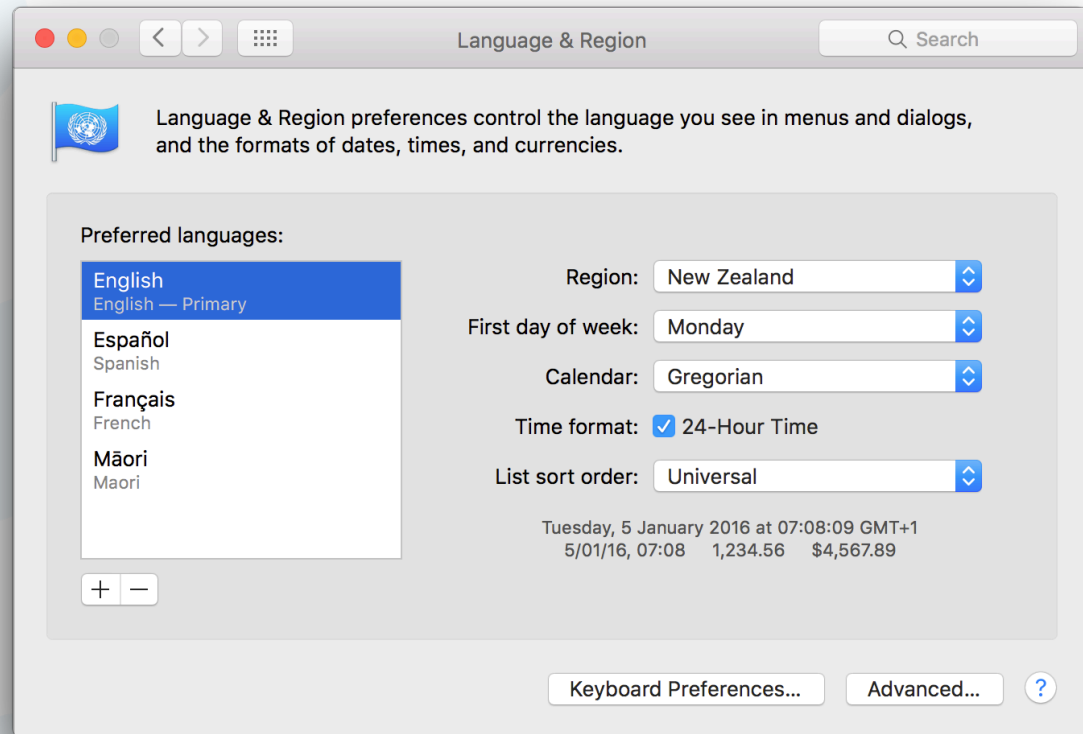# Mapa de Topología usando sondas RIPE Atlas

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En esta presentación

- Motivación

- Objetivos

Mapping a country's Internet Topology using RIPE Atlas

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Motivation

- Improve understanding of the Internet connectivity at a country level
  Started with New Zealand, applicable to any country

- Checking with evidence about common (mis)conceptions
  Better informed decisions

- Finding oddities, strange behavior
  Traffic destined to the country leaving the country
  Use and benefit of IXs

Goals

- Create reproducible research
  By making code available
  Methodology available
  Data available

- Generate a visual representation of BGP adjacencies derived from IP paths
  Added with analytics
  Allow anybody to explore and draw their own conclusions

Methodology

- Use RIPE Atlas probes as starting point
  Generate and collect as many IP paths as possible

- Select a reasonable number/quality of destinations

  1. RIPE Atlas probes public address
  2. Curated list of popular sites (Alexa minus undesirable sites)
  3. Active IPv4 addresses in the country address space
     BGP views + https://censys.io datasets

- Select reasonable traffic to use
  UDP traceroute unreliable
  ICMP Paris available
  TCP traceroute testing pending

Methodology

- Deal with incompleteness

You can't map to ASN

    Star nodes

        Host that don't respond to ICMP probing

    Private addresses

    Non-routable addresses

        Some internal routing within ISP

        AWS

IXP addresses

    Most of them visible using PeeringDB

Methodology

Hop Name	AS	Guessed AS
Probe 17594	133579	133579
Private 17594-1	Priv	133579
*	X0	133579
131.203.224.57	9503	9503
122.56.118.165	4648	4648
*	X0	4648
125.236.192.9	4771	4771
*	X0	4771
125.236.218.204	4771	4771

- Patching up the path
  - Star nodes (addresses not answering) and private addresses can't be mapped to ASN
  - Assume inter-AS edges will answer ICMP with public addresses
  - Assume start/private nodes happen inside AS.

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Code

- IpTopologyMap
  https://github.com/NZRS/IpTopologyMap
  Fetch BGP data using BGPStream (CAIDA)
  Determine country's IPv4 address space from RIR and BGP data
  Select sources and destinations
  Schedule traceroutes
  Collect results
  Combine
  Visualize

Results

- NZ IP Topology Map
  - http://ip.topology.net.nz/NZ_20160922/

- Legend
  - Red: IX
  - Blue: In-country AS
  - Yellow: Secondary country
 - Green: any other country
  - Orange: Tier1

A view of NZ

Metadata

- 78 probes
- 32225 traces
  - 68.67% complete
 - 31.33% incomplete
- Trace length
  - 10 hops +/- 4

Observations

- Most influential providers are Australian
- New IXPs are gaining traction
  - AKL-IX and MegaIX
  - APE and WIX are well established
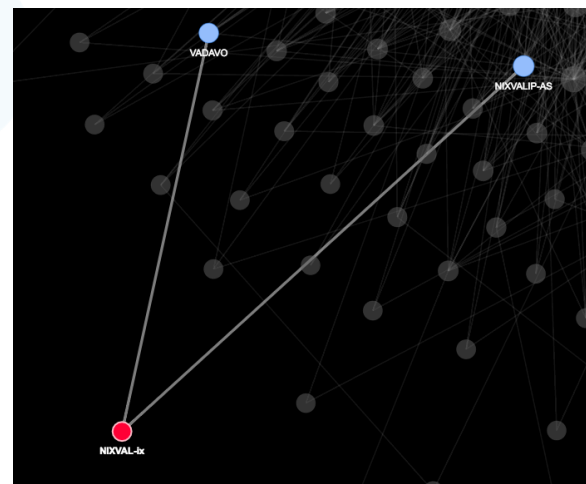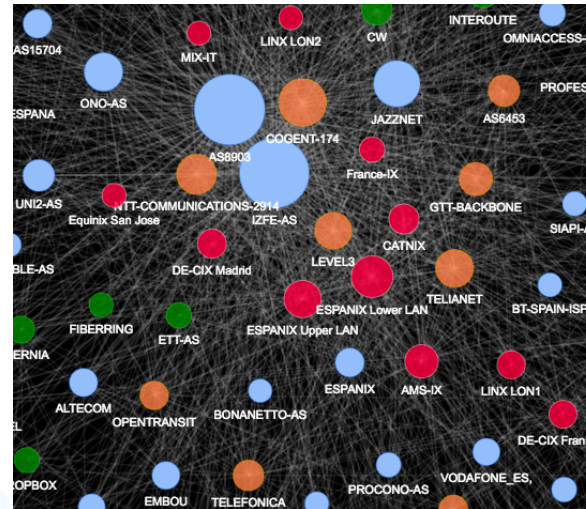- Big providers peer with each other
  - SPARK and CLIX/Vodafone

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Results

- Spain Topology
  - http://ip.topology.net.nz/ES-20160914/
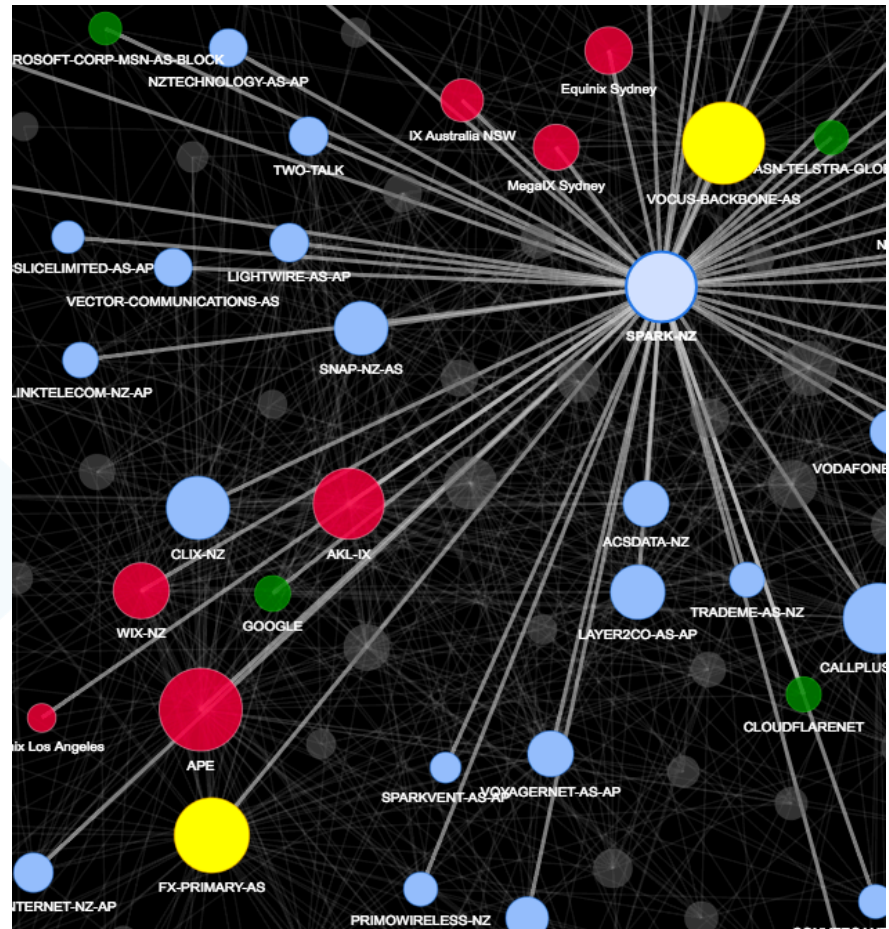
- Metadata
  - 115 probes
  - 65052 traces
    - Complete: 72.27%
    - Incomplete: 27.73%
  - Trace length
    - 12 +/- 4
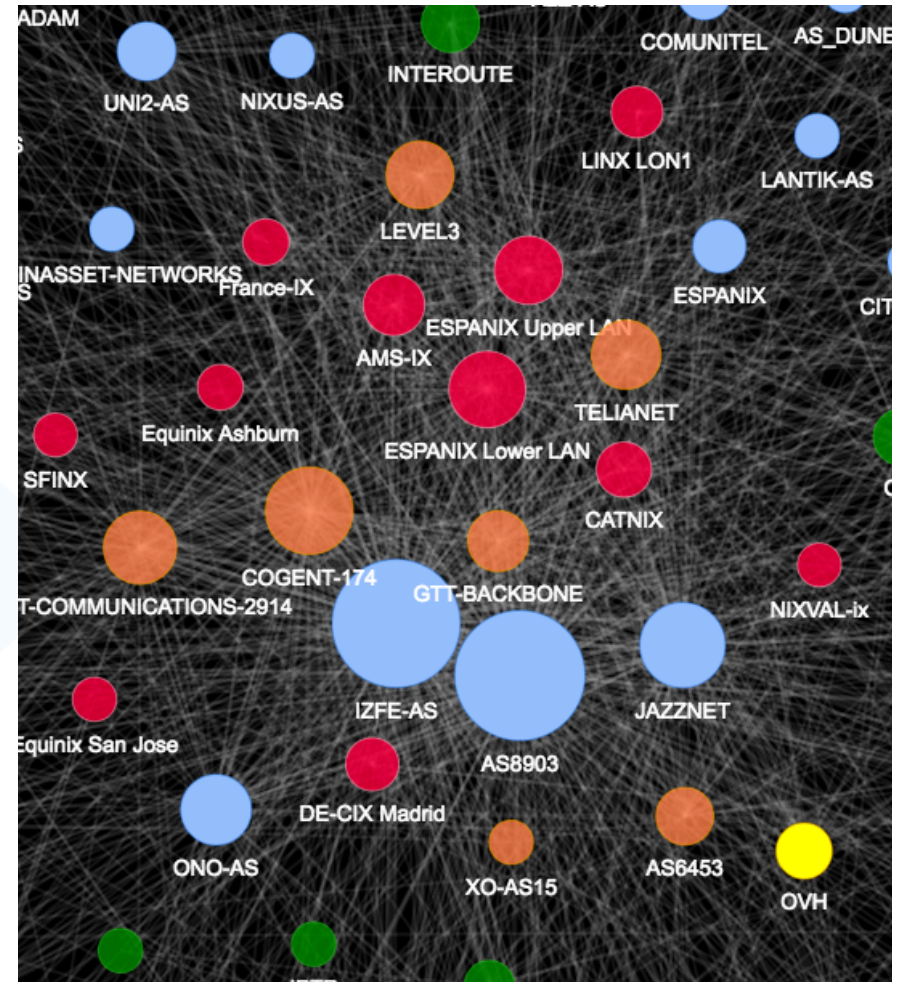
A view of ES

- IZFE as big as AS8903 (BT)

- Telefonica not quite as big as expected

- Three IXs identified
  - ESPANIX – 3 entries
  - CATNIX
  - NIXVAL

Your time to play

- Clicking in a node highlights the neighbors
  Display Organization, number of detected peers and country

- Clicking an edge shows the addresses involved in that edge

- Data used is available as JSON file
  Network representation in GraphML format

Related work

- CAIDA
  https://www.caida.org/research/topology/

- IXP Country Jedy
  https://github.com/emileaben/ixp-country-jedi
  Emile Aben, RIPE NCC

IXP Country Jedi integration

- We all love IXP Country Jedi

- Now you can generate IXP Country Jedi from this

  Example:

  http://ip.topology.net.nz/NZ_20160922/IXP_Country_Jedi/

```
7    """ export-to-ixp-jedi.py
8        Takes the set of files created by an IP Topology Map run and converts
9        them to the structure expected by the IXP Country Jedi to generate the
10       visualization and analysis
11   """
```

Caveats

- Potential Bias on sources
  Clue core
  Not enough diversity

- Not all destinations covered
  A bit of a scale problem
  A bit of a "what's visible" problem

- ICMP Traceroute not fully reliable
  Possibly better with TCP traceroute

Future Work

- Automate analytics process
  Link RTT estimation

- Run process regularly
  Path detection changes
  New actors entering the market

- Make data snapshots available

Gracias!

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