RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Multi-Approach Infrastructure Geolocation

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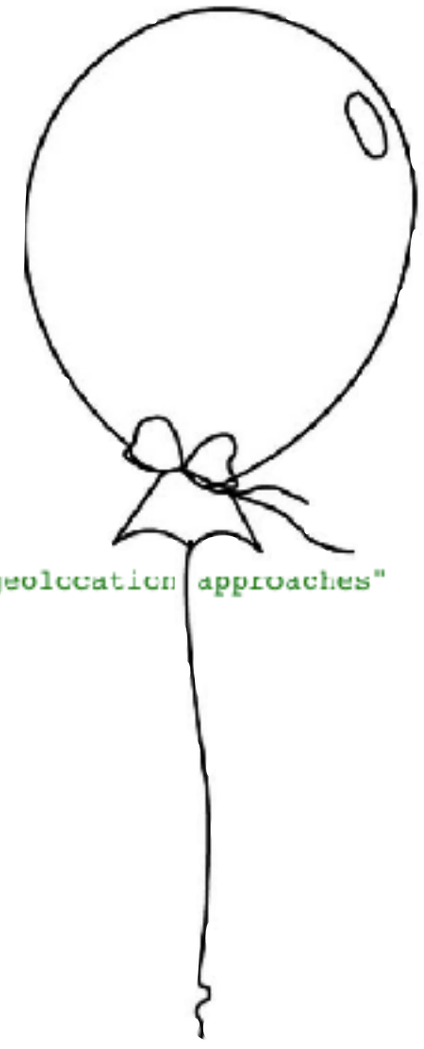
Reasons

1. Increased interest in IP geolocation
   - Content providers, researchers
   - https://www.ripe.net/manage-ips-and-asns/db/tools/geolocation-in-the-ripe-database
2. A unified geographical data format is needed
   - Across all our tools
   - Enabling future geographical investigations
   - Accurate information
3. IP geolocation is extremely difficult
   - Various approaches, some of them not accurate enough to be used singularly
   - Academia is working on it! Let's work together

FOCUS ON Infrastructure

What's new: RIPE NCC's geo service

geo.ripe.net




```
[
  {
    "url": "/locate",
    "description": "Geolocation service. It provides geolocation according to a set of passive and active geolocation approaches"
  },
  {
    "url": "/worlds",
    "description": "Worlds dataset, providing standard geolocation format to all other services"
  },
  {
    "url": "/crowdsource",
    "description": "Geolocation service based on crowdsourced information."
  },
  {
    "url": "/peeringdb",
    "description": "PeeringDB interface for geolocation purposes.'
  },
  {
    "url": "/triangulation",
    "description": "Active geolocation service based on latency triangulation."
  },
  {
    "url": "/anycast",
    "description": "Anycast geolocation service based on active measurements'
  }
]
```

/locate

https://geo.ripe.net/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": {}
    }
  }
}
```

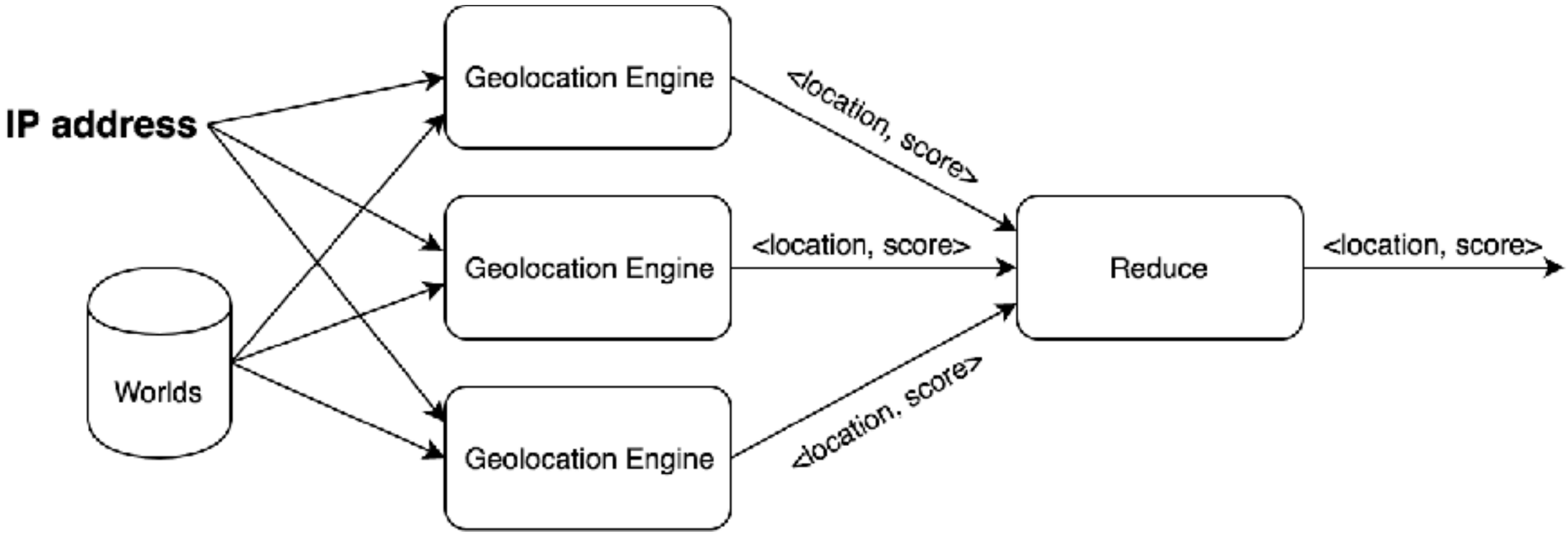

*queries can be bundled with:

https://geo.ripe.net/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

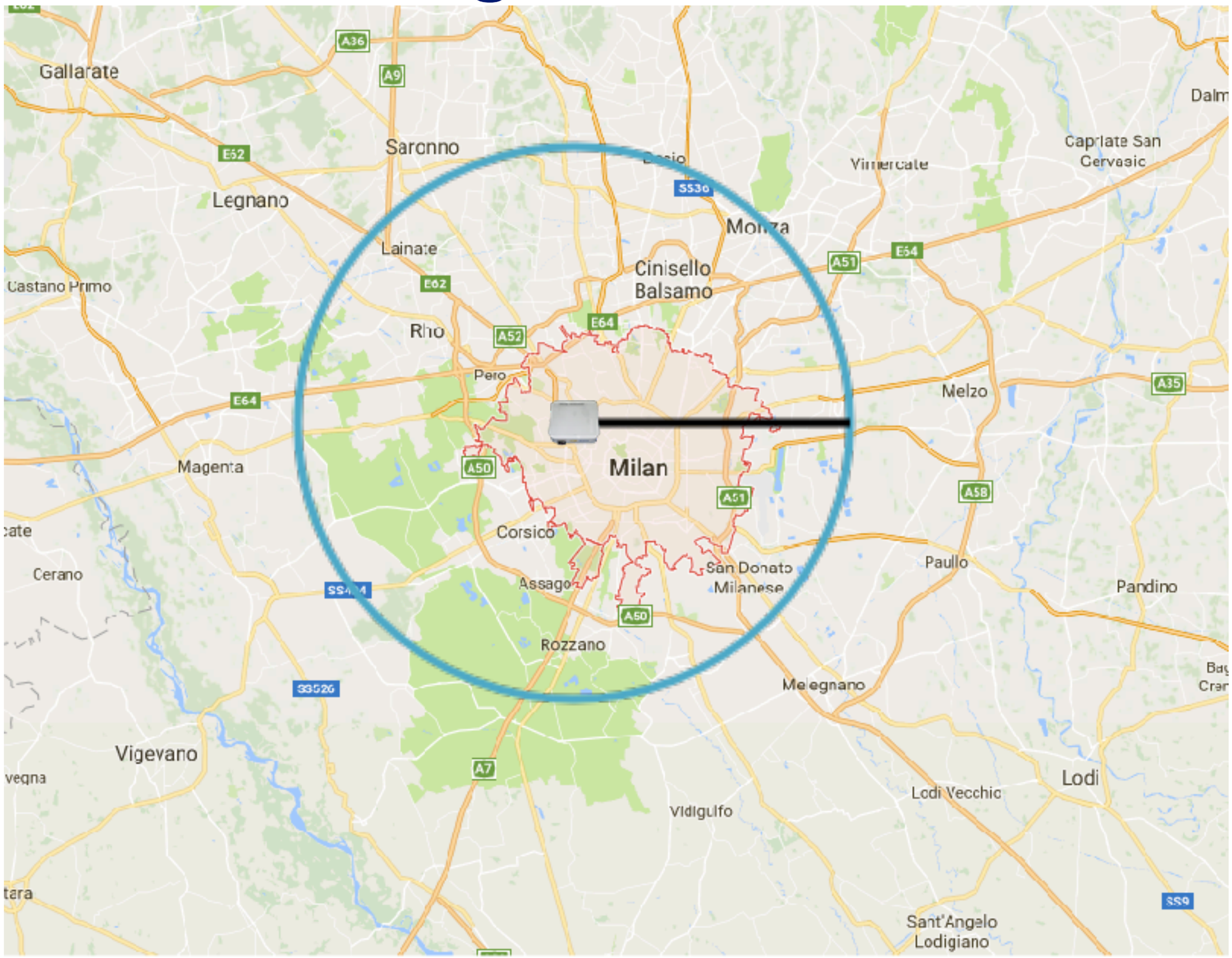
https://geo.ripe.net/locate/83.163.50.165/partials


```
{
  "partials": [
    {
      "engine": "probeslocation",
      "description": "Probes location suggestor - based on user setting",
      "scoreFactor": 10,
      "locations": [ … ] // 1 item
    },
    {
      "engine": "anycastparistech",
      "description": "Anycast engine - Paristech dataset",
      "scoreFactor": 10,
      "locations": []
    },
    {
      "engine": "crowdsourced",
      "description": "Crowdsourced engine",
      "scoreFactor": 9,
      "locations": []
    },
    {
      "engine": "triangulation",
      "description": "Triangulation engine (if empty try in 3 minutes, triangulation requires time)",
      "scoreFactor": 5,
      "locations": [ … ] // 20 items
    }
  ],
  "meta": {
    "distribution": {
      "version": "17.9.18.1"
    },
    "service": {
      "version": "0.0.1"
    },
```

/locate - Active geolocation

1. 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!)

/locate - Active geolocation



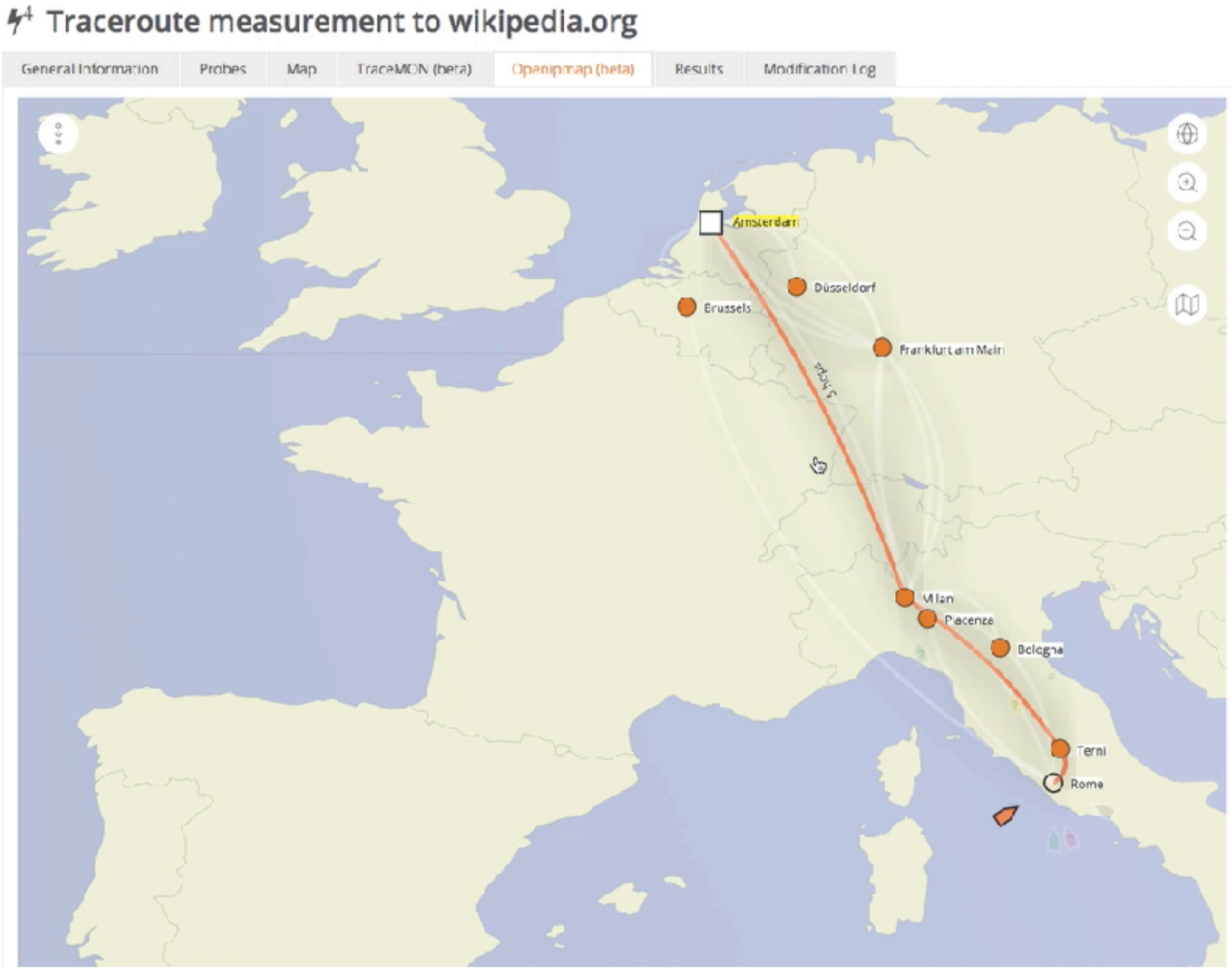
OpenIPmap

1. A topological network view is not enough - sometimes you need to see IPs on a **map**
   - To make sense of RTTs
   - To understand network relationships among countries
   - To verify your geographical optimisation policies

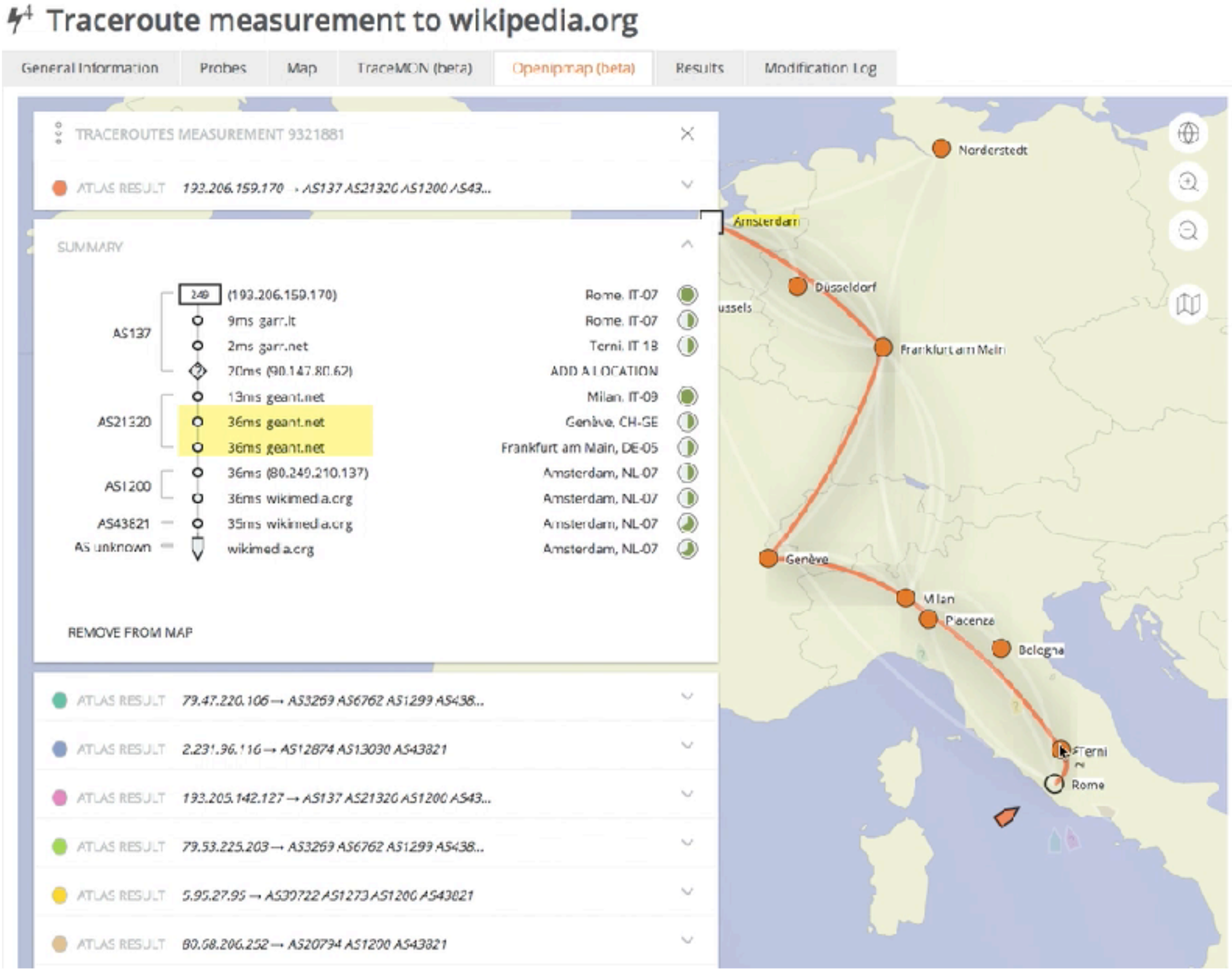
2. Crowdsourcing data by using a map
   - Easier than using the API for occasional use
   - Exposes wrong geolocations
   - Improves accuracy of the crowdsourced data

OpenIPmap Demo

OpenIPmap Demo

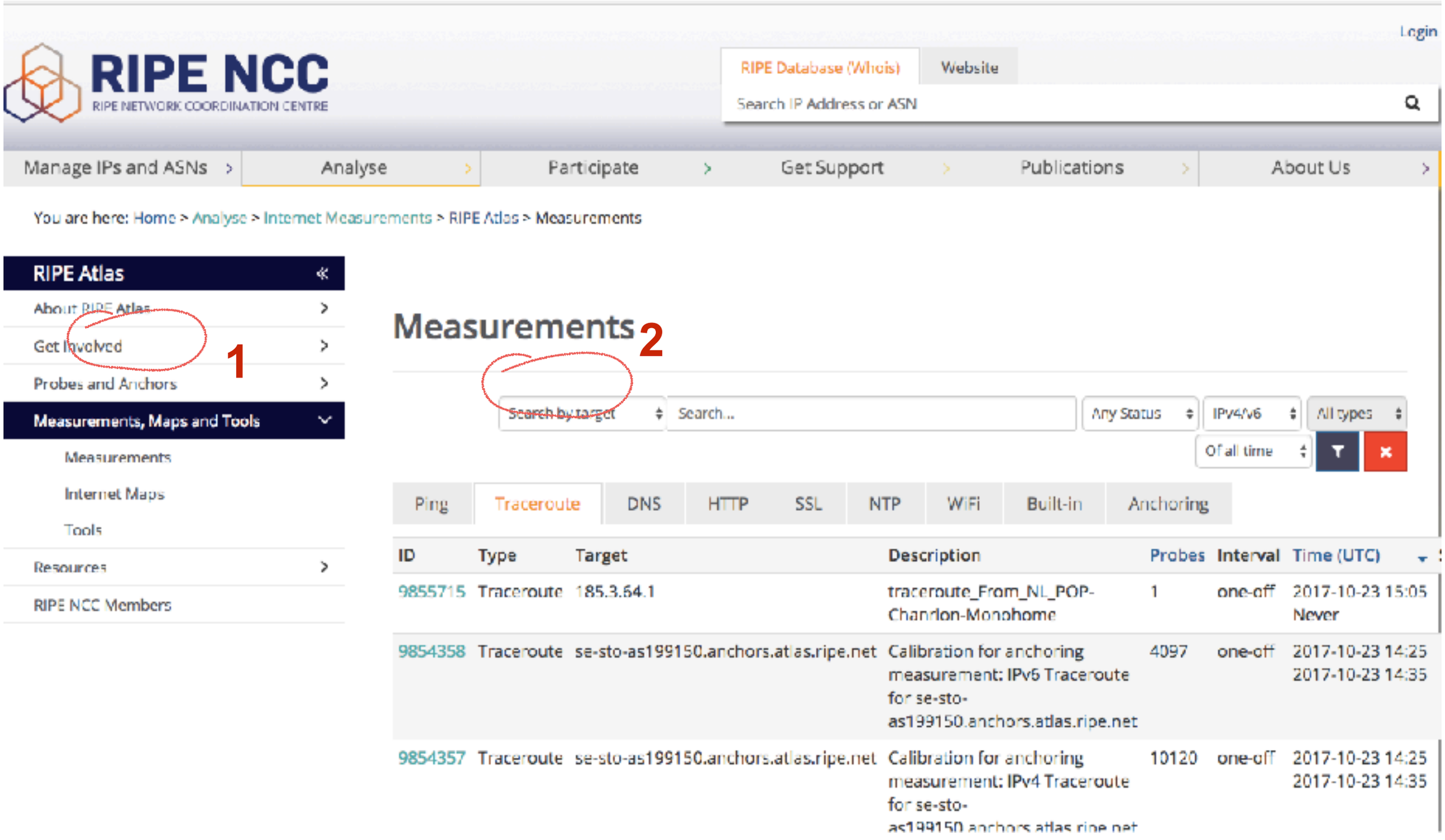


OpenIPmap Demo



Where is OpenIPmap?

https://atlas.ripe.net



Future Work

1. Introduce new geolocation engines
   - Increase research collaborations
   - Integrate RIR data
   - Reverse DNS engine
   - Third-party services
2. Define and publish some KPI for service evaluation
   - We already collect metadata

Questions

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