

Monitoring System for the Internet in Latin America

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CONEXDAT GROUP

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Agenda

- Motivation
- Objectives
- Internet Fundamentals
- Data Collection
- Graphic Selection
- Architecture
- Implementation
- Results

Motivation

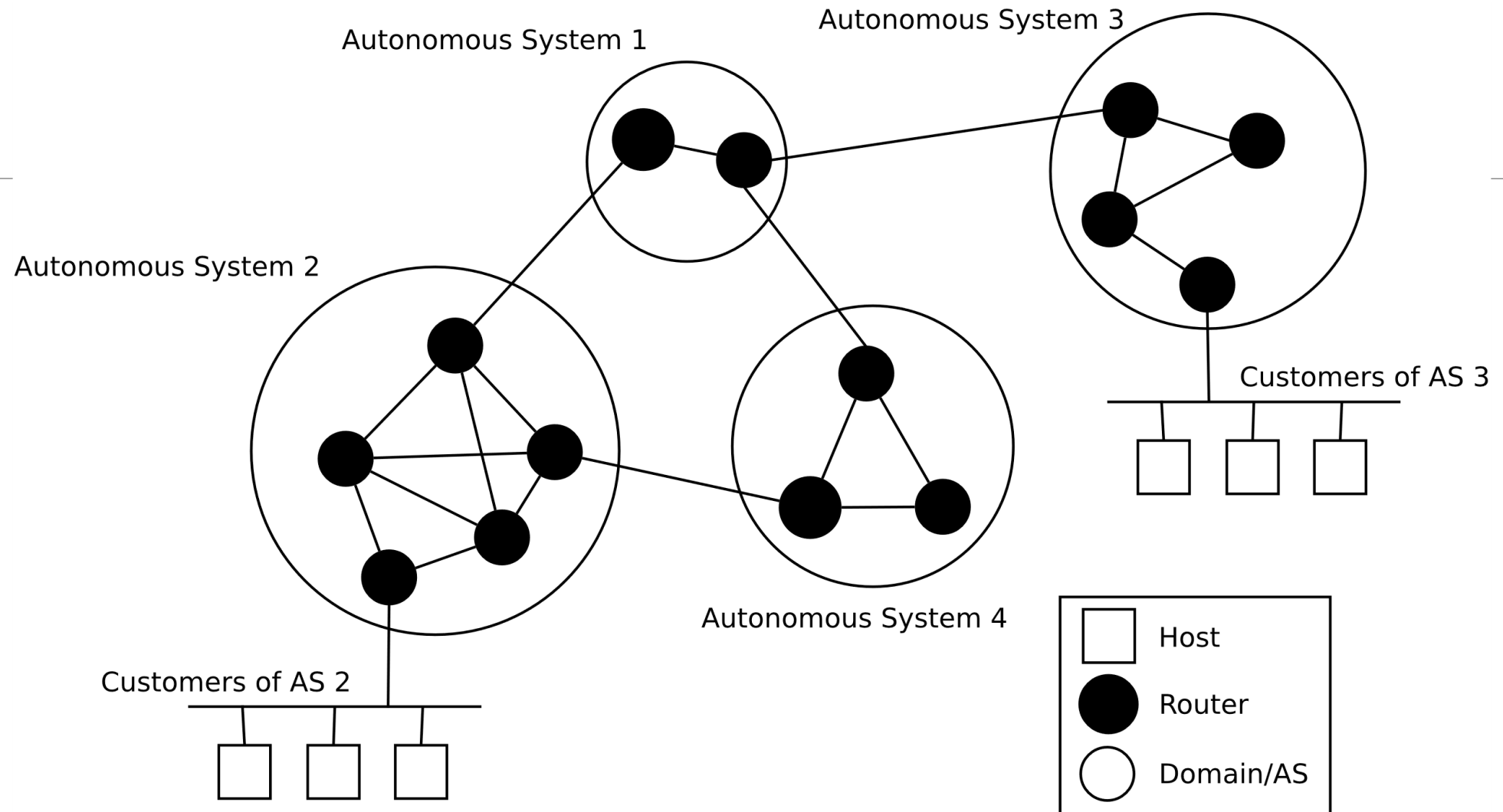
- Constantly changing landscape
 - IPv4-address drain
 - (Lack of) IPv6 development
- Platform to automatically process and visualize data
- Geographical restriction
- Scheduling of measurements

Objectives

- Display disparities between IPv4 and IPv6
- Collect AS-Data
- Schedule measurements
- Process and visualize results
- Accessible results
- Continuity

Internet Network Topology

- Network topology: Layout of a network
- Many different Autonomous Systems
 - Interconnected
 - Independent
- Intra-domain network
- Inter-domain network



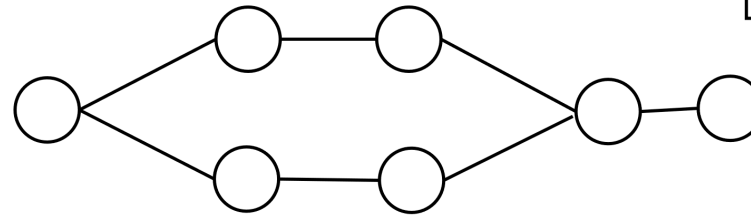
Internet Routing

- Intra-domain routing
 - Determines package flow inside an AS
- Inter-domain routing
 - Determines package flow between Ases
 - Secures every subnet is known in the Internet
- Path selection
 - Per destination
 - Per flow
 - Per packet

Internet Measurements

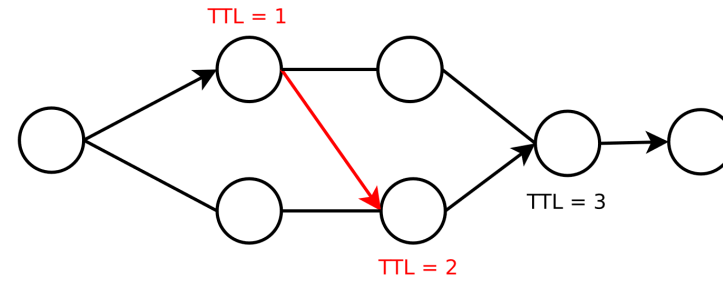
- Routing path invisible to the user
- Create readable network traffic
 - Traceroutes
- Access to different traceroute origins
- Altering Paths
 - Paris traceroute

Example Network

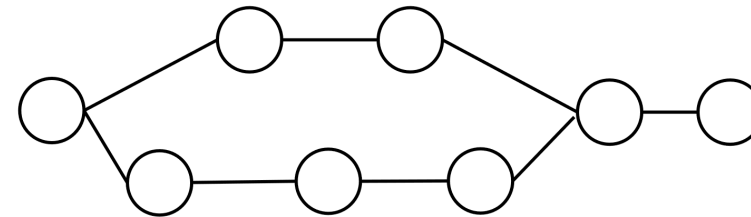


TTL =
time to live

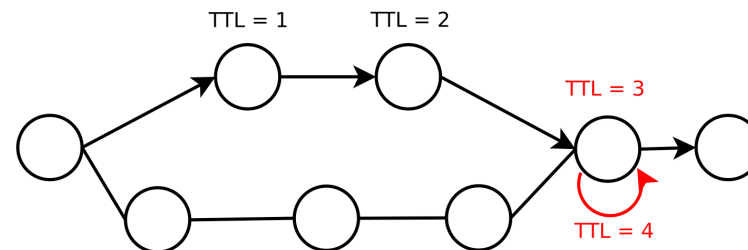
Wrong link created by routing change between the 1st and 2nd packet



Example Network 2



Loop created by routing change between the 3rd and 4th packet



Data Collection - Platforms

- CAIDA AS-Rank
 - AS numbers
 - Location
- Routeviews IP-prefix to AS mapping
- RIPE Atlas
 - Probe data
 - Measurements

Target Selection

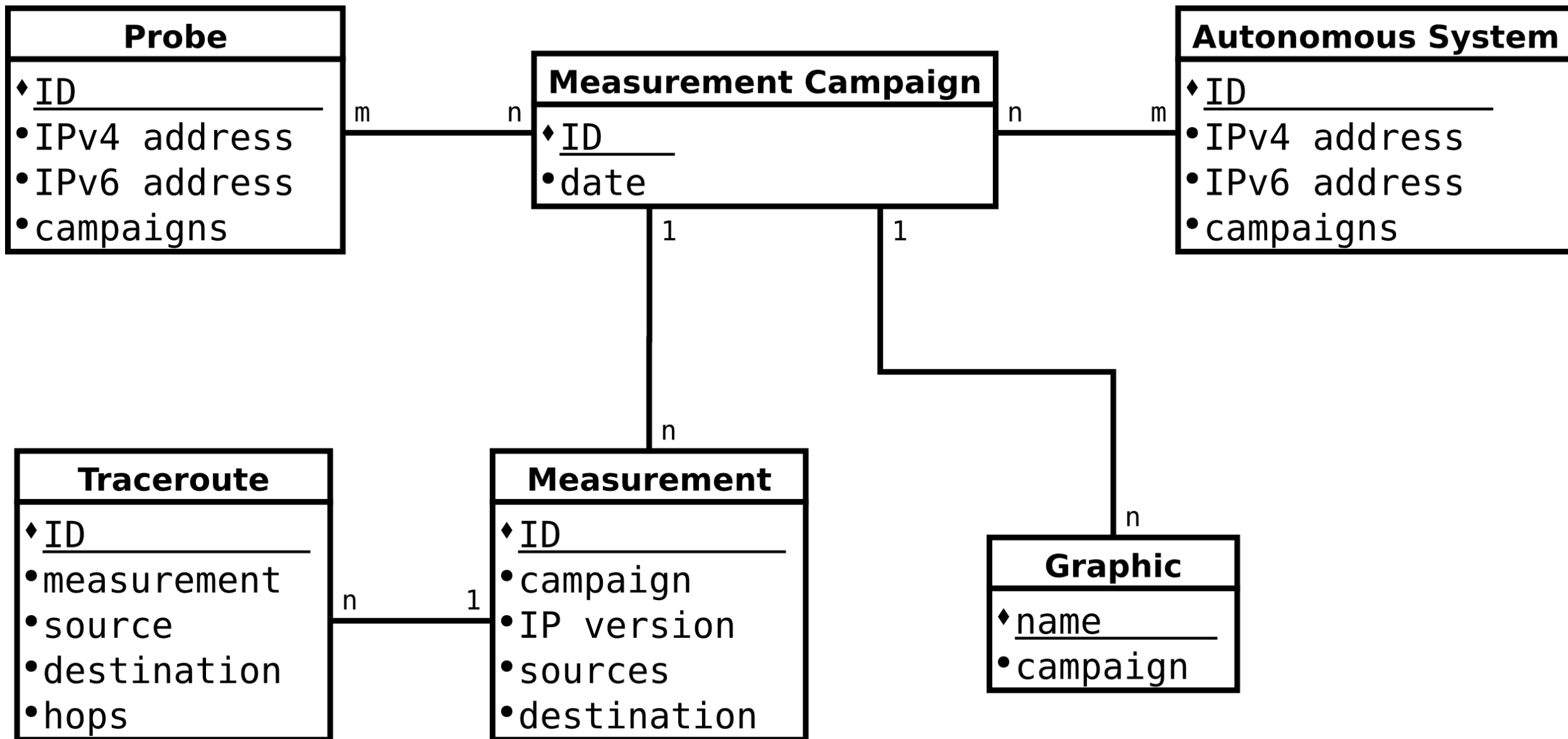
- IPv4 and IPv6 support
- Geo-location in Latin America
- Latin American country name
- Customer cone size = 1

Source Selection

- IPv4 and IPv6 support
- Connected and active
- Geo-location in Latin America
- 1 source per AS

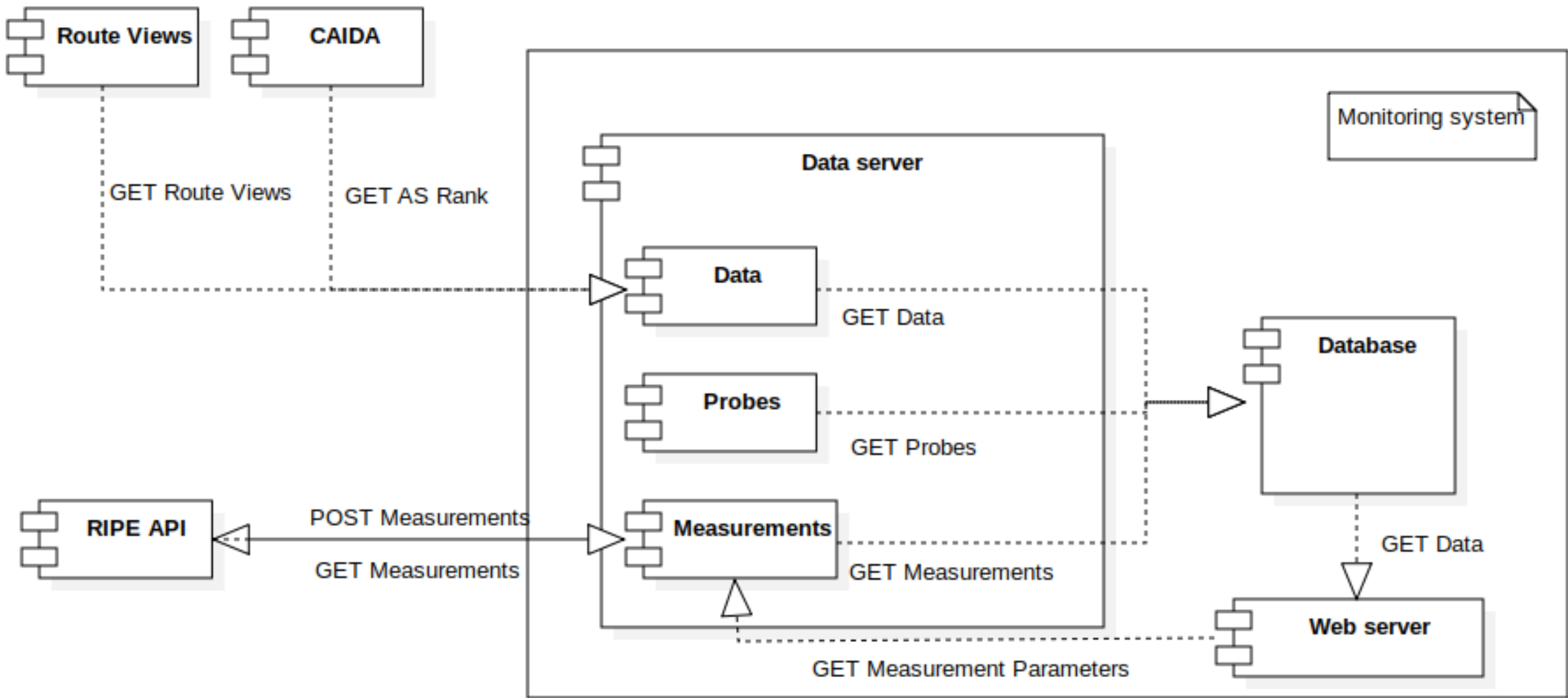
Frequency - Limitations

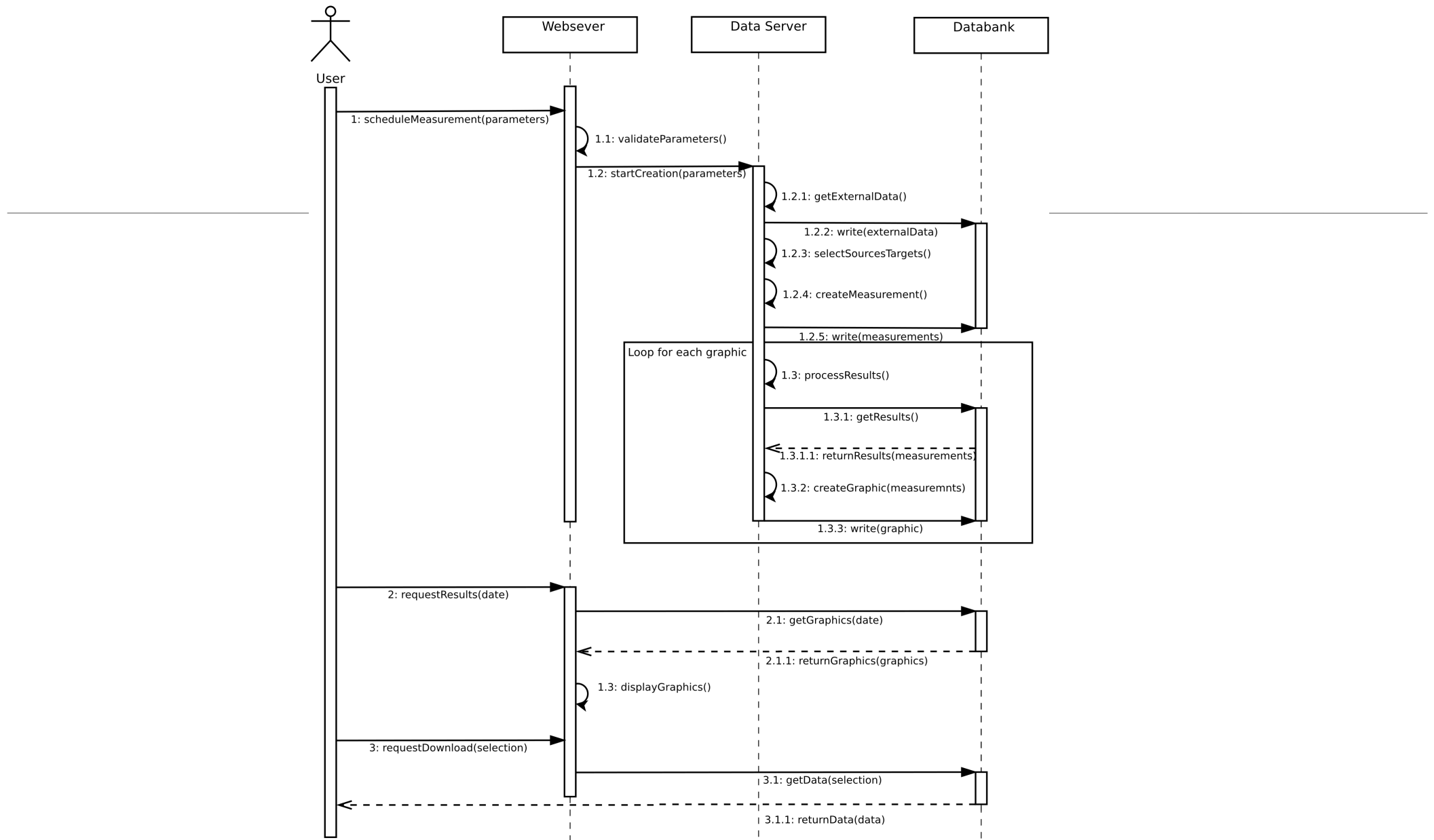
- 10 RIPE Atlas credits per traceroute result
- 100 simultaneous measurements
- 100.000 results per day
- 1.000.000 credits per day



Graphic Selection

- Heatmaps grouped by country
- k-core decomposition of AS-map
- Degree Distribution
- Average Neighbor Degree
- Clustering Coefficient





Implementation - Target Selection

- Get ASes
- Get Routeviews data
- Filter ASes
- Assign IP-interfaces to ASes

```
"data": {
  "clique": "true",
  "source": "e5e3b9c13678dfc483fb1f819d70883c_ARIN",
  "org": { "name": "Level 3 Parent, LLC", "id": "LPL-141-ARIN" },
  "cone": { "prefixes": 516117, "addresses": 1293145968, "asns": 36019 },
  "latitude": "36.0978209554736",
  "rank": "1",
  "country": "US",
  "name": "LEVEL3",
  "country_name": "United States",
  "degree": {
    "peers": 95,
    "globals": 5178,
    "siblings": 9,
    "customers": 5083,
    "transits": 5177
  },
  "longitude": "-91.335620170744",
  "id": "3356"
}
```

185.115.216.0/22	→	34762
185.115.220.0/22	→	34560
185.115.228.0/22	→	15622
185.115.228.0/24	→	15622
185.115.229.0/24	→	15622
185.115.232.0/22	→	204062
185.115.236.0/22	→	204195
185.115.240.0/24	→	42831
185.115.241.0/24	→	42495
185.115.242.0/24	→	202365
185.115.243.0/24	→	51167
185.115.252.0/22	→	16186

Implementation - Source Selection

- Get RIPE Atlas probes
- Filter probes
 - IPv4 and IPv6 interfaces
 - Network connectivity
- Reduce probes

Enter your Measurement Parameters

Sources:

Targets:

Repetition of measurements:

Concurrent measurements:

Description:

Protocol:

Packets:

First Hop:

Max Hops:

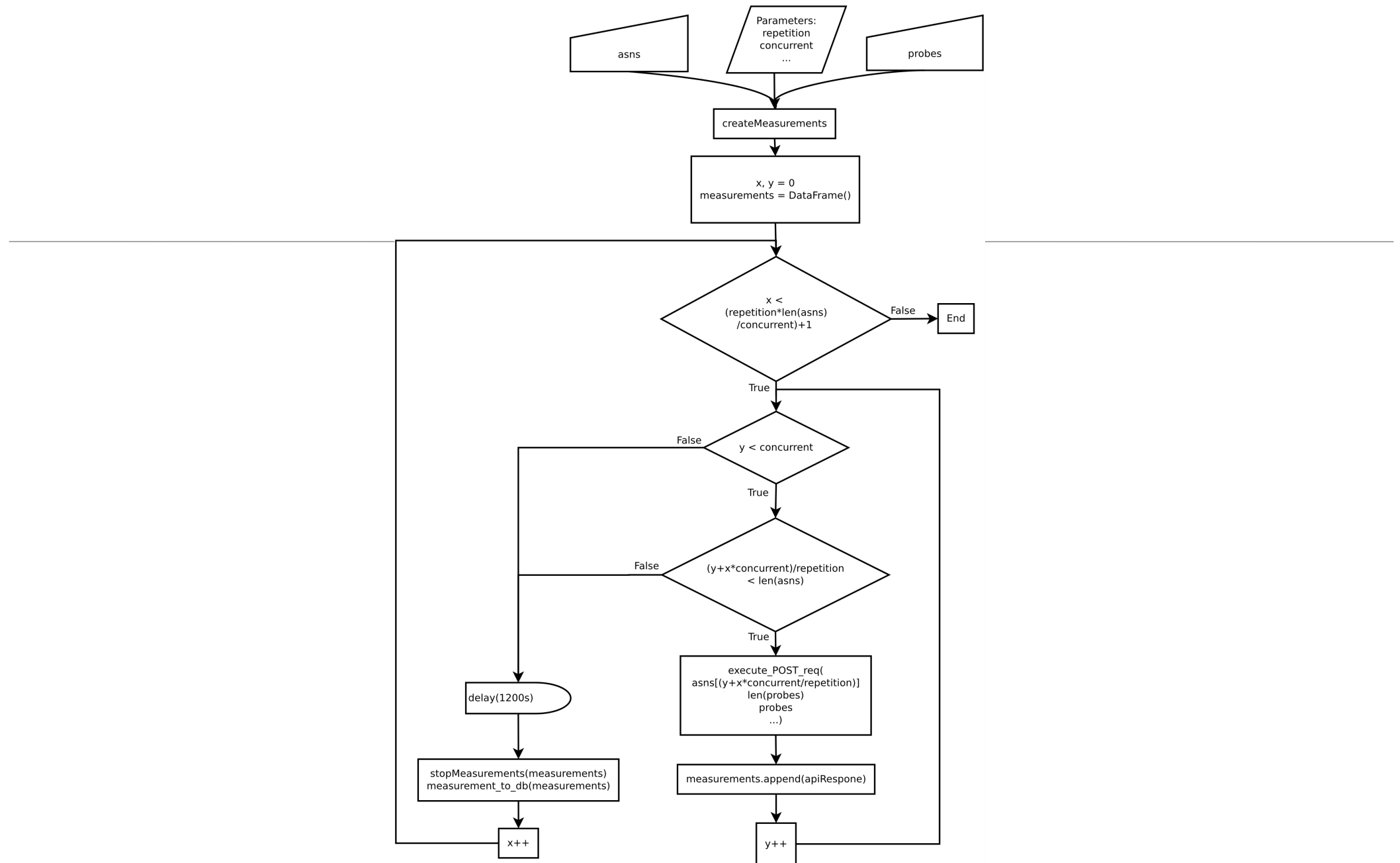
Paris:

Billing address:

API-Key:

Repeat every:

```
exemplary_request = {  
    "definitions": [  
        {  
            "target": "202.153.100.2",  
            "af": 4,  
            "description": "Test measurement",  
            "protocol": "TCP",  
            "packets": 8,  
            "size": 48,  
            "first_hop": 2,  
            "max_hops": 255,  
            "paris": 16,  
            "interval": 3600,  
            "type": "traceroute"  
        }  
    ],  
    "probes": [  
        {  
            "value": [1526, 2435, 6547, 6783, 7536],  
            "type": "probes",  
            "requested": 5  
        }  
    ],  
    "is_oneoff": False,  
    "start_time": "2019-07-07T12:00:00Z",  
    "stop_time": "2019-07-07T15:00:00Z",  
    "bill_to": "ripe.user@test.com"  
}
```

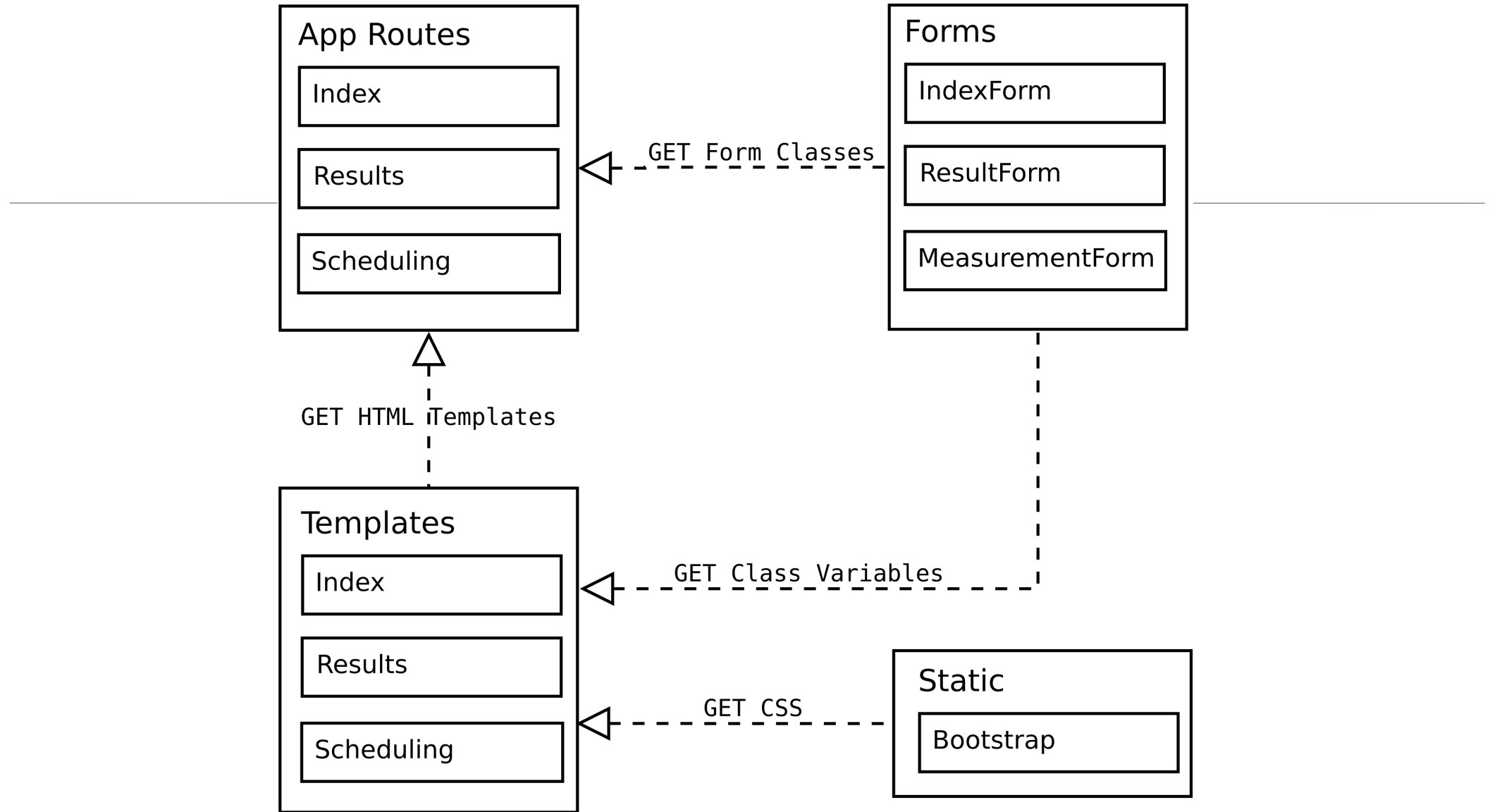


Graphic Creation

- Create AS-Edges
- Map hop-IPs to AS
- Make edge of directly connected ASES
- Transform edges to map
- Calculate and plot results

Heatmap Creation

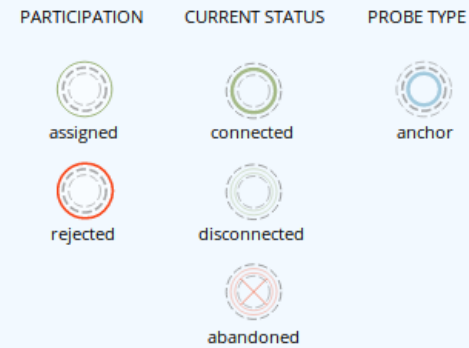
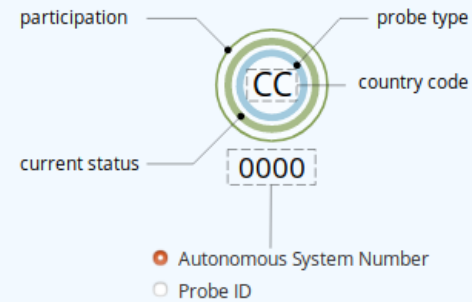
- Get last hop of every measurement
- Group by source-destination-country-pair
- Calculate median of the RTTs
- Transform data into heatmap



Participation Requests

REQUEST 1 🕒 2019-05-24T21:43:47Z
add 50 probes with specified probe IDs

LEGEND & DISPLAY OPTIONS

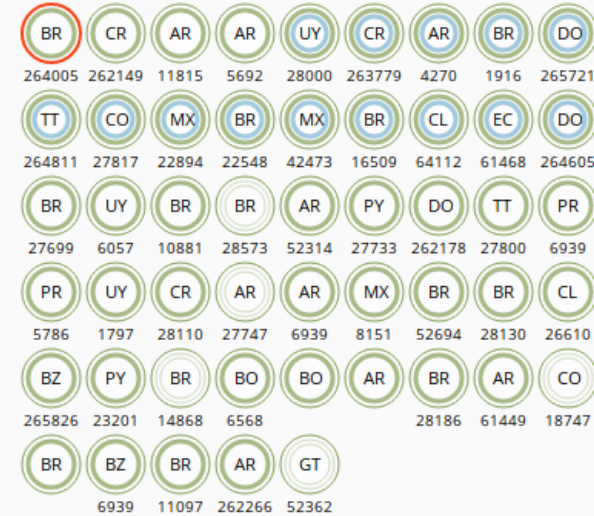


showing probes information for current date

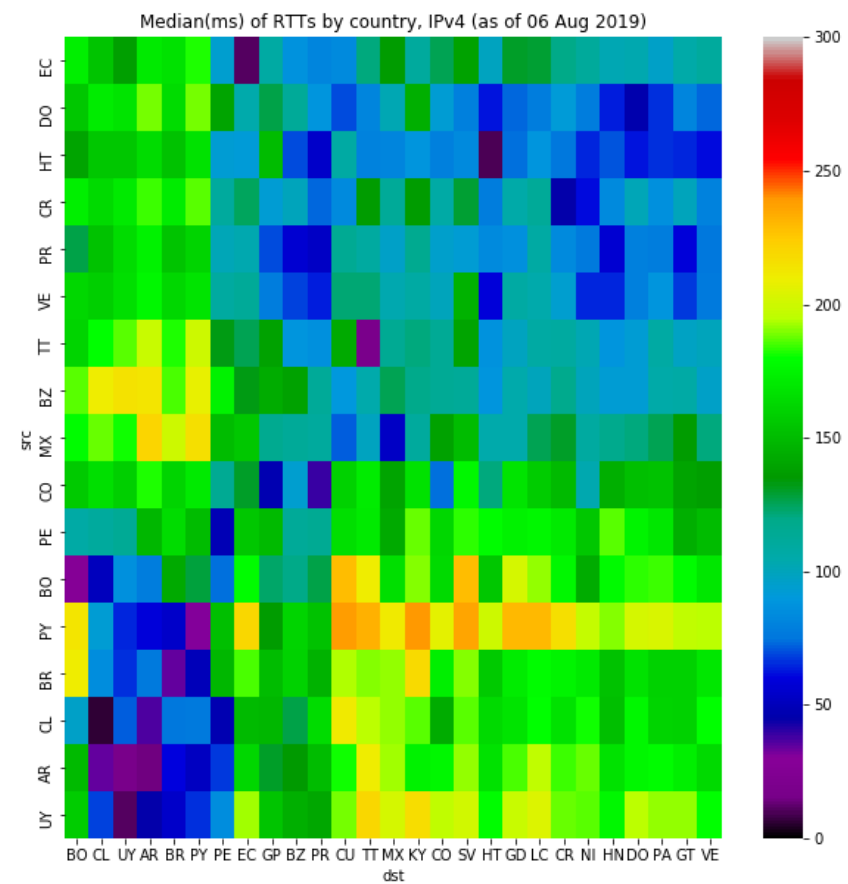
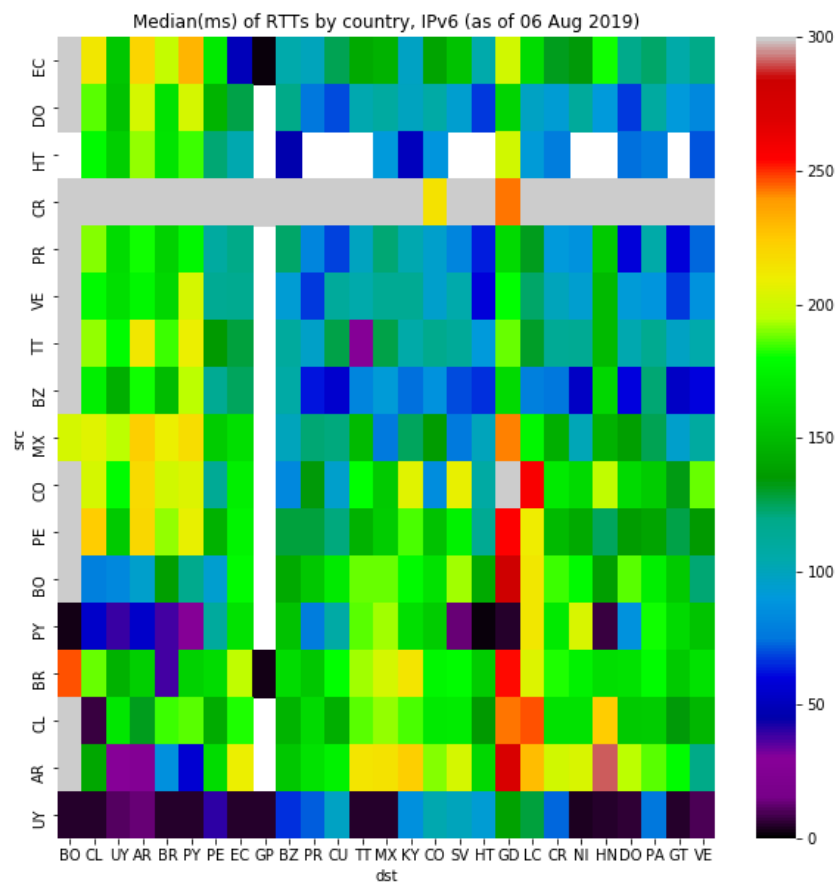
These probes were requested by the user

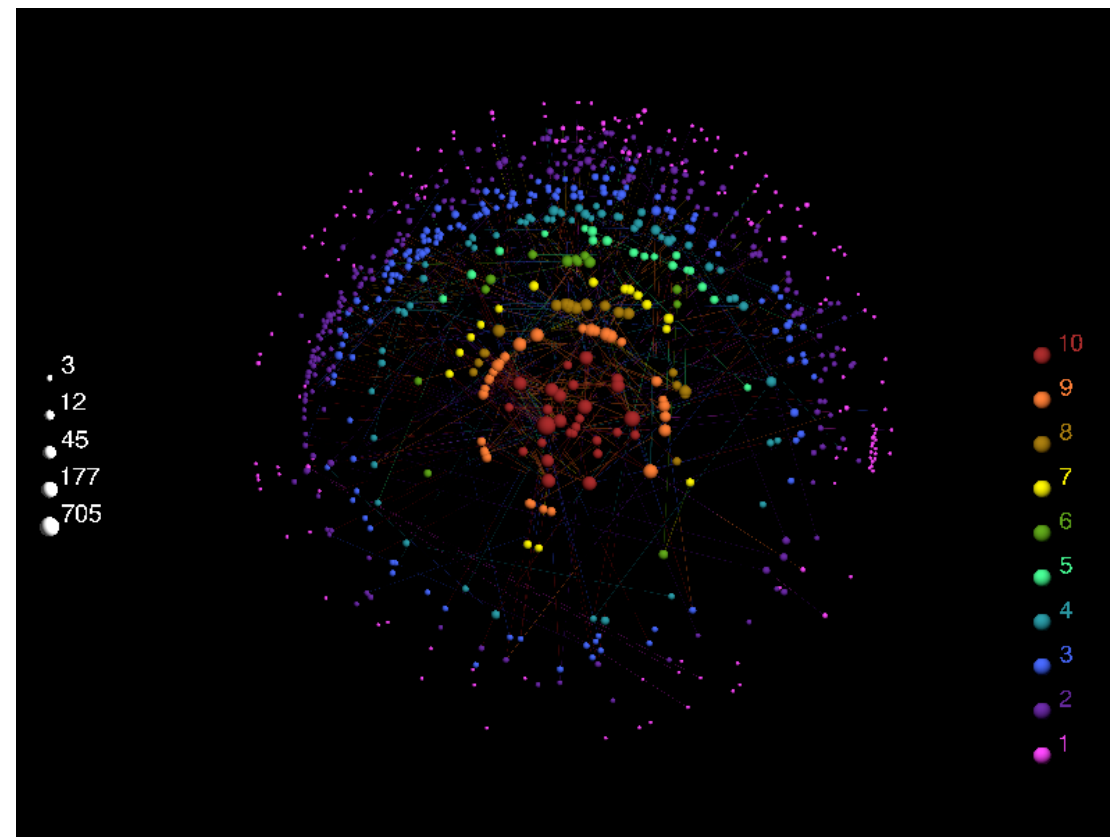
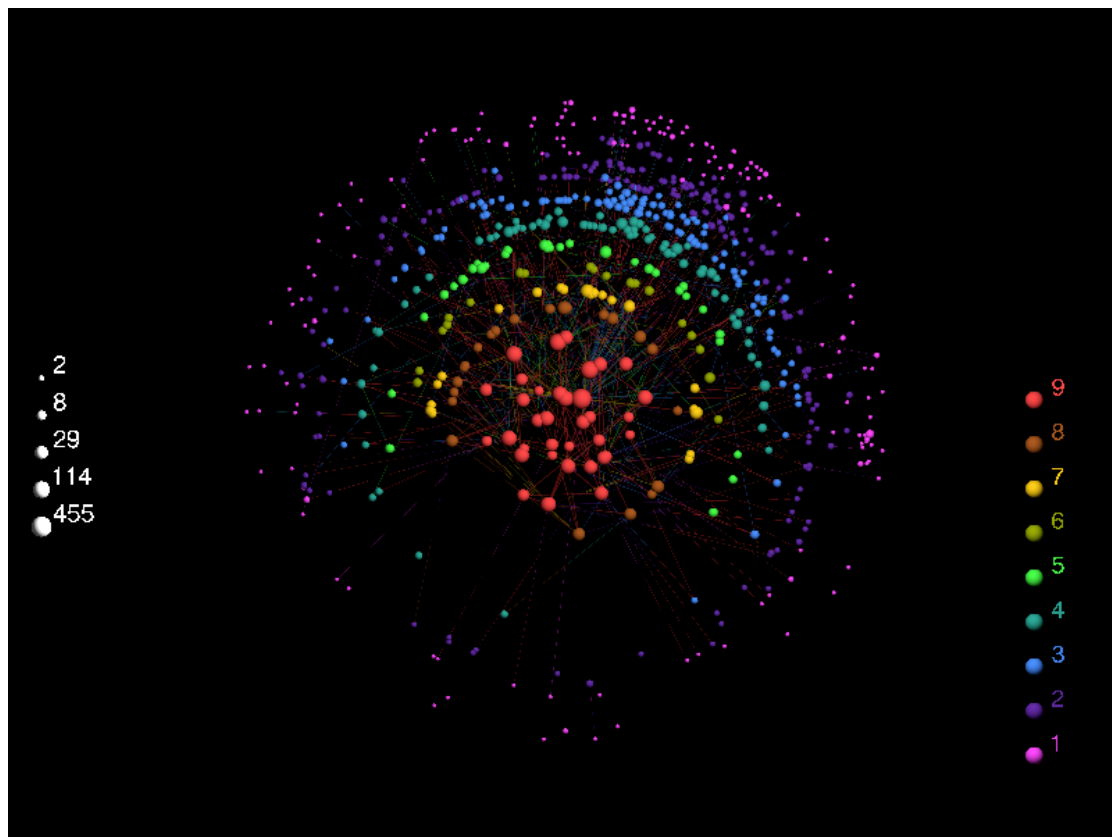
OVERVIEW OF PROBES FOR THIS PARTICIPATION REQUEST

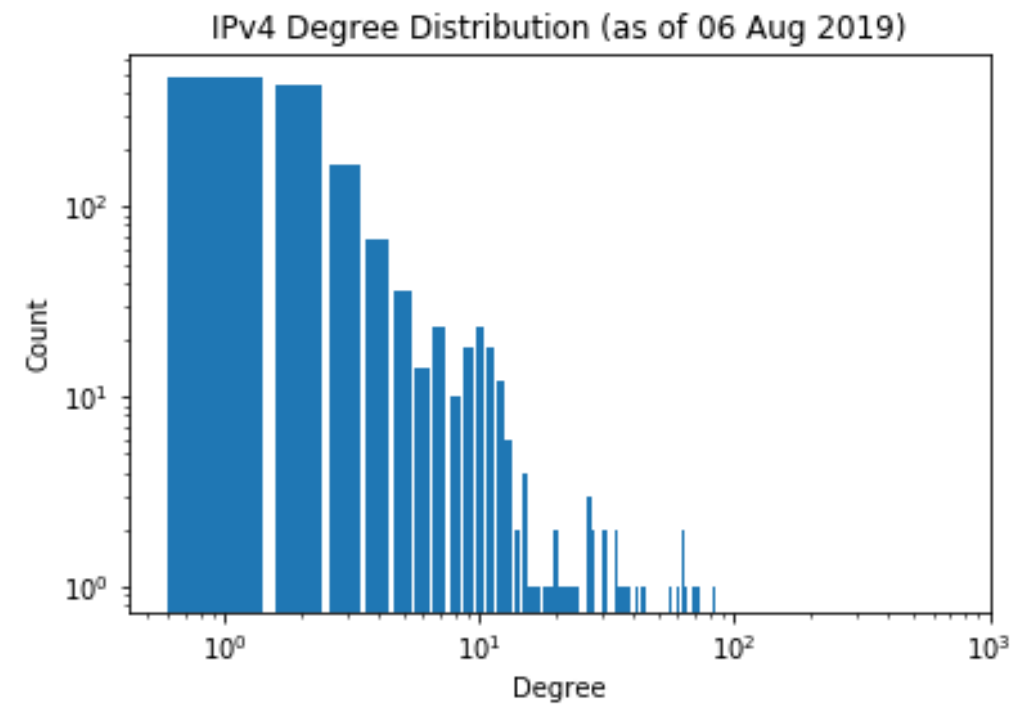
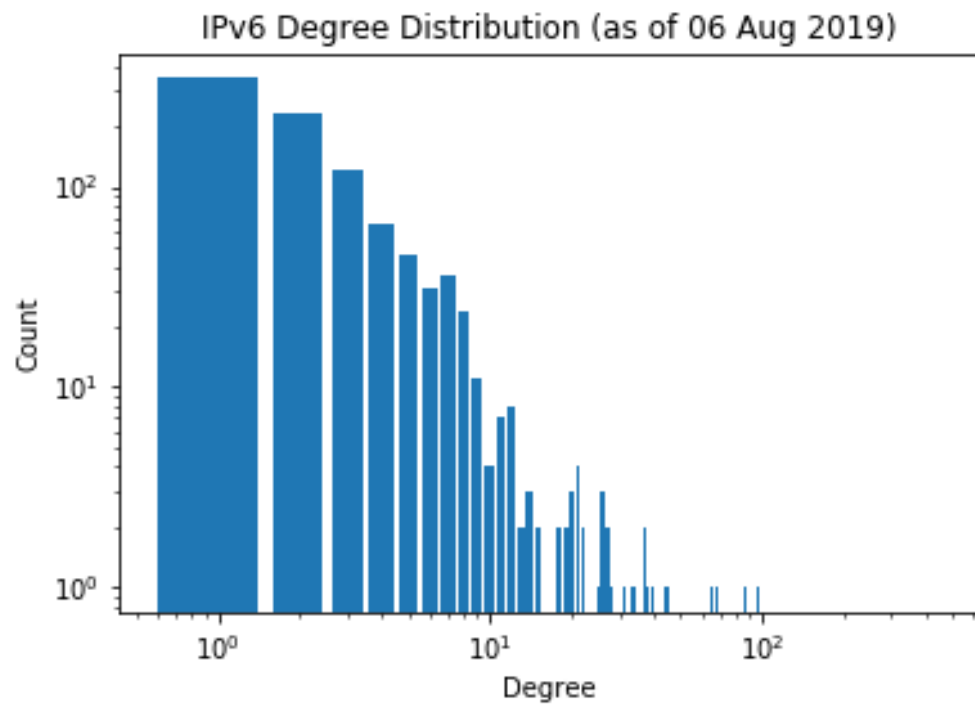
49 probes assigned / 1 rejected

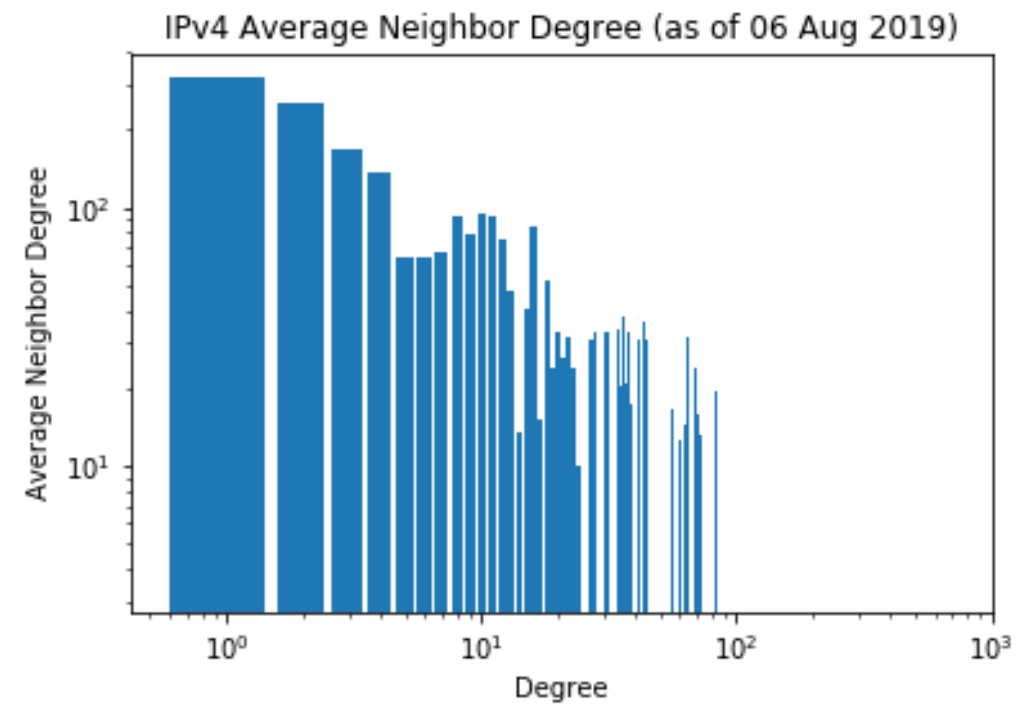
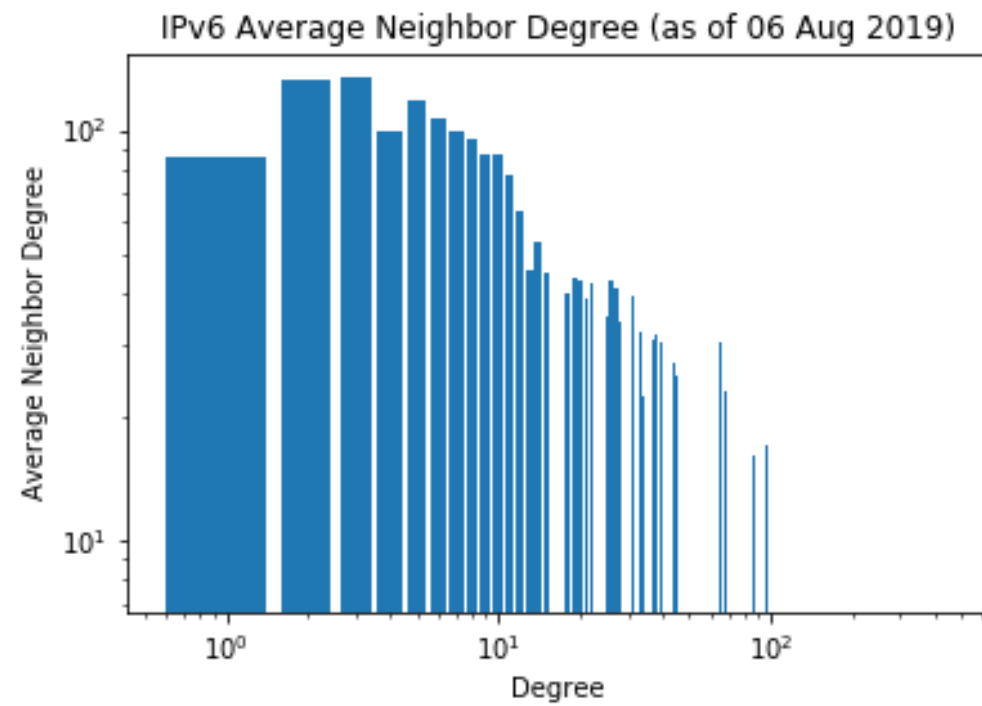


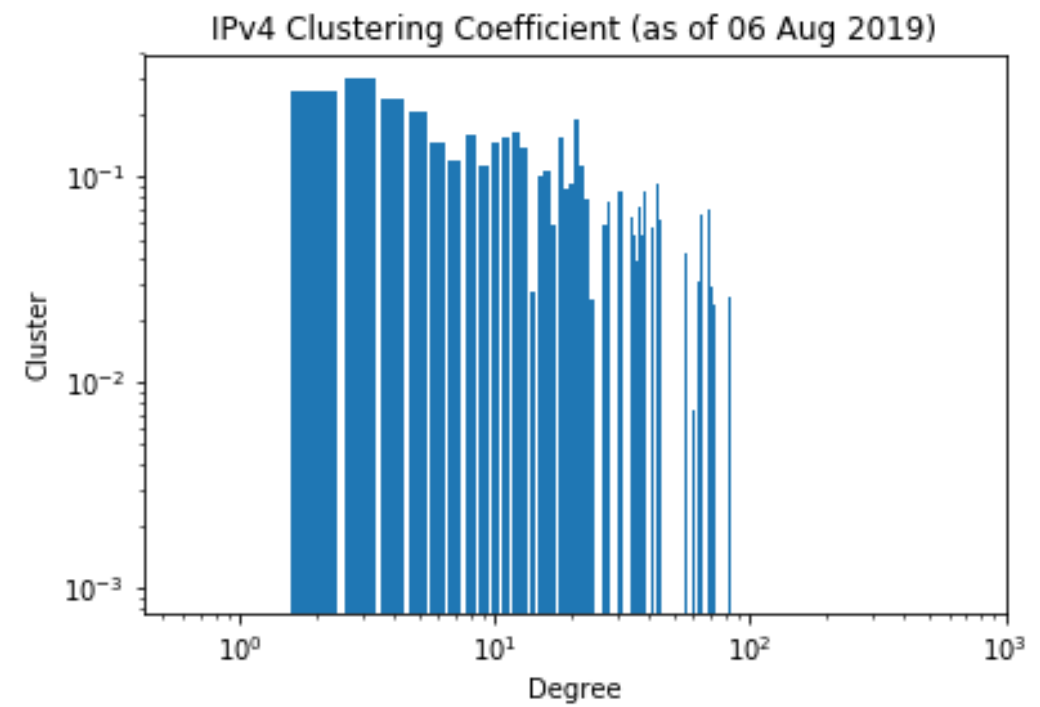
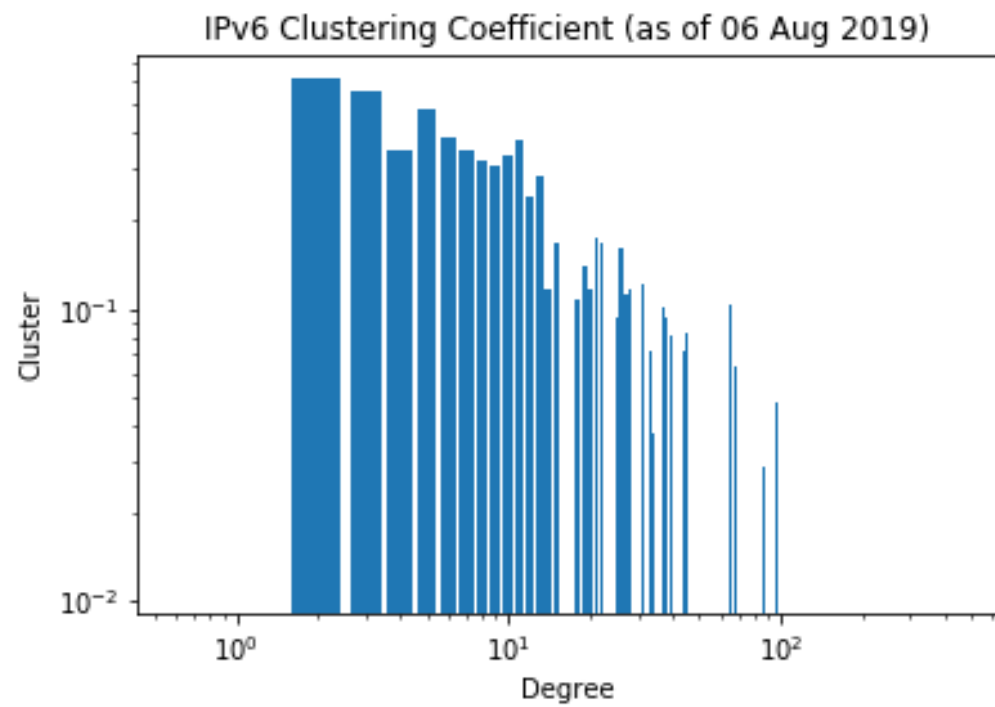
This is the evaluation of all the requested probes. They are either assigned or not assigned.











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- Display disparities between IPv4 and IPv6
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