



**RIPE NCC**

RIPE NETWORK COORDINATION CENTRE

# Infrastructure Geolocation with RIPE IPmap

Massimo Candela | May 2018 | LACNIC 29

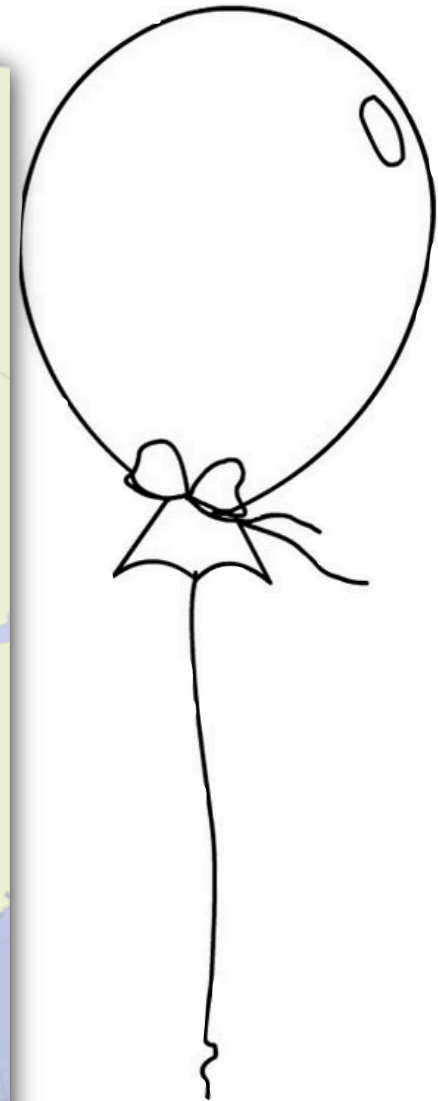
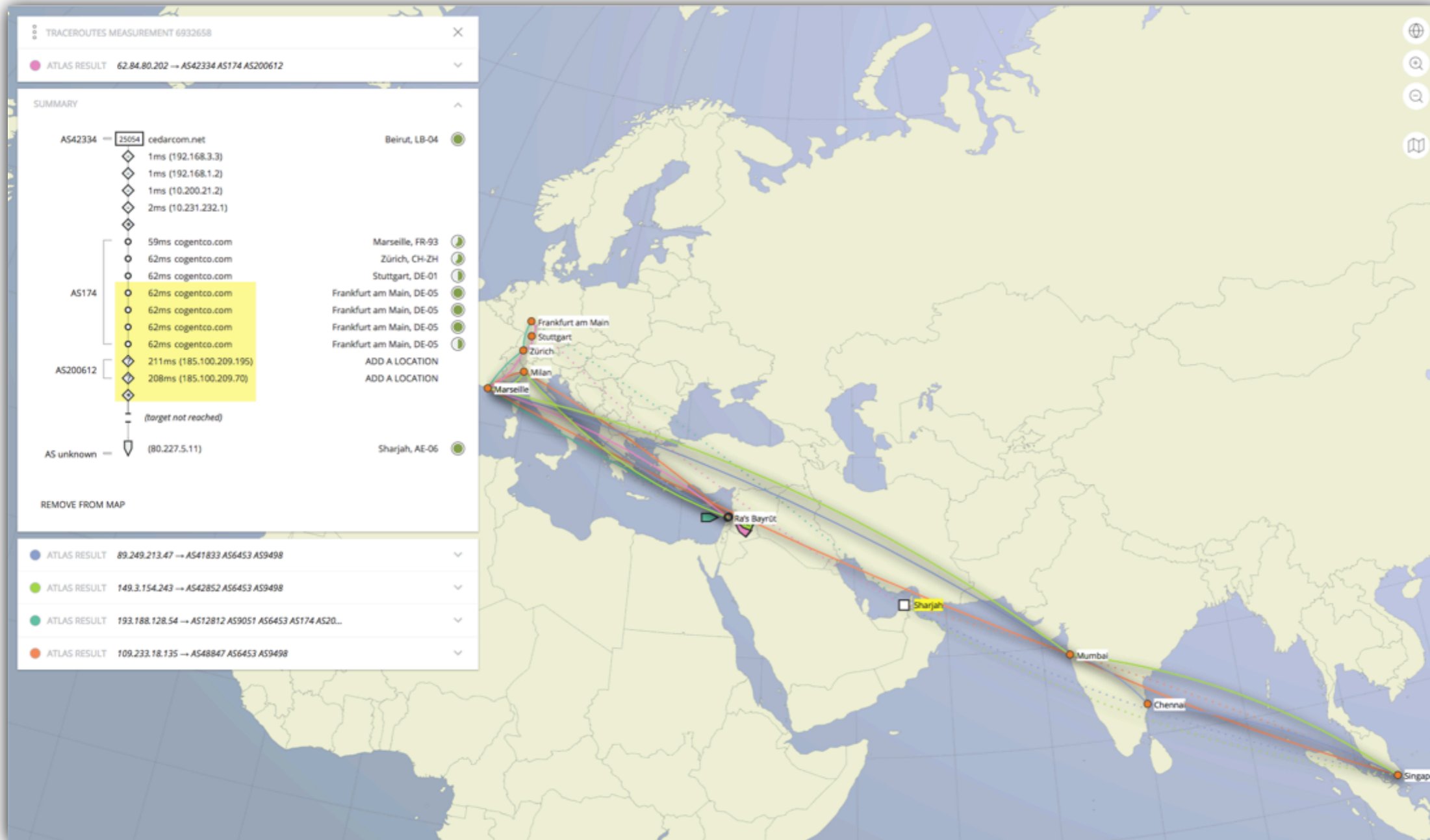
# Reasons



- 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
- 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

FOCUS ON  
Infrastructure

# What's new: [ipmap.ripe.net](http://ipmap.ripe.net)



# What is [ipmap.ripe.net](https://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?



RIPE NCC  
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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 >

Probes and Anchors >

**Measurements, Maps and Tools** v

Measurements 1

Internet Maps

Tools

Resources >

RIPE NCC Members

## Measurements

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


Of all time

Ping **Traceroute** 2 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-Chanrion-Monohome	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

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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 > Measurement #12317005

## ⚡ Traceroute measurement to wikipedia.org **here!**

General Information Probes Map TraceMON **IPmap (beta)** Results

### General Information

ID	#12317005
Group ID	#12317005
Type	⚡ Traceroute
Public measurement?	Yes
Target	wikipedia.org
Resolve on Probe	No
This is a one-off measurement	
Timing	2018-04-26 12:25 - 2018-04-26 12:35
Costs	60 per result, 1200 per day
Response timeout	4000
Protocol	TCP

# RIPE IPmap Demo

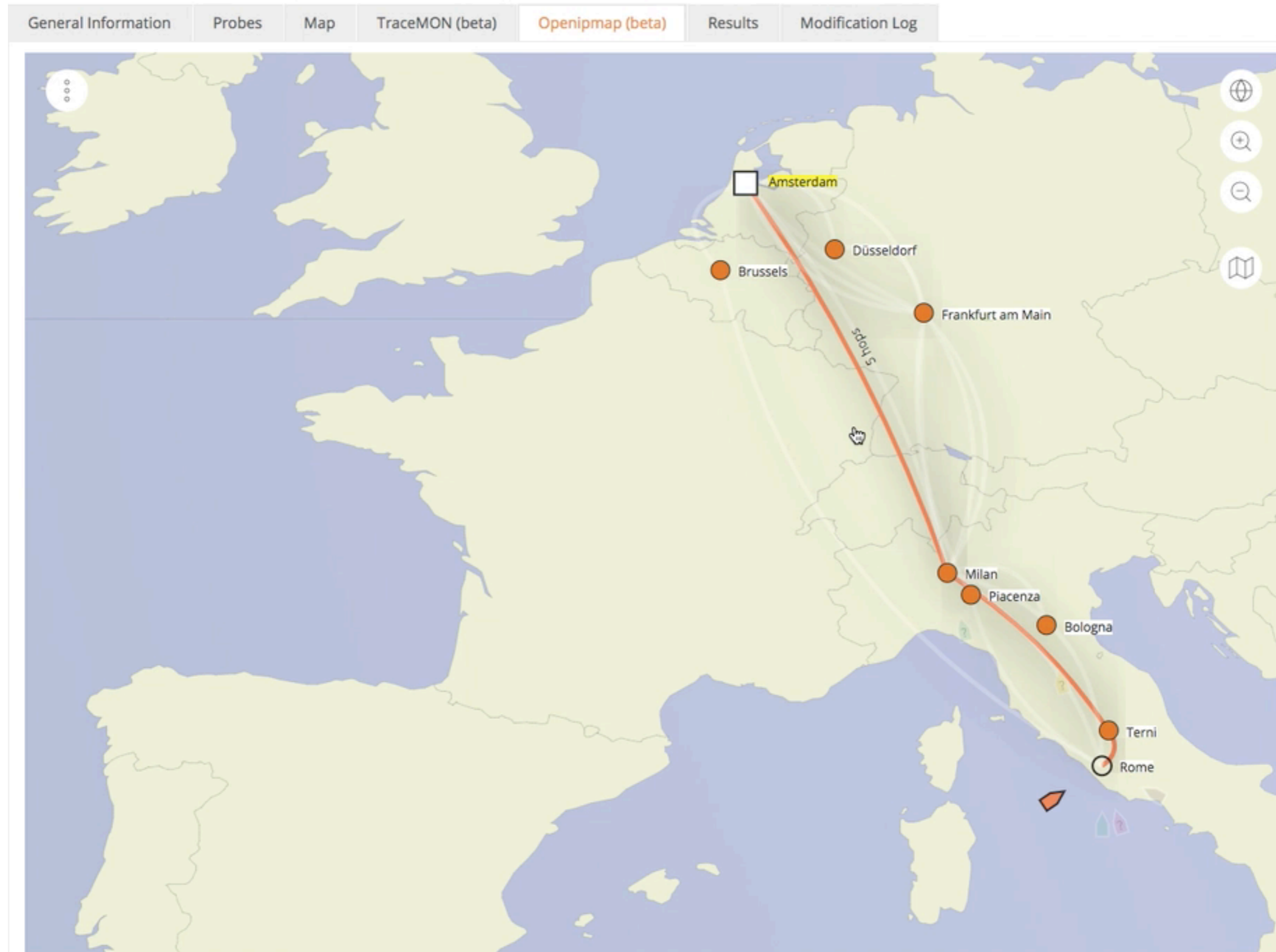


A screenshot of the RIPE NCC website. The top left features the RIPE NCC logo and the text "RIPE NCC RIPE NETWORK COORDINATION CENTRE". To the right, there are two tabs: "RIPE Database (Whois)" and "Website". Below the tabs is a search bar with the text "Search IP Address or ASN" and a magnifying glass icon. A dark blue banner below the search bar contains the text "By searching you explicitly express your agreement with the RIPE Database terms and conditions". Below the search bar is a horizontal navigation menu with the following items: "Manage IPs and ASNs &gt;", "Analyse &gt;", "Participate &gt;", "Get Support &gt;", "Publications &gt;", and "About Us".

# RIPE IPmap Demo



⚡ Traceroute measurement to wikipedia.org





# RIPE IPmap Demo



## ⚡ Traceroute measurement to wikipedia.org

General Information Probes Map TraceMON (beta) **Openipmap (beta)** Results Modification Log

TRACEROUTES MEASUREMENT 9321881

ATLAS RESULT 193.206.159.170 → AS137 AS21320 AS1200 AS43...

SUMMARY

AS137	249 (193.206.159.170)	Rome, IT-07	●
	○ 9ms garr.it	Rome, IT-07	●
	○ 2ms garr.net	Terni, IT-18	●
	◇ 20ms (90.147.80.62)	ADD A LOCATION	
AS21320	○ 13ms geant.net	Milan, IT-09	●
	○ 36ms geant.net	Genève, CH-GE	●
	○ 36ms geant.net	Frankfurt am Main, DE-05	●
AS1200	○ 36ms (80.249.210.137)	Amsterdam, NL-07	●
	○ 36ms wikimedia.org	Amsterdam, NL-07	●
AS43821	○ 35ms wikimedia.org	Amsterdam, NL-07	●
AS unknown	▬ wikimedia.org	Amsterdam, NL-07	●

REMOVE FROM MAP

ATLAS RESULT 79.47.220.106 → AS3269 AS6762 AS1299 AS438...

ATLAS RESULT 2.231.96.116 → AS12874 AS13030 AS43821

ATLAS RESULT 193.205.142.127 → AS137 AS21320 AS1200 AS43...

ATLAS RESULT 79.53.225.203 → AS3269 AS6762 AS1299 AS438...

ATLAS RESULT 5.95.27.95 → AS30722 AS1273 AS1200 AS43821

ATLAS RESULT 80.68.206.252 → AS20794 AS1200 AS43821



# 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:

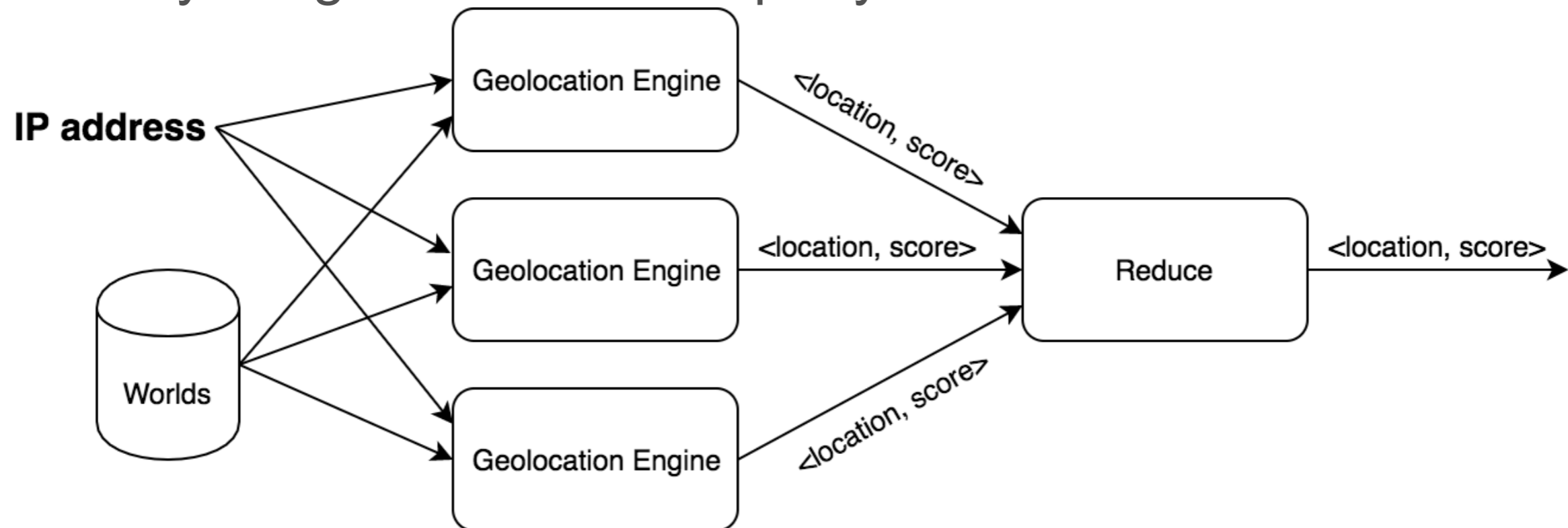
<https://ipmap.ripe.net/api/v1/locate/all?resources=ip1,ip2,ip3>



# 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



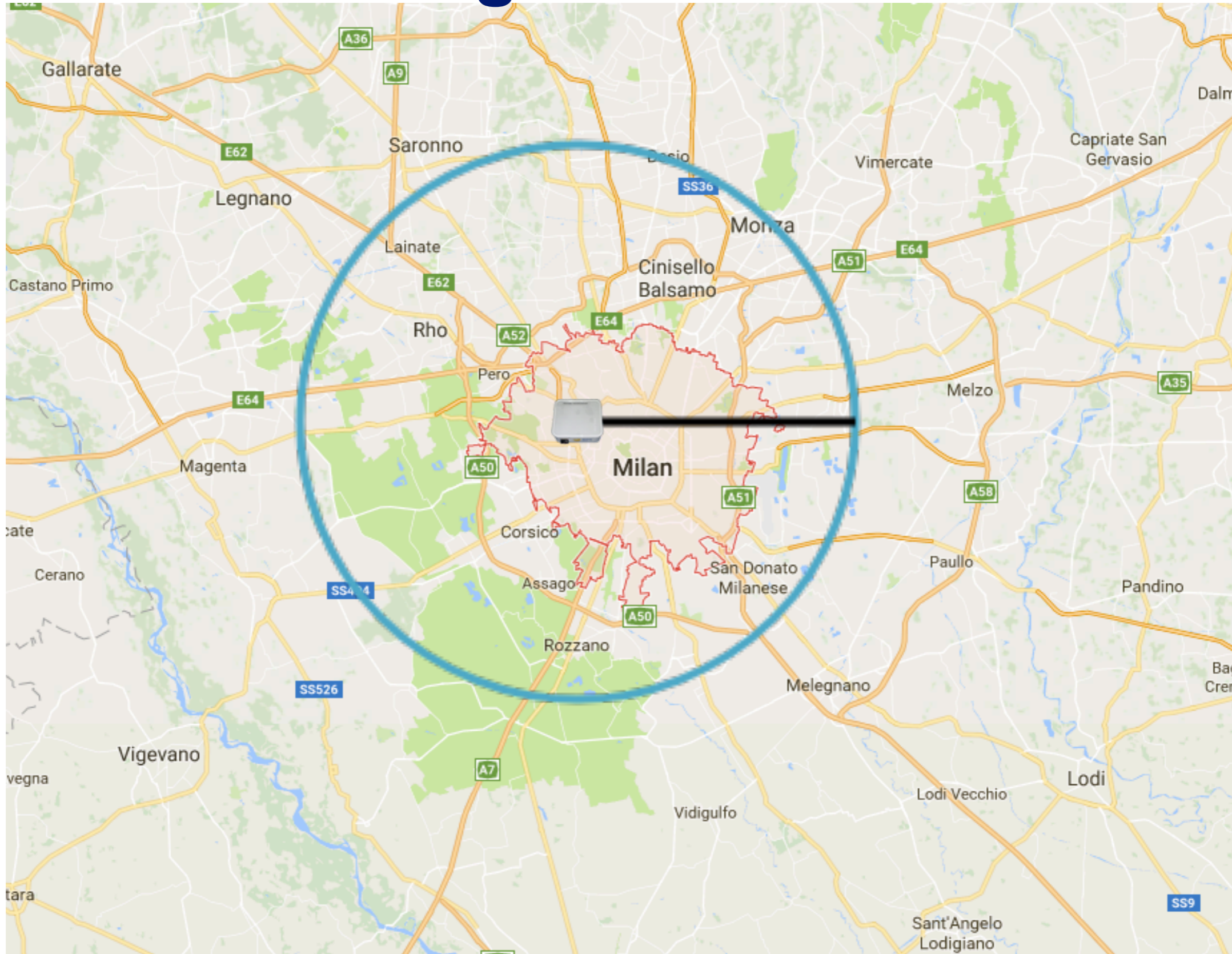
<https://ipmap.ripe.net/api/v1/locate/83.163.50.165/partial>

```
{
  "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

[mcandela@ripe.net](mailto:mcandela@ripe.net)

