Prototype with 30k+ infrastructure IPs mapped:
  - https://marmot.ripe.net/openipmap/



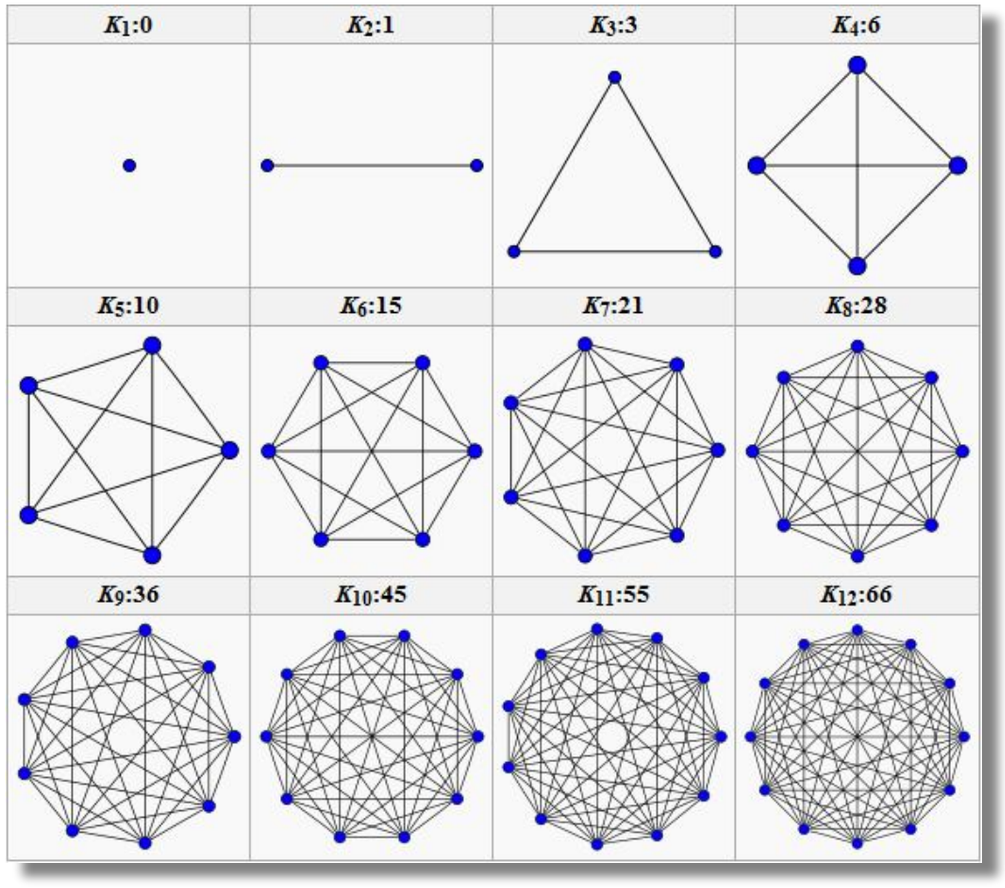
RIPE NCC

How To Measure?

NETNOD - Stockholm,SE | early 21th century

How to Measure a Country?

- IPv4 and IPv6 traceroutes in a mesh of probes
- Select all probes in a country?
  - Same ASN+location = redundant info (typically)
- Better:
  - Select probes based on ASN and location diversity



http://2.bp.blogspot.com/_-oyHn0YMV_k/TTpSnEh1vqI/AAAAAAAAAEM/jXUSbhDy63o/s1600/complete%2Bgraphs.JPG

Example Probe Selection For SE

- 141 Public RIPE Atlas probes online in Sweden
- Group probes by ASN, then select based on 3 key locations (Stockholm, Gothenburg, Kiruna)
  - For each ASN:
    - For each city select closest and most distant probe
- Results in 85 probes and a lot less redundant measurement data
- 51/440 SE ASNs covered

Probe Tags For Selected Probes

System Tags

anchor auto-geoip-city auto-geoip-country ipv4-doesnt-work ipv4-works ipv6-doesnt-work ipv6-works resolver-mangles-case resolves-a-correctly resolves-aaaa-correctly v1 v2 v3

User Tags

academic aivivid cable core datacentre dmvpn dsl fibre hackspace home ipv6-tunnel ixp known-ipv6-issues makerspace mobile multihomed nat native-ipv6 no-nat non-profit office satellite sweden swedish-anchor

RIPE NCC

Measuring Sweden

NETNOD - Stockholm,SE | early 21th century

Keeping Local Traffic Local

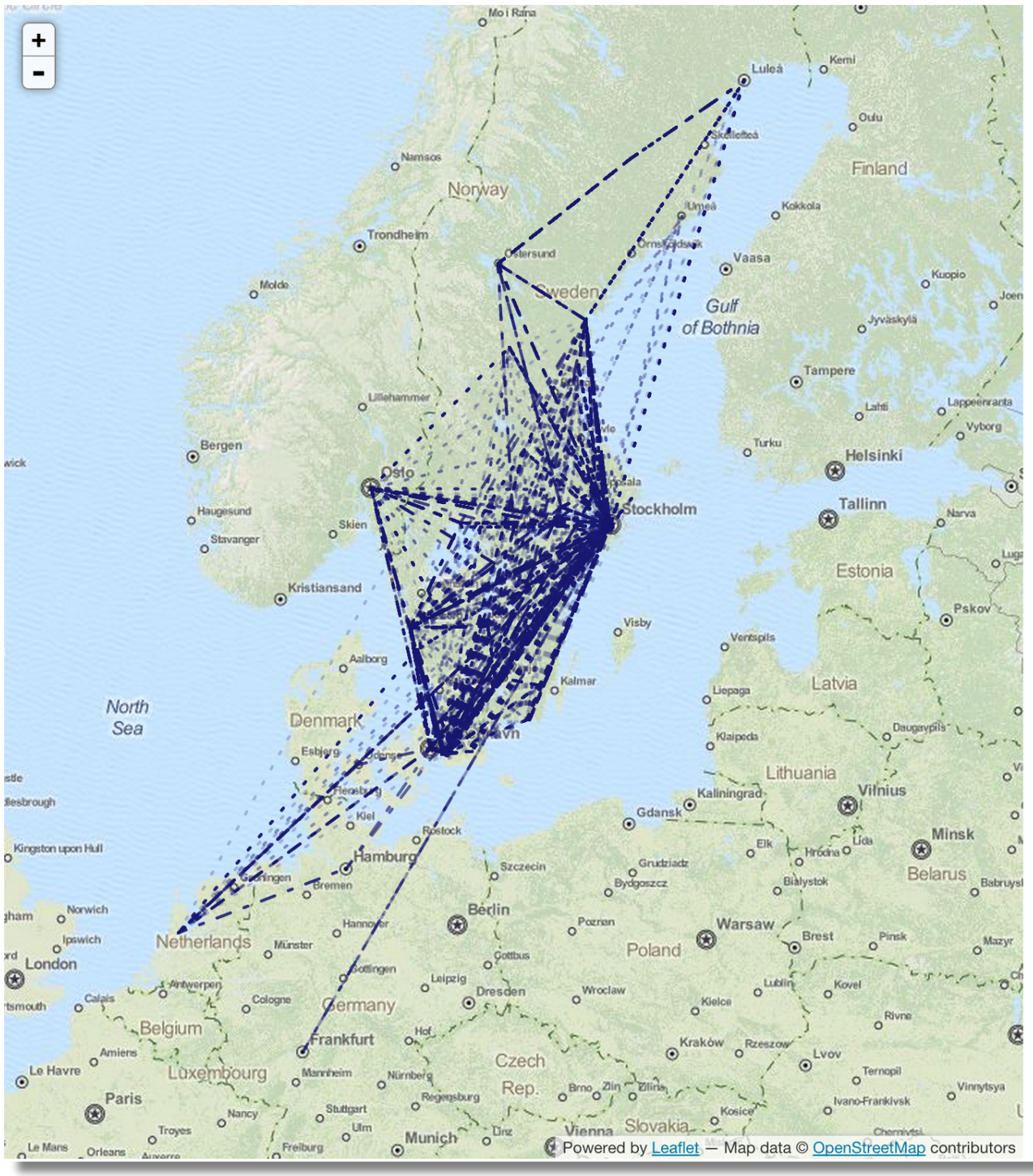
- Apply OpenIPMap geo data on Sweden probe-mesh data
- What happens in Sweden stays in Sweden?
  - Mostly!
    - **88%** in-country paths in IPv4
    - **79%** in-country paths in IPv6
  - Subject to accuracy/completeness of OpenIPMap and bias of RIPE Atlas probe placement
  - Basis for a Keeping-Local-Traffic-Local (KLoTr?) Index?

Out of Country Where?

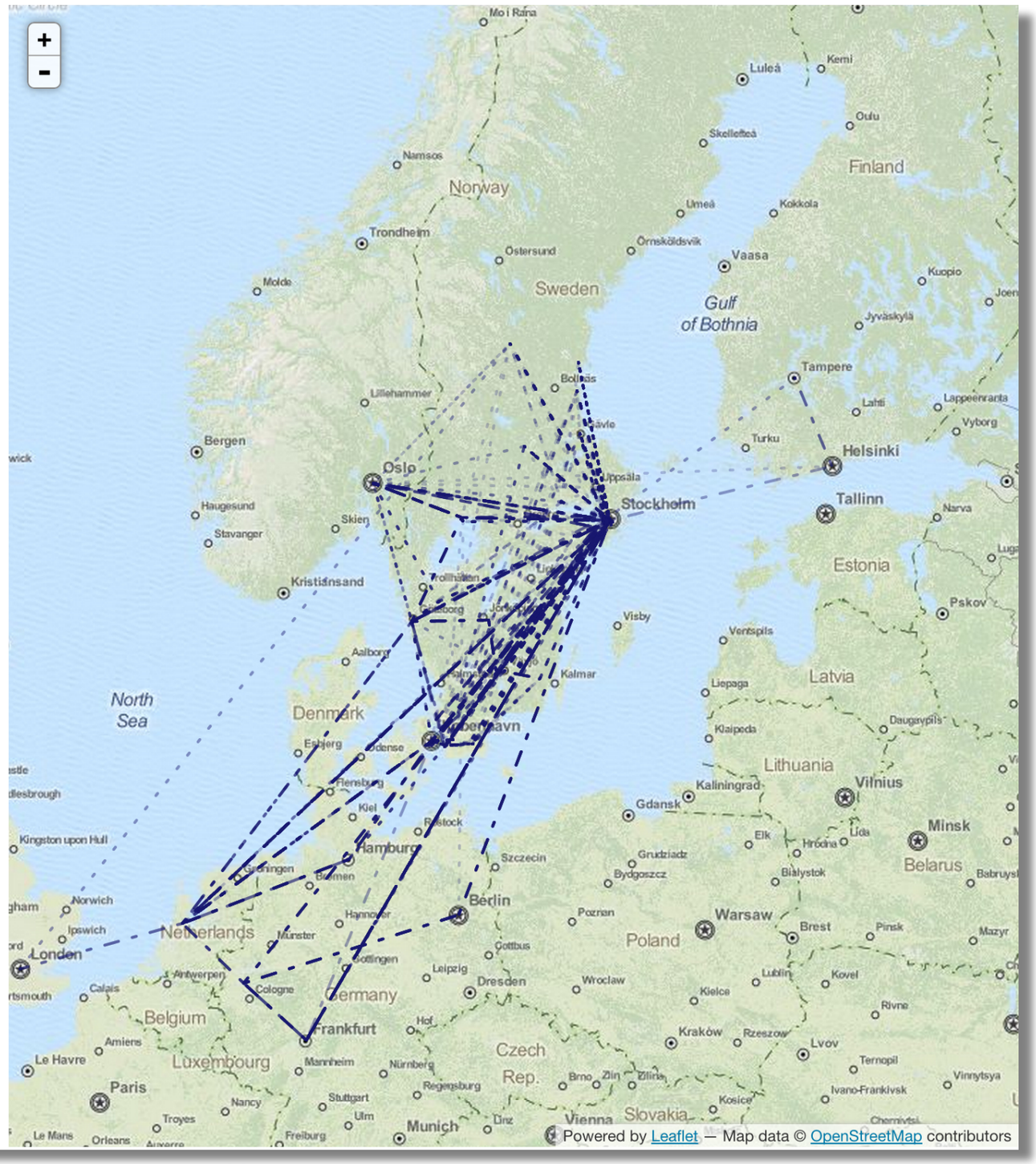
- IPv4 paths with non SE IPs:
  - DK : 7% (497)
  - NO : 5% (352)
  - NL : 0.4% (31)
  - DE : 0.1% (7)
- IPv6 paths with non SE IPs:
  - DK : 12% (107)
  - NL : 5% (51)
  - DE : 5% (50)
  - NO : 5% (43)
  - GB : 0.2% (2)
  - FI : 0.2% (2)

Visually

IPv4



IPv6



http://sg-pub.ripe.net/demo-area/ixp-country-jedi/SE-2015-03/geopath/

RIPE NCC

The Role Of An IXP

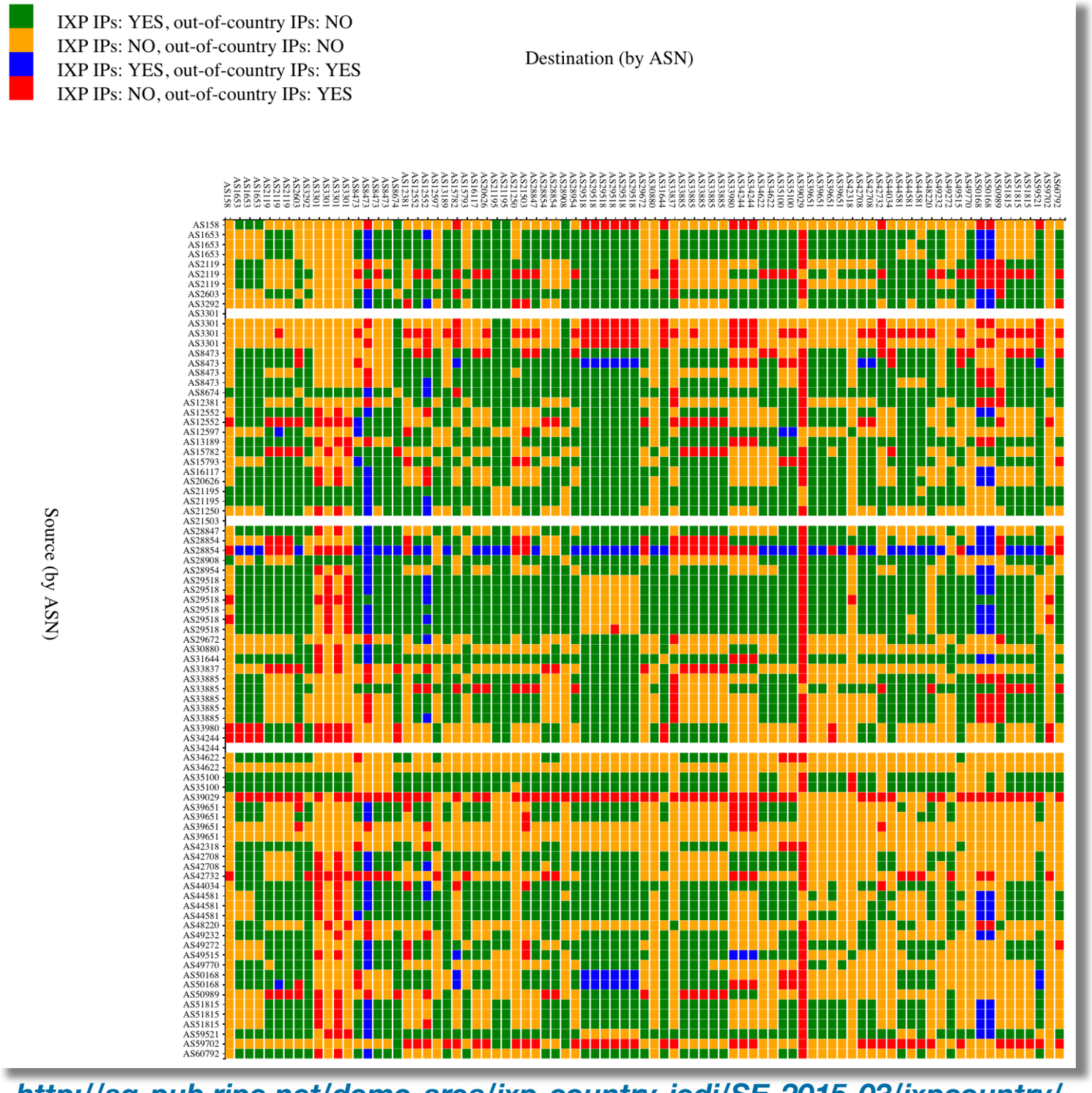
- Paths containing NETNOD IXP LAN IPs:
  - IPv4: **50.2%**
  - IPv6: **51.4%**

- Note: IXP=NETNOD exclusively
- Caveat: based on traceroute data

- Do intra-national paths cross an IXP?

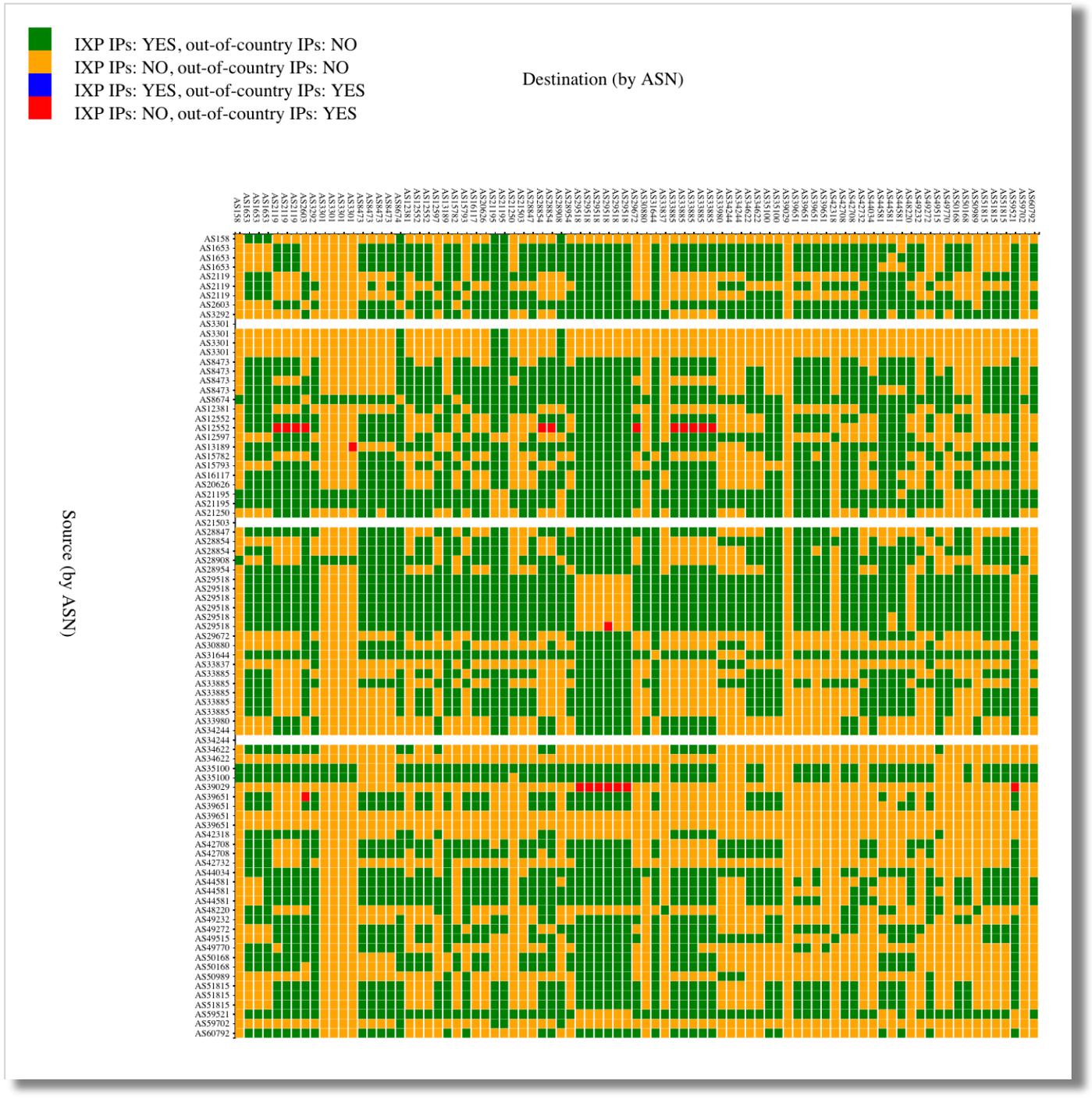
IXP versus Out-Of-Country Paths (IPv6)

IXP versus Out-Of-Country Paths (IPv4)



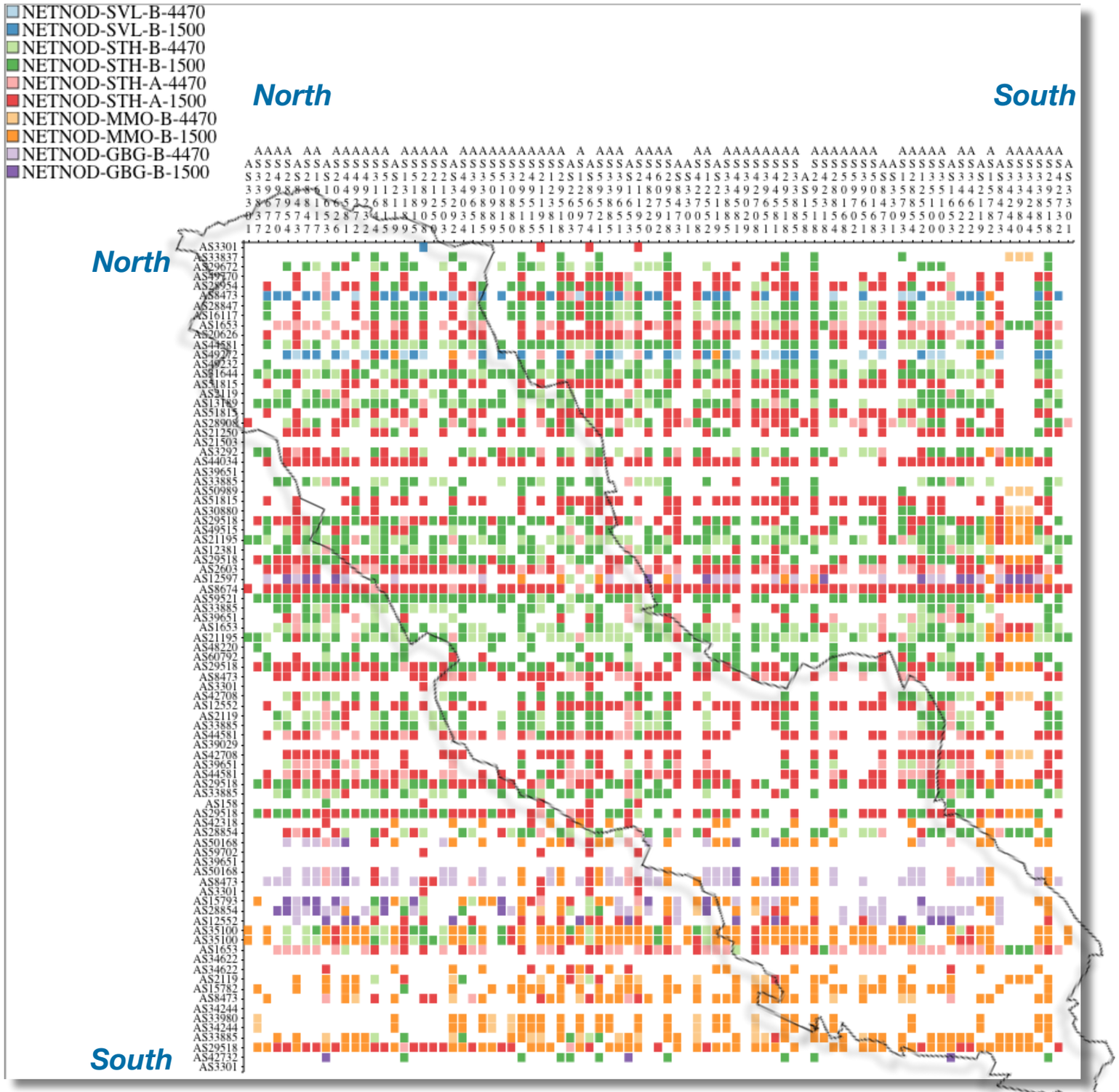
http://sg-pub.ripe.net/demo-area/ixp-country-jedi/SE-2015-03/ixpcountry/

IXP versus Out-Of-Country Paths (IPv4)



- Same graph, now ignoring Oslo and Copenhagen as out-of-country

What Peering LANs?



http://sg-pub.ripe.net/demo-area/ixp-country-jedi/SE-2015-03/ixplans/

RIPE NCC

How To Do This Yourself

NETNOD - Stockholm,SE | early 21th century

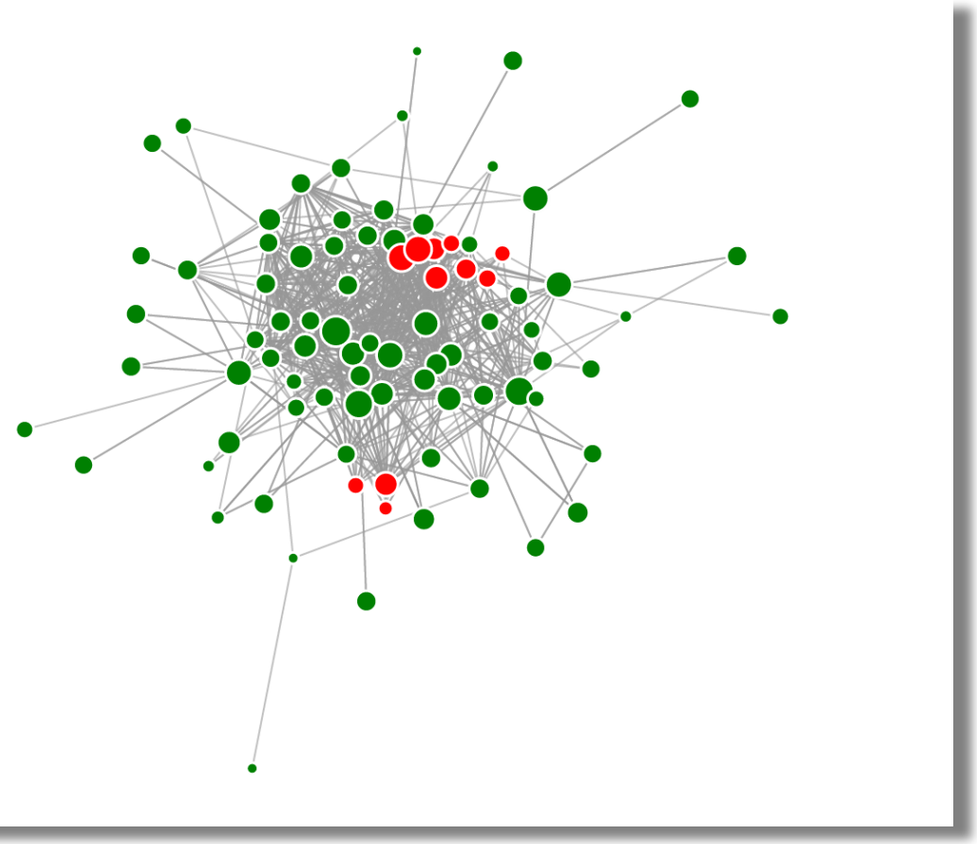
How To DIY

- Ingredients:
  - One config file
  - RIPE Atlas credits
  - A bunch of scripts: https://github.com/emileaben/ixp-country-jedi
- IXPs section could be auto-filled from https://github.com/euro-ix/json-schemas
  - Auto-tagging of IXP-members

```
  1 {
  2   country: "SE",
- 3   ixps: [
- 4     {
  5       name: "NETNOD-STH-A-1500",
- 6       peeringlans: [
  7         "194.68.123.0/24"
  8       ]
  9     },
+10     { …
+16     { …
+22     { …
+28     { …
+34     { …
+40     { …
+46     { …
+52     { …
+58     { …
+64     { …
+70     { …
+76     { …
 82   ],
-83   locations: [
 84     "Stockholm,SE",
 85     "Gothenburg,SE",
 86     "Kiruna,SE"
 87   ]
 88 }
```

Future Work

- Unfinished idea:
  - AS+IXP graph:
    - AS (green)
    - IXP LAN (red)



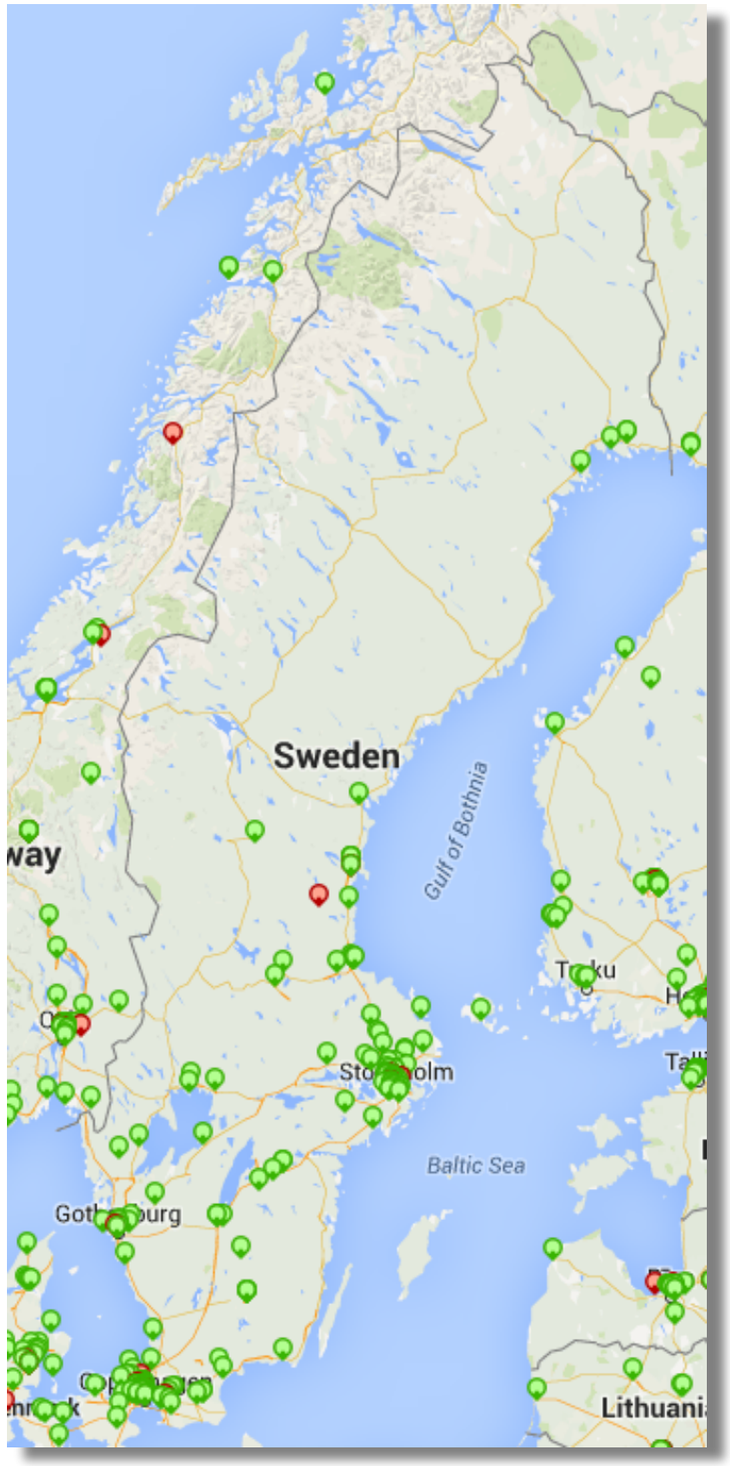
- Code contributions and ideas welcome!

Future Work

- RIPE Atlas has access networks bias
  - Big content is harder to get into
- A RIPE Atlas Anchor at the IXP to model what IXP-connected content looks like
- What to measure?
  - Automatically find resources in content networks that can be measured to?
    - http://www.alexa.com/topsites/countries/SE ?
  - CDNs?
  - Have local community define important targets?

Final Thoughts

- Examples of how RIPE Atlas can provide insight
  - Potentially help peering at IXPs
- More probes & anchors = More coverage = More better data
  - ASNs that are not covered yet
  - Locations that are not covered yet (Orebro, Umea, Kiruna?)
- Interested to hear your thoughts
  - How can RIPE Atlas serve an IXP community best?



Questions?