



RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Multi-Approach Infrastructure Geolocation

Massimo Candela | 10 November 2017 | ITNOG

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": "/crowdsourced",  
    "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:

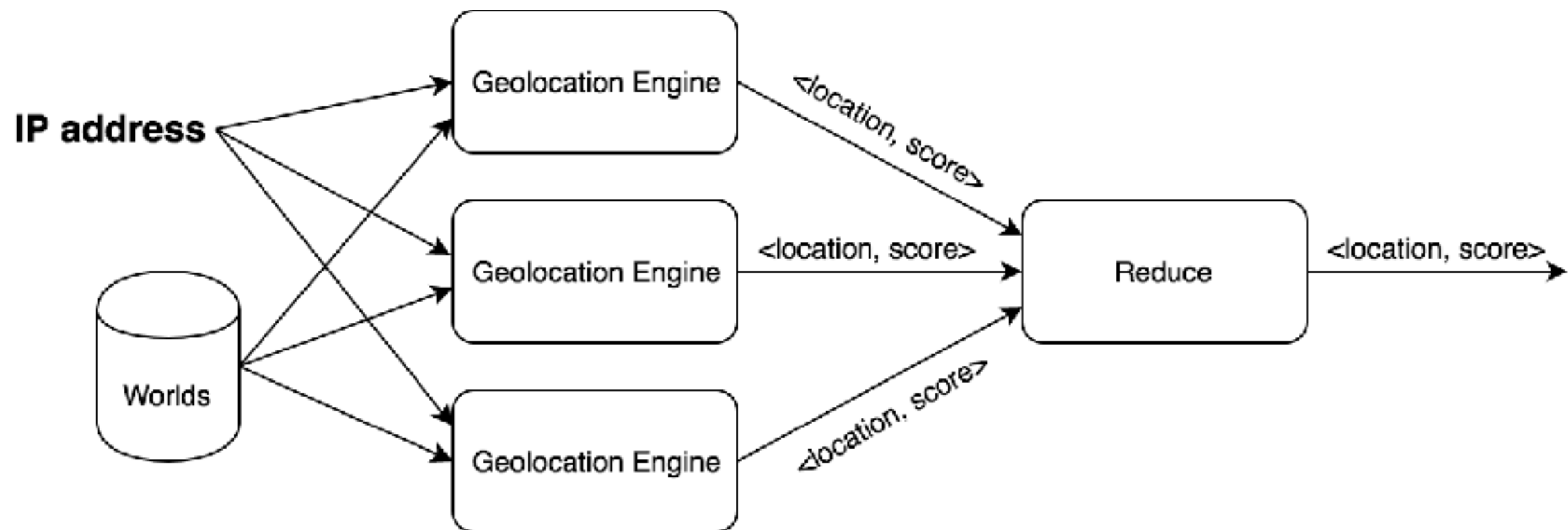
[https://geo.ripe.net/locate/all?
resources=ip1,ip2,ip3](https://geo.ripe.net/locate/all?resources=ip1,ip2,ip3)

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"
    },
  },
}
```

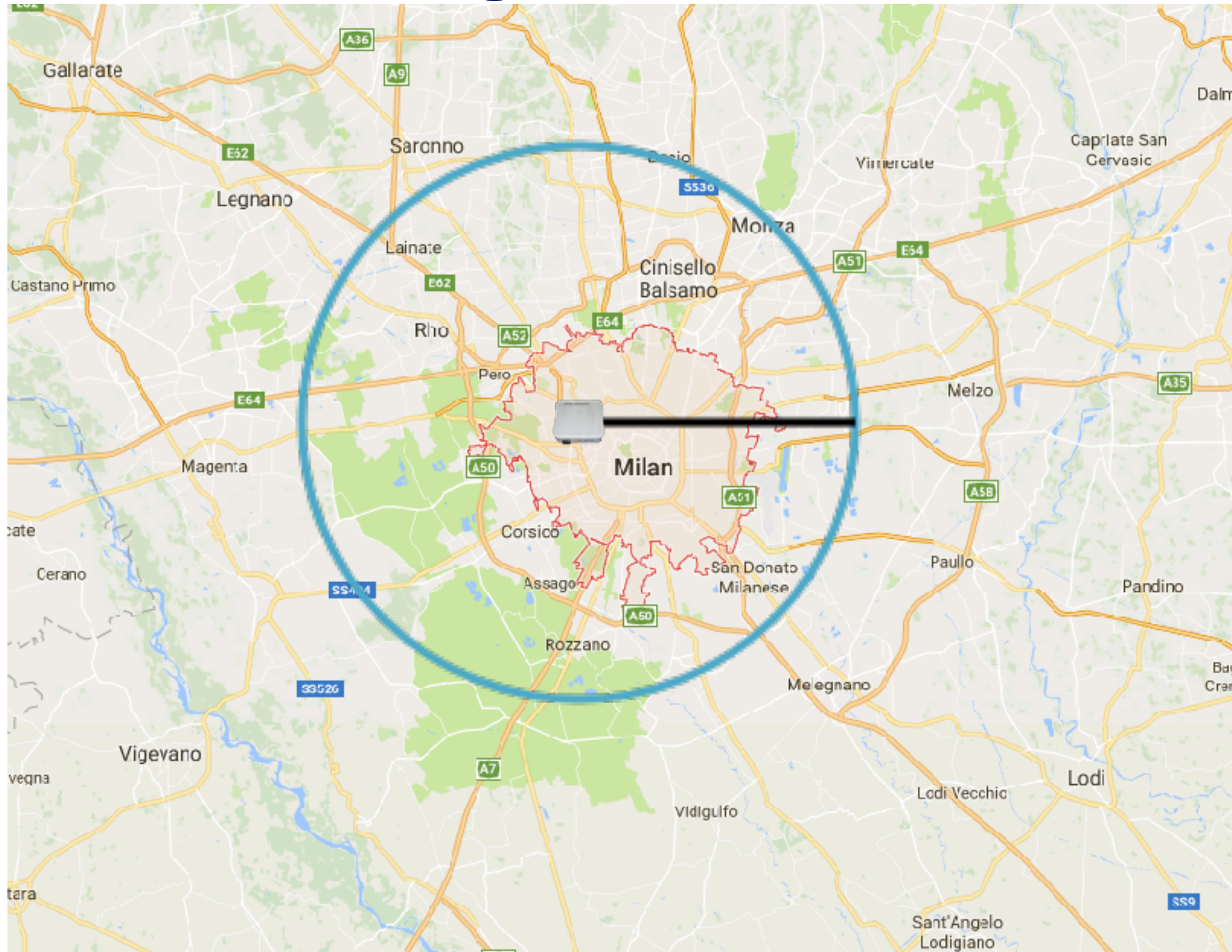
/locate - Active geolocation



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

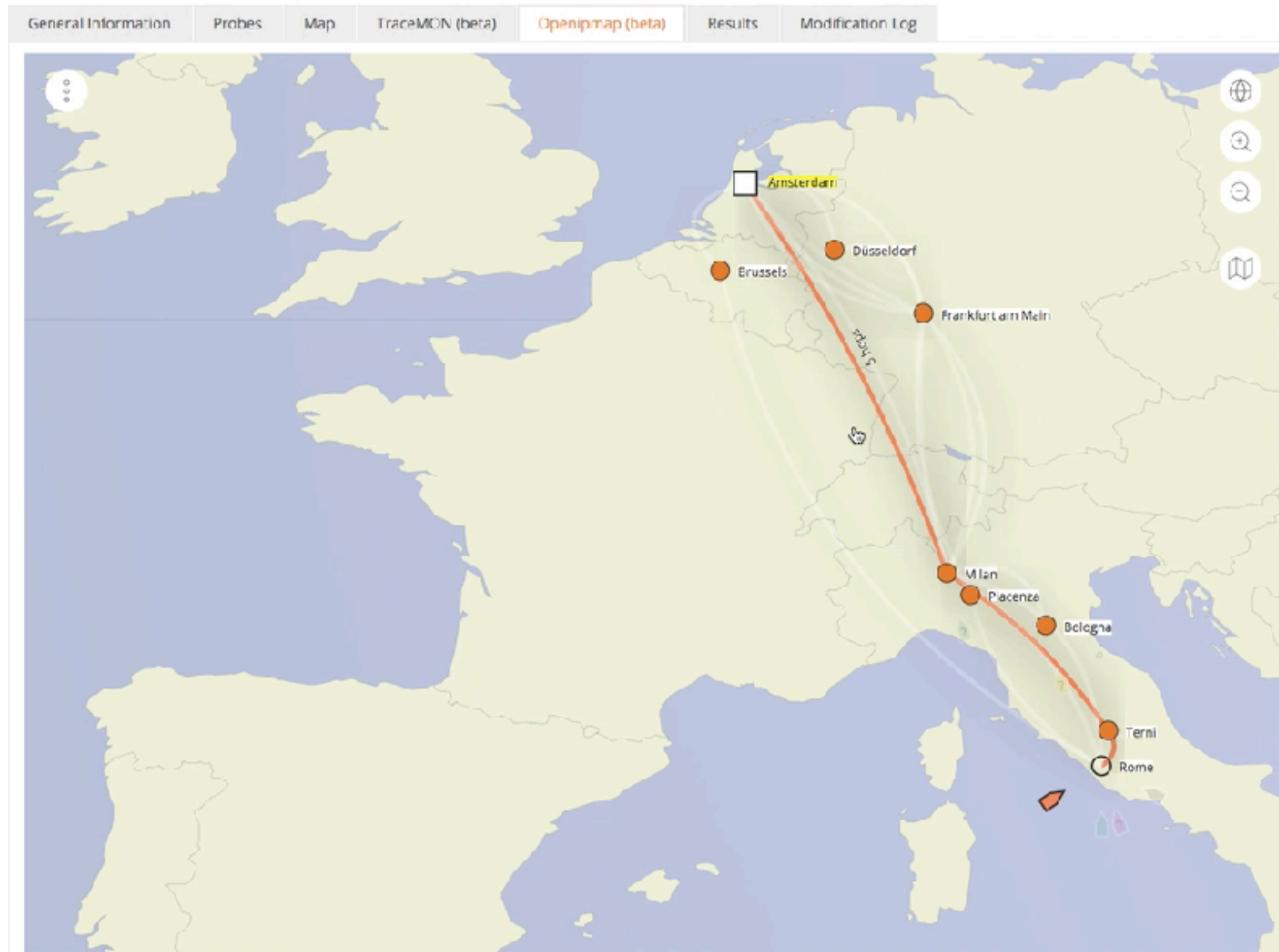
OpenIPmap Demo



OpenIPmap Demo



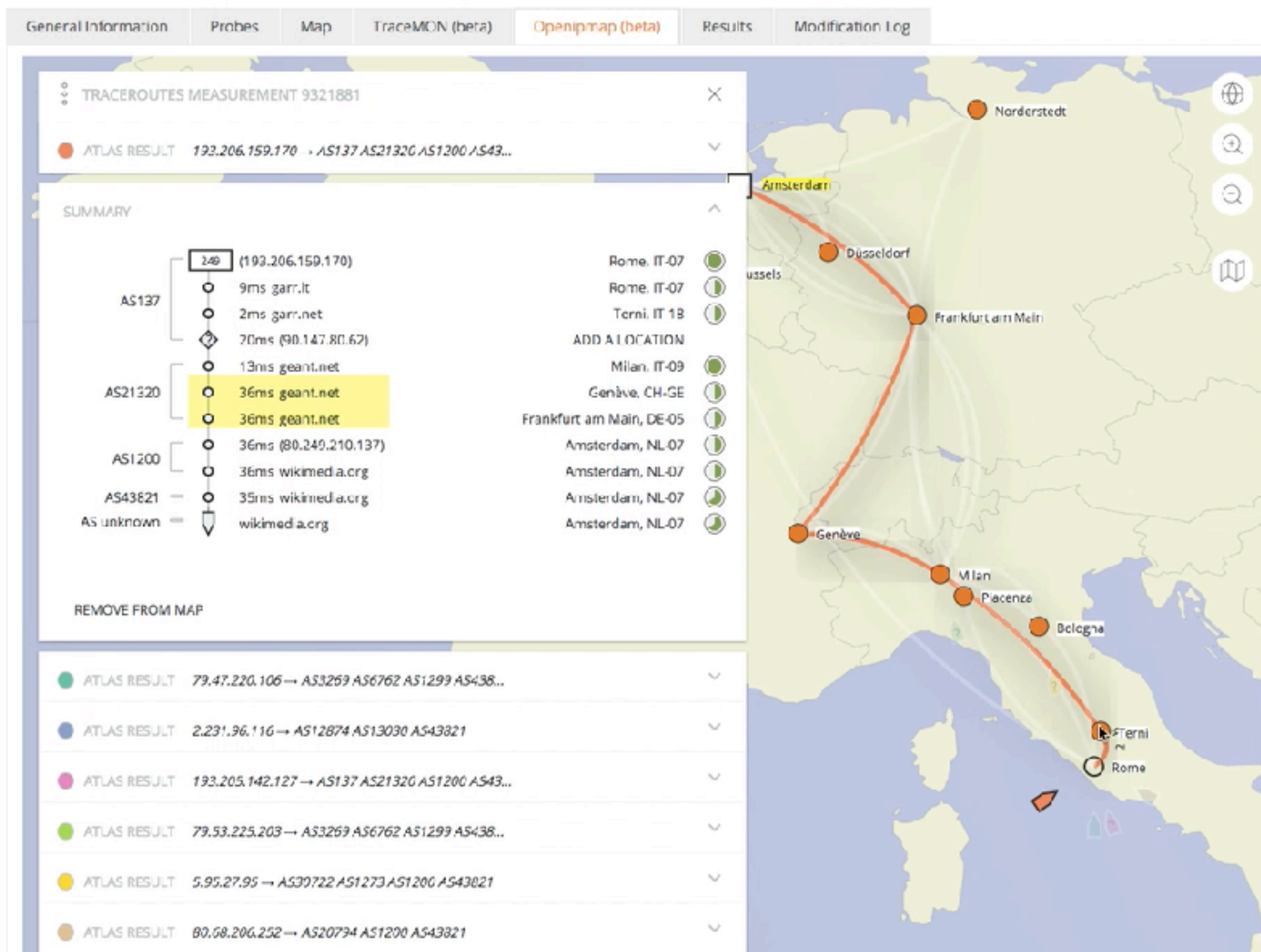
⚡ Traceroute measurement to wikipedia.org



OpenIPmap Demo



Traceroute measurement to wikipedia.org



Where is OpenIPmap?



<https://atlas.ripe.net>

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

RIPE Database (Whois) Website

Search IP Address or ASN

Manage IPs and ASNs > Analyse > Participate > Get Support > Publications > About Us >

You are here: Home > Analyse > Internet Measurements > RIPE Atlas > Measurements

RIPE Atlas <<

- About RIPE Atlas >
- Get Involved > **1**
- Probes and Anchors >

Measurements, Maps and Tools v

- Measurements
- Internet Maps
- Tools

Resources >

RIPE NCC Members

Measurements **2**

Search by target Search... Any Status IPv4/v6 All types

Of all time T X

Ping **Traceroute** DNS HTTP SSL NTP WIFI Built-in Anchoring

ID	Type	Target	Description	Probes	Interval	Time (UTC)
9855715	Traceroute	185.3.64.1	traceroute_From_NL_POP-Chandon-Monhome	1	one-off	2017-10-23 15:05 Never
9854358	Traceroute	se-sto-as199150.anchors.atlas.ripe.net	Calibration for anchoring measurement: IPv6 Traceroute for se-sto-as199150.anchors.atlas.ripe.net	4097	one-off	2017-10-23 14:25 2017-10-23 14:35
9854357	Traceroute	se-sto-as199150.anchors.atlas.ripe.net	Calibration for anchoring measurement: IPv4 Traceroute for se-sto-as199150.anchors.atlas.ripe.net	10120	one-off	2017-10-23 14:25 2017-10-23 14:35

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

mcandela@ripe.net

