RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Infrastructure Geolocation with RIPE IPmap

Massimo Candela | May 2018 | LACNIC 29

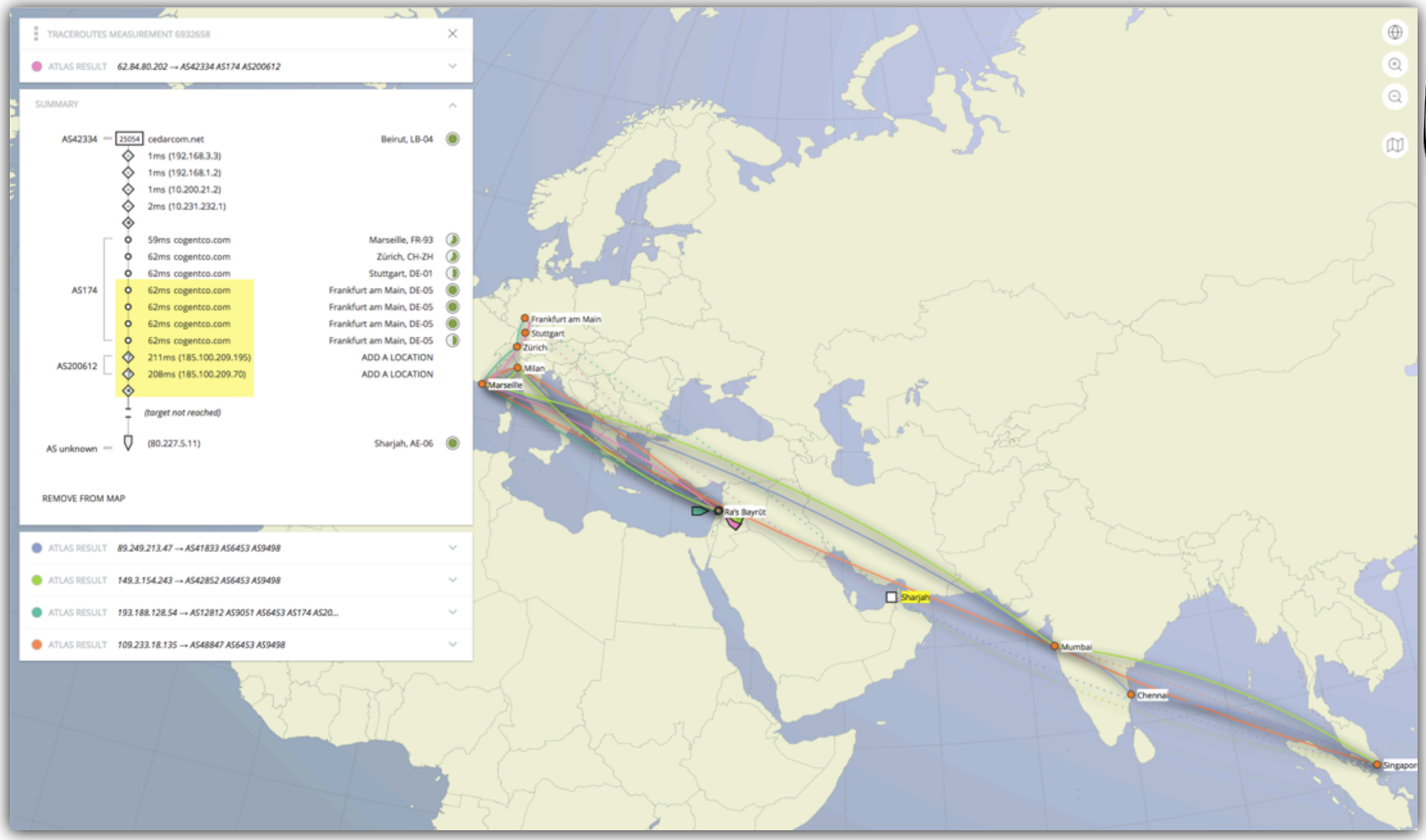
Reasons

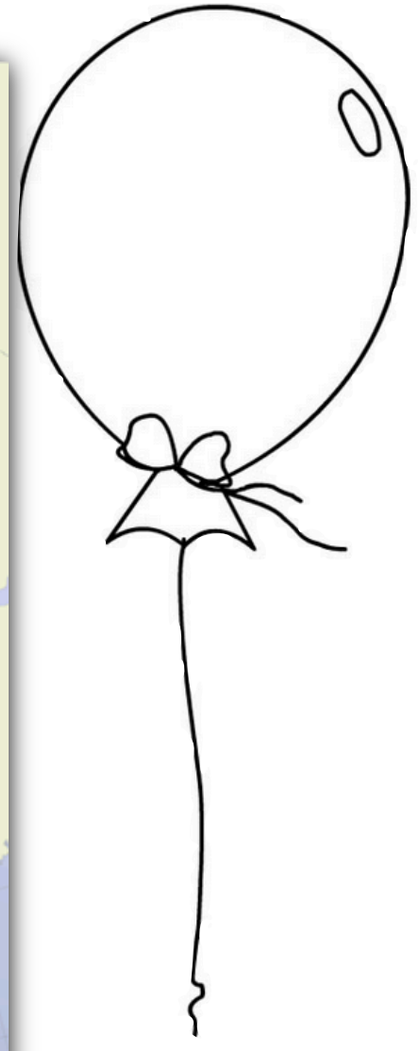
- Increased interest in IP geolocation
  - From operators and researchers
  - https://www.ripe.net/manage-ips-and-asns/db/tools/geolocation-in-the-ripe-database
  - The “geoloc” attribute is not a solution

FOCUS ON Infrastructure

- IP geolocation is extremely difficult
  - Various approaches, some of them cannot be used singularly
  - Academia is working on it! Let’s work together
  - A validation/feedback loop is needed
  - A unified geographical data format is needed

What's new: ipmap.ripe.net

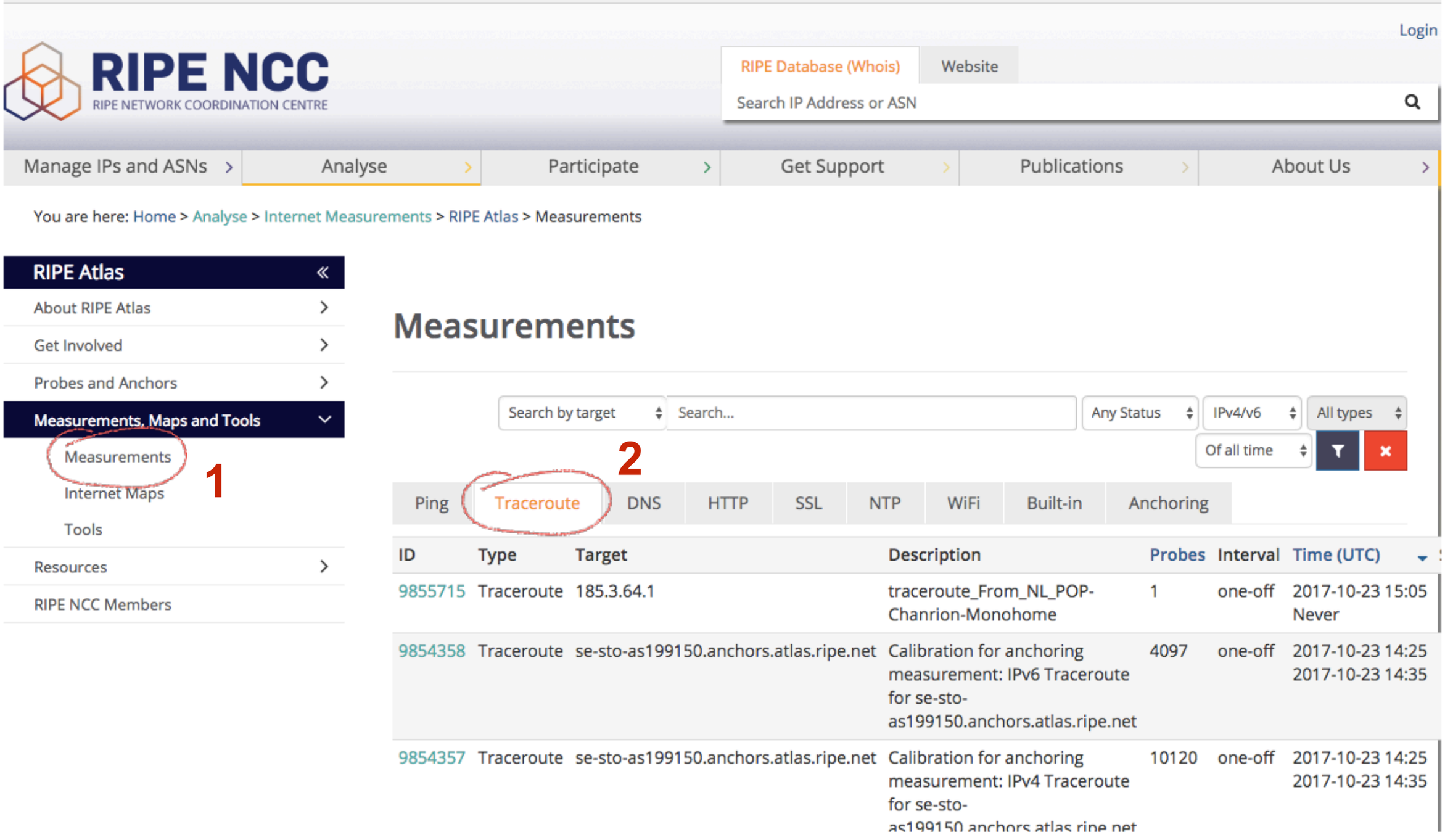




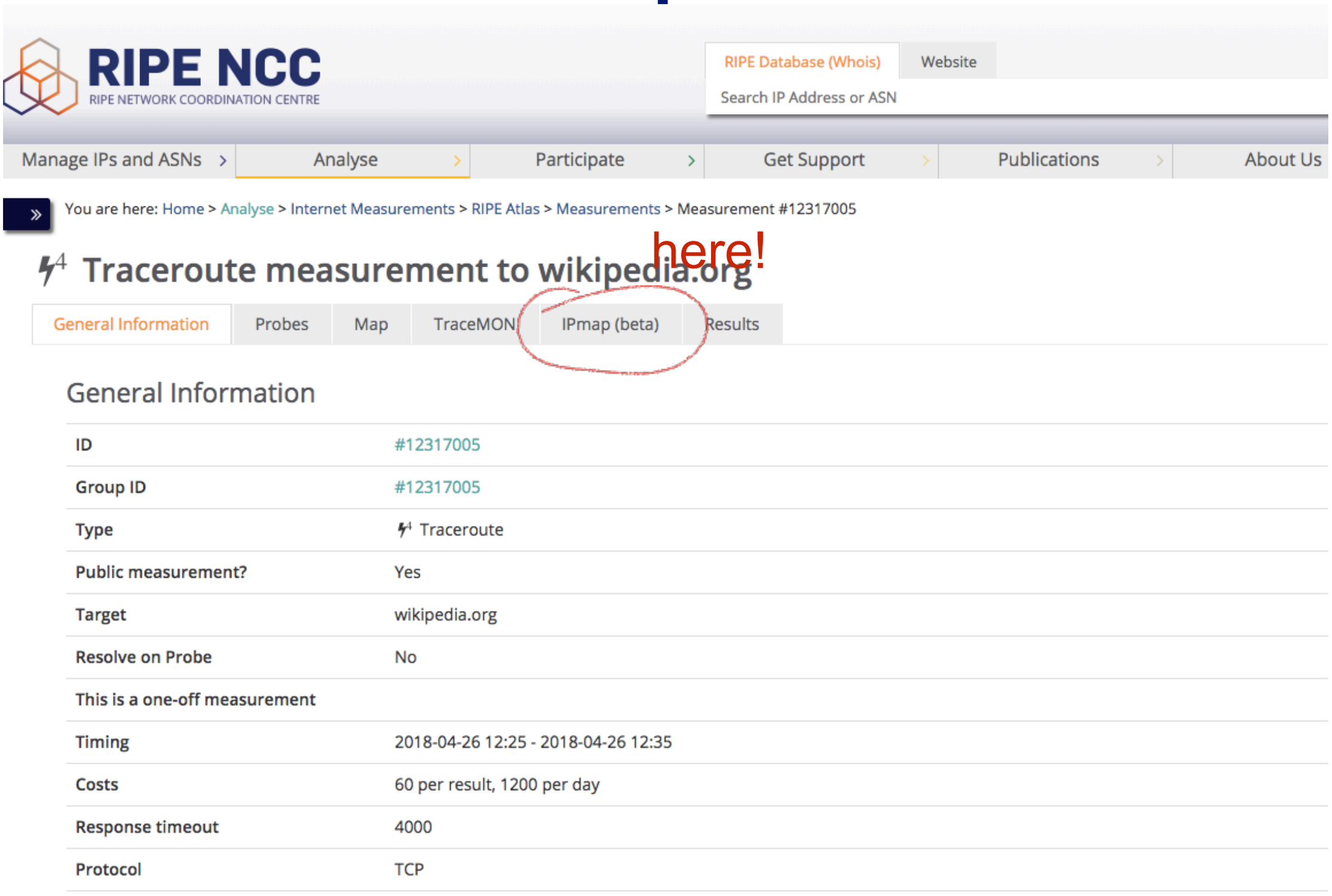
What is ipmap.ripe.net

- A web application where you can query/ correct the geolocation of an IP address
- An API where you can query for multiple IP addresses in bulk
- An API where you can correct/provide yourself the geolocation of an IP address
- A web application to visualize traceroutes geolocated on a map

Where is RIPE IPmap?



Where is RIPE IPmap?



RIPE IPmap Demo

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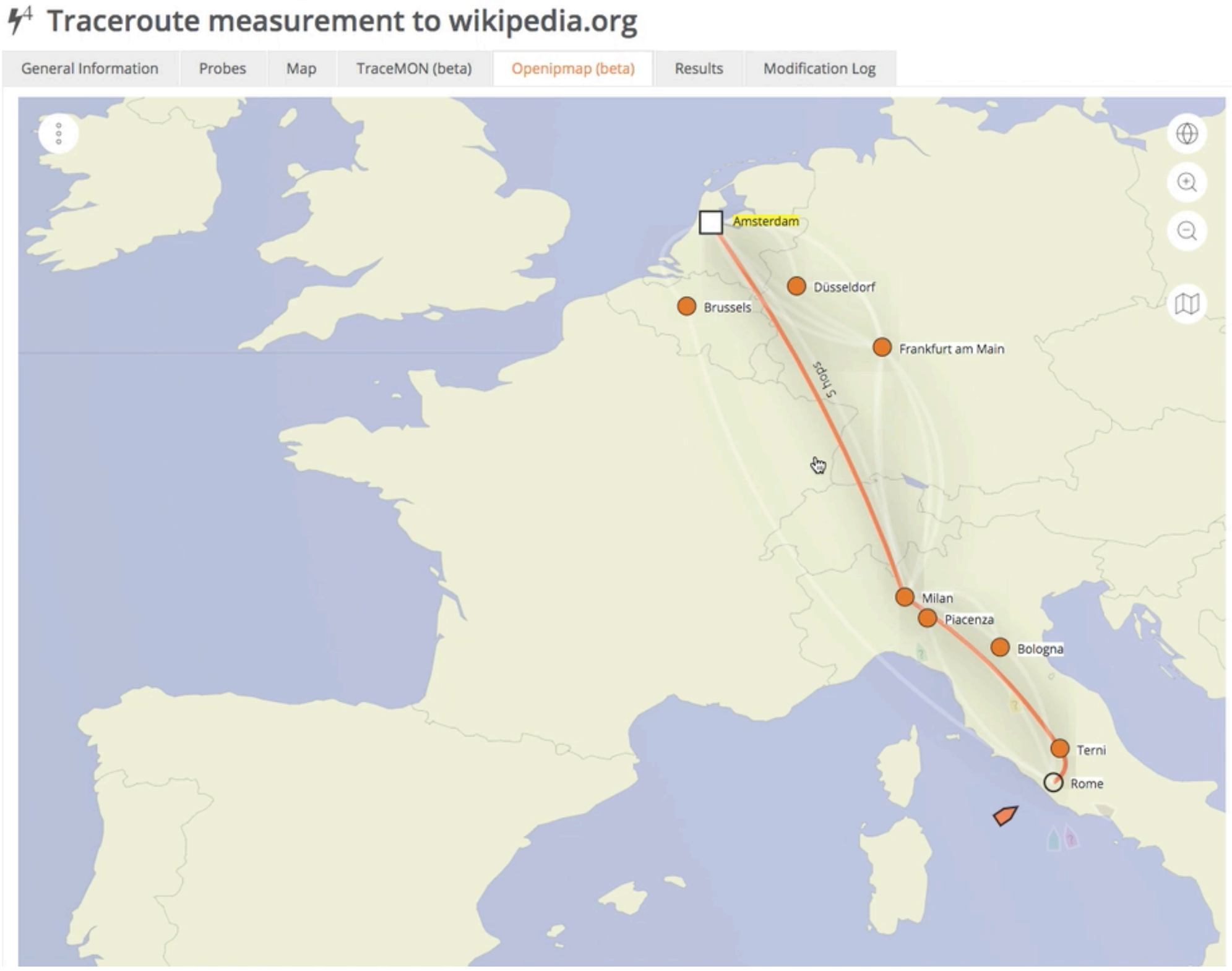

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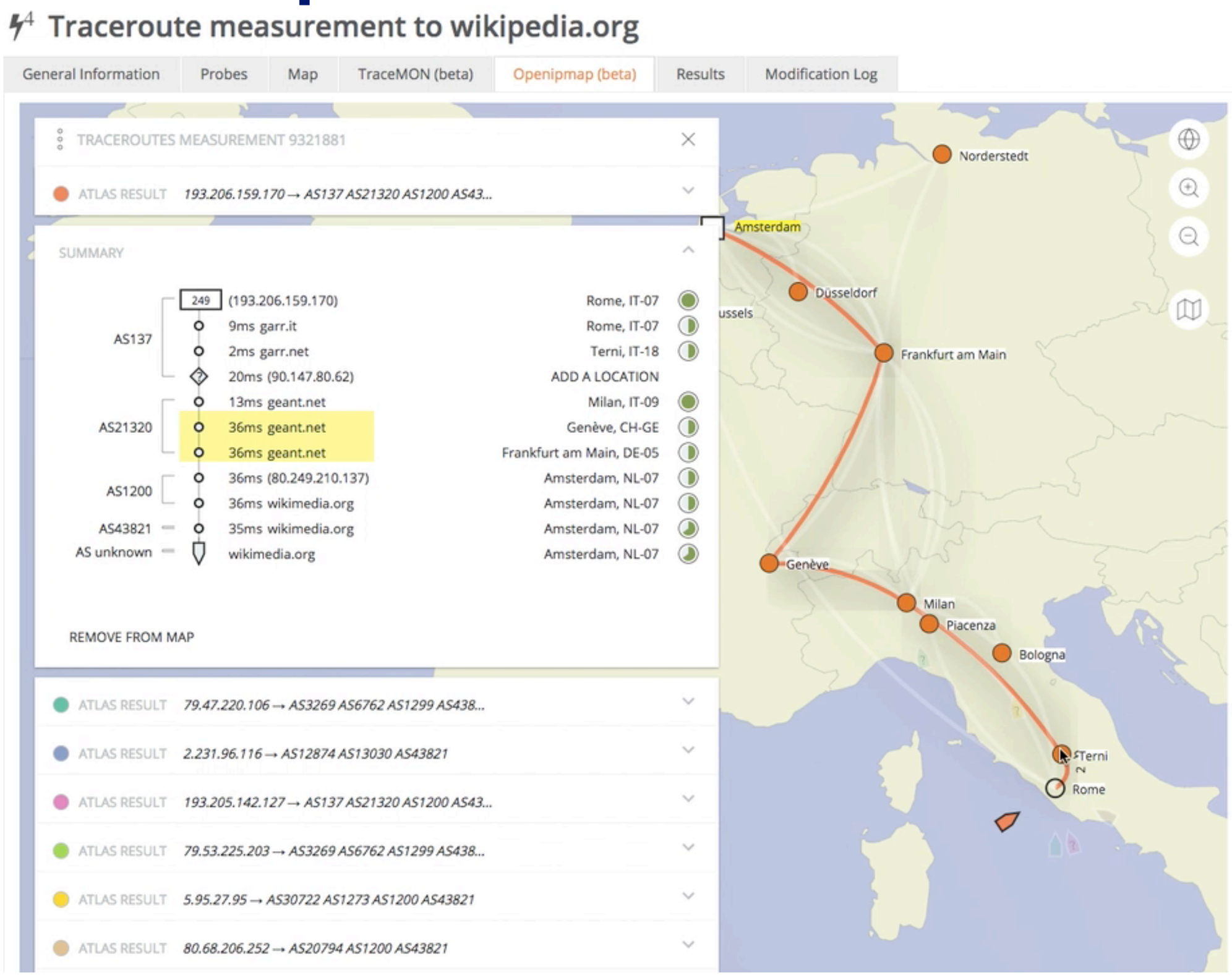


Geolocation API

https://ipmap.ripe.net/api/v1

/locate

https://ipmap.ripe.net/api/v1/locate/83.163.50.165/best


```
{
  "location": {
    "score": 145,
    "countryCodeAlpha3": "NLD",
    "countryCodeAlpha2": "NL",
    "cityPopulation": 147590,
    "stateAnsiCode": "07",
    "pointGeometry": "0101000020E61000005C72DC291D8C12401B81785DBF304A40",
    "cityNameAscii": "Haarlem",
    "stateIsoCode": "NL-07",
    "countryName": "Netherlands",
    "stateName": "North Holland",
    "longitude": 4.63683,
    "geonameId": 2755003,
    "latitude": 52.38084,
    "cityName": "Haarlem",
    "type": "city",
    "id": "HAARLEM-NL-07-U173CX8KTBR196ECJF92"
  },
  "meta": {
    "distribution": {
      "version": "17.9.18.1"
    },
    "service": {
      "version": "0.0.1"
    },
    "request": {
      "params": {
        "ip": "83.163.50.165"
      },
      "query": {}
    }
  }
}
```

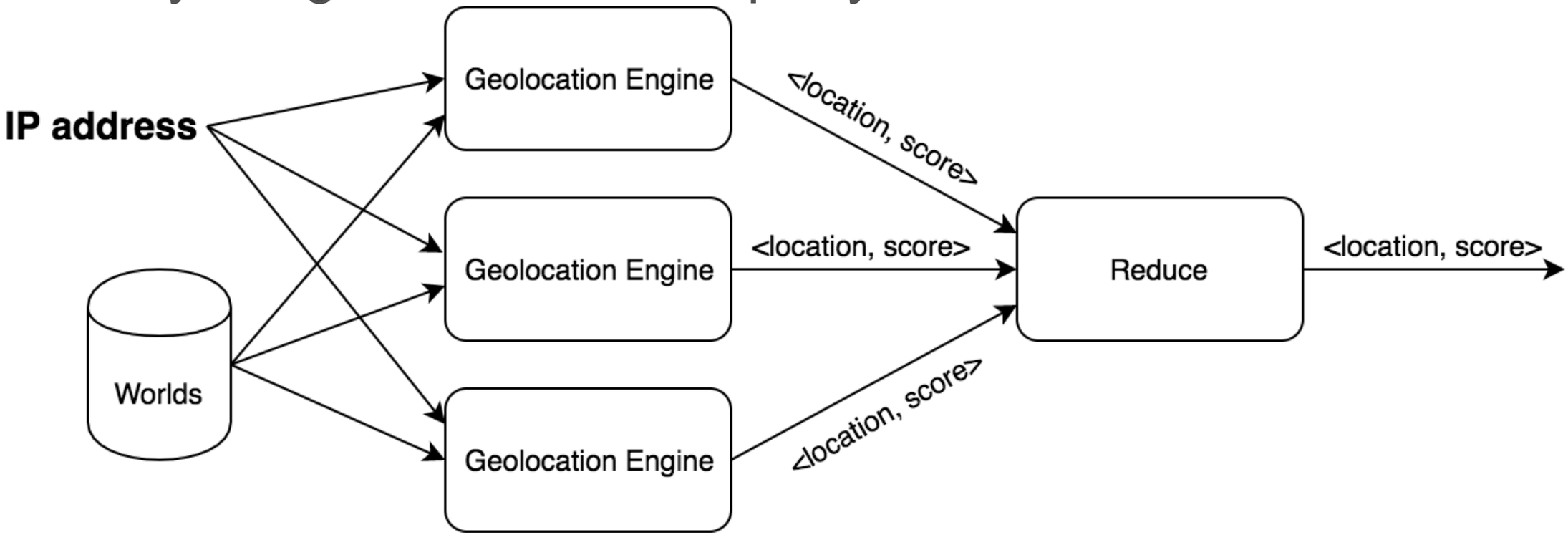

*queries can be bundled with:

https://ipmap.ripe.net/api/v1/locate/all?resources=ip1,ip2,ip3

Multi-Approach Geolocation

Various engines contribute to geolocation

- Each of them is applicable only in some cases
- Some of them are used to remove false positives
- Each of them has a score factor
- Easy integration with third-party work!



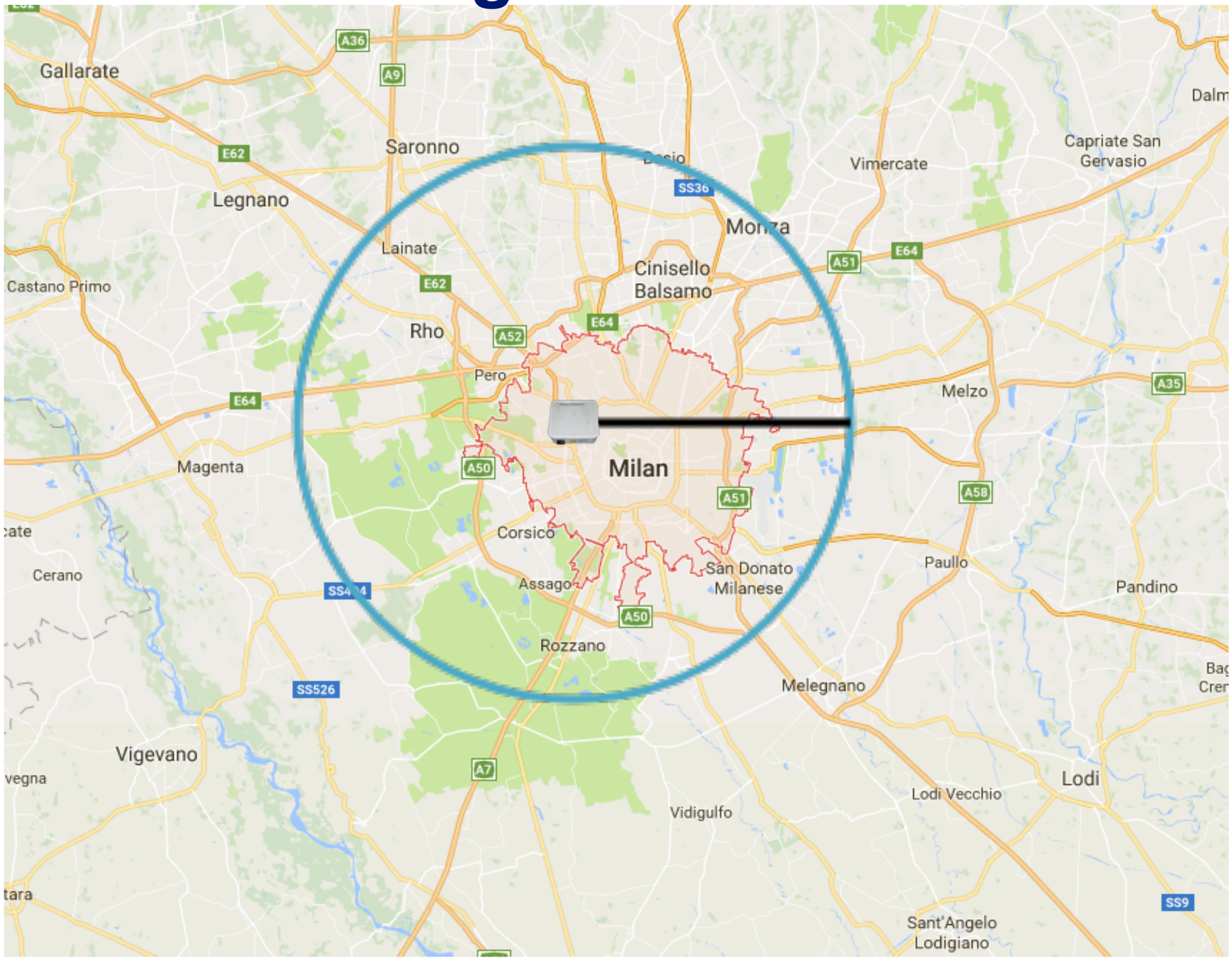
/locate

https://ipmap.ripe.net/api/v1/locate/83.163.50.165/partials


```
{
  "partials": [
    {
      "engine": "probeslocation",
      "description": "Probes location suggestor - based on user setting",
      "scoreFactor": 10,
      "locations": [],
      "applicable": true,
      "type": "probes"
    },
    {
      "engine": "anycast",
      "description": "Anycast engine",
      "scoreFactor": 10,
      "locations": [],
      "applicable": true,
      "type": "anycast"
    },
    {
      "engine": "crowdsourced",
      "description": "Crowdsourced engine",
      "scoreFactor": 6,
      "locations": [],
      "applicable": true,
      "type": "crowdsource"
    },
    {
      "engine": "single-radius",
      "description": "Single-radius engine (if empty try in 3 minutes, active geolocation requires time)",
      "scoreFactor": 5,
      "locations": [ … ], // 100 items
      "applicable": true,
      "type": "active"
    }
  ],
  "metadata": { … } // 3 items
}
```

Active geolocation with RIPE Atlas

/locate - Active geolocation



/locate - Active geolocation

- If the IP has not been measured yet, a new Ping measurement starts
  - Peering DB data and BGP data are used to reduce the locations probed
  - Score based on RTT, only RTT <10ms are considered
  - PeeringDB facilities and population bust the score
  - A list of possible locations is returned
  - We are working on it! (Contributions are welcome!)

That’s why you need…

RIPE Atlas coverage!

Future Work

- Introduce new geolocation engines
  - Integration with RIR and RIR databases
  - Reverse DNS engine
  - More features for resource holders
- Define and publish some KPI for service evaluation
  - Constant accuracy evaluation
  - We already collect metadata

Questions

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