

A world map with numerous colorful circles of varying sizes overlaid on it, representing data points or network nodes. The circles are concentrated in North America, Europe, and Asia, with some scattered in South America and Africa. The colors include red, green, blue, purple, yellow, and orange.

Periscope: Unifying Looking Glass querying

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Traceroute has multiple operational and research use cases

- Troubleshoot operational routing issues
- Measure and analyse performance
- Generate Internet topologies
- IP geolocation
- Detect prefix hijacks and outages
- Location of congestion
- ...

Multiple traceroute platforms offer diverse Vantage Points (VPs)

- Crowdsourced traceroute VPs:
 - CAIDA's Ark, RIPE Atlas, Dasu, ...
 - Deployed over end hosts, such as home computers
- VPs deployed over the academic network:
 - iPlane
- VPs deployed by operators:
 - Looking Glasses (LGs)
 - Not an homogenous set of VPs

What is a Looking Glass (LG)

- Web-based interface to routers that allow the execution of read-only network commands
- Each LG can offer access to multiple backbone or border routers
 - Combine data-plane and control plane routing information
- Each LG is completely independently from each other

Traceroute

[Diagnostic Tools: Traceroute](#) | [Ping](#) | [BGP](#)

Core Node	Charlotte-NC
Destination:	google.com
<input type="button" value="Get Results"/> <input type="button" value="Reset"/>	

Note: Results can take 30-45 seconds to display...

Results

```
Tracing the route to 74.125.225.1
 0 1 2 3 4 5 6 7 8 9 10
 1 64.35.126.161 0.097 ms 0.74 ms 2.022 ms
 2 216.156.0.233 7.919 ms 8.377 ms 8.677 ms
 3 207.88.13.153 5.197 ms 5.211 ms 5.231 ms
 4 216.156.108.114 5.232 ms 8.808 ms 15.955 ms
 5 72.14.233.56 20.175 ms 20.204 ms 20.224 ms
 6 66.249.94.20 20.605 ms 20.614 ms 20.621 ms
 7 72.14.239.91 25.253 ms 25.276 ms 25.312 ms
 8 209.85.254.239 25.038 ms 25.208 ms 25.339 ms
 9 72.14.237.109 25.15 ms 25.211 ms 25.273 ms
10 74.125.225.1 24.817 ms 24.833 ms 24.846 ms
```

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Requirements for unified LG querying

- I. Automatic discovery of available LGs
 - No authoritative repository available

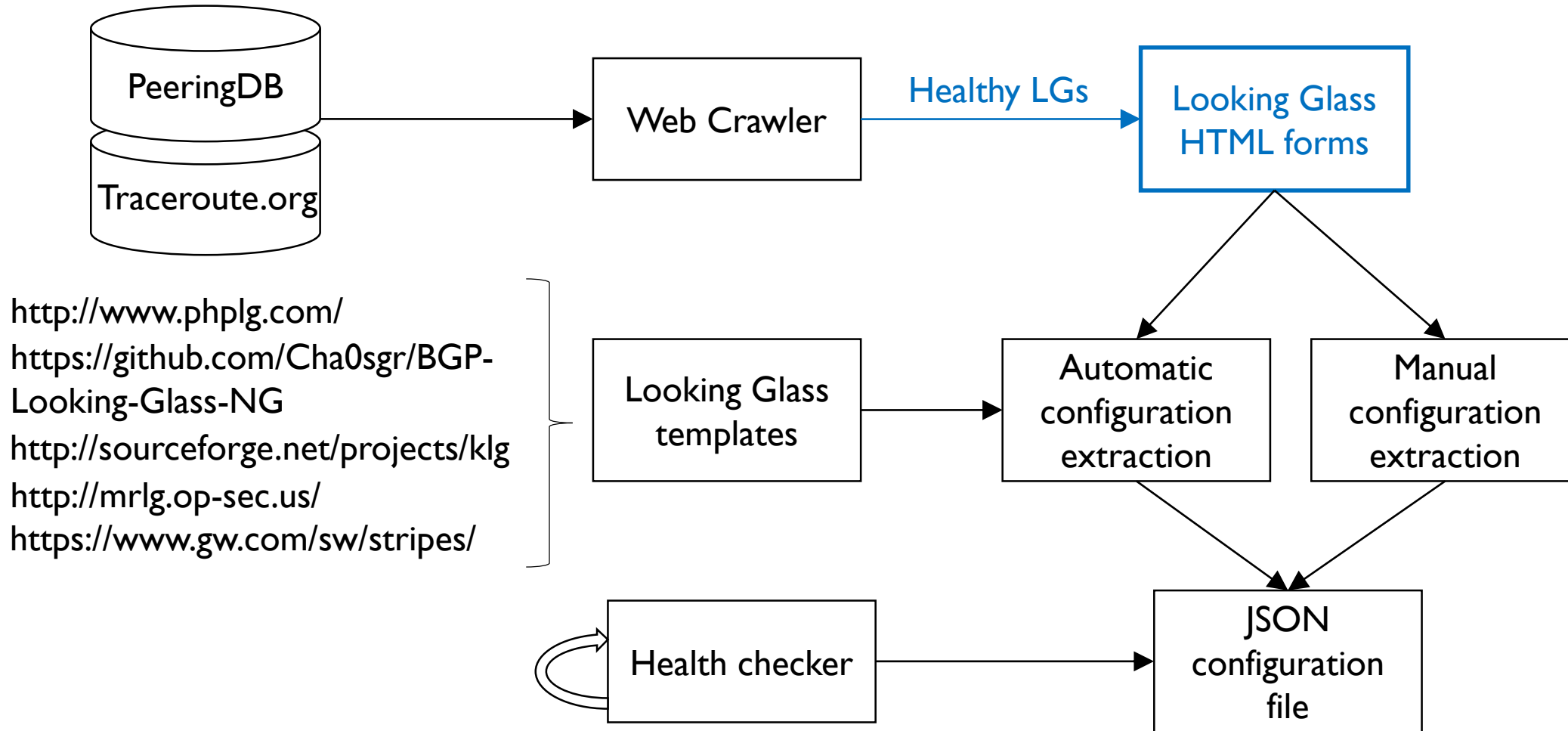
Requirements for unified LG querying

1. Automatic discovery of available LGs
 - No authoritative repository available
2. Input and output standardization
 - LGs have disparate input parameters, output formats and supported commands

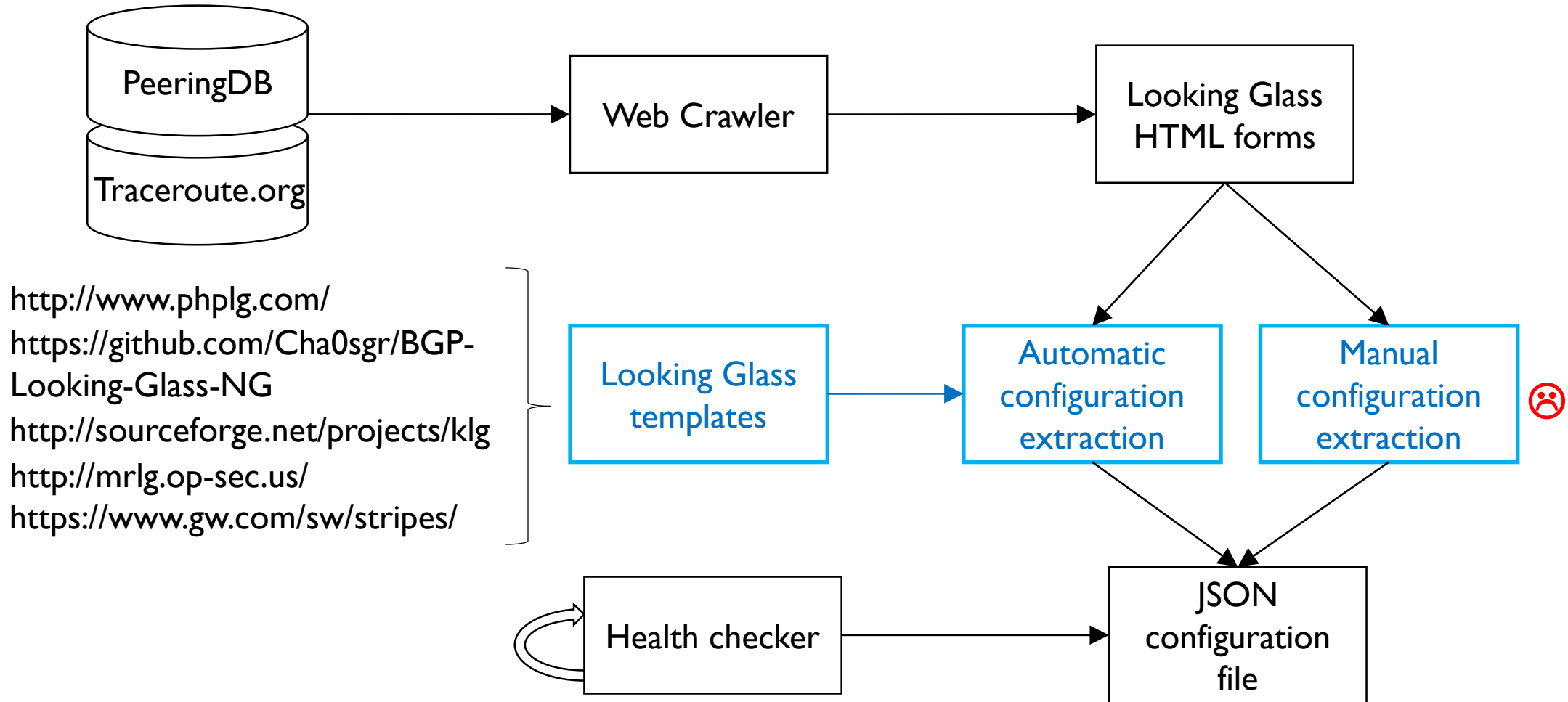
Requirements for unified LG querying

1. Automatic discovery of available LGs
 - No authoritative repository available
2. Input and output standardization
 - LGs have disparate input parameters, output formats and supported commands
3. Automatic discovery of interface changes
 - LGs are volatile in terms of availability and specifications

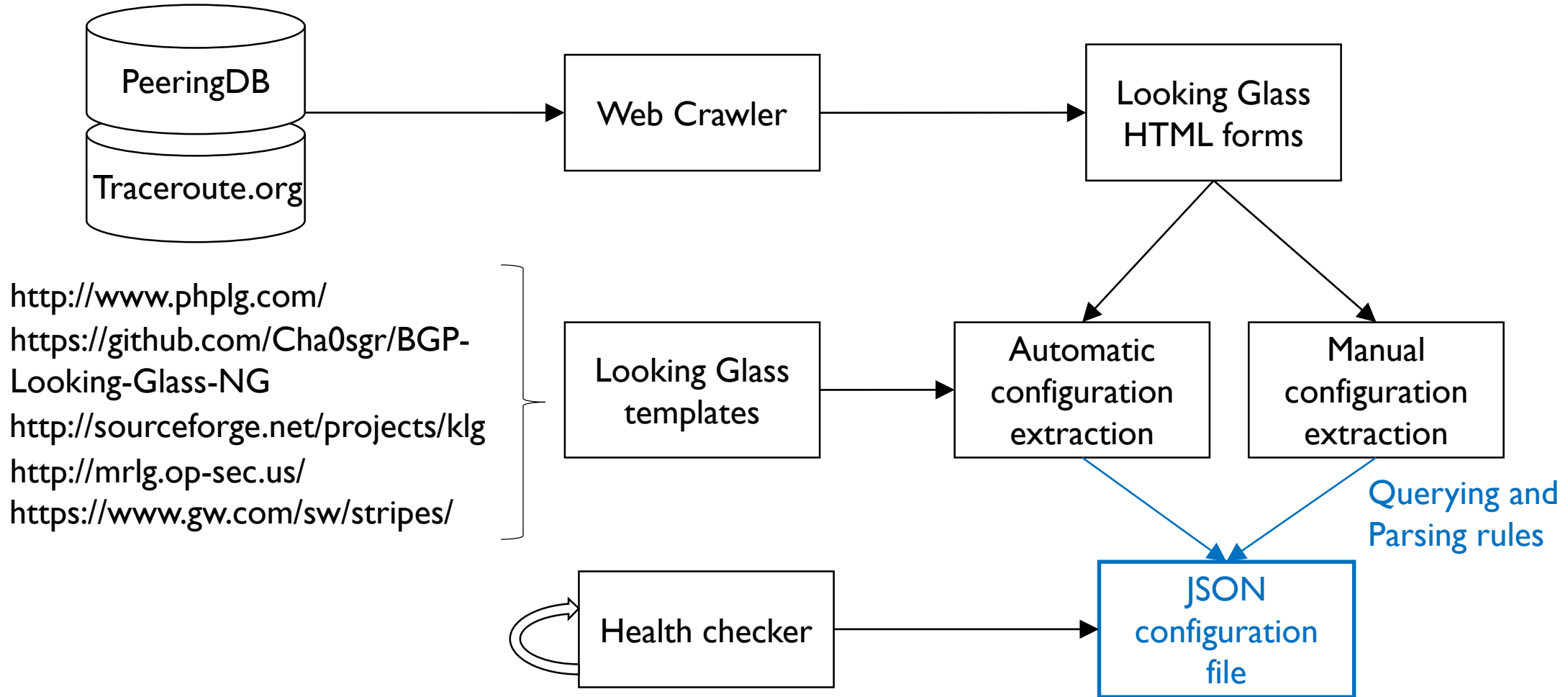
Looking glass discovery methodology



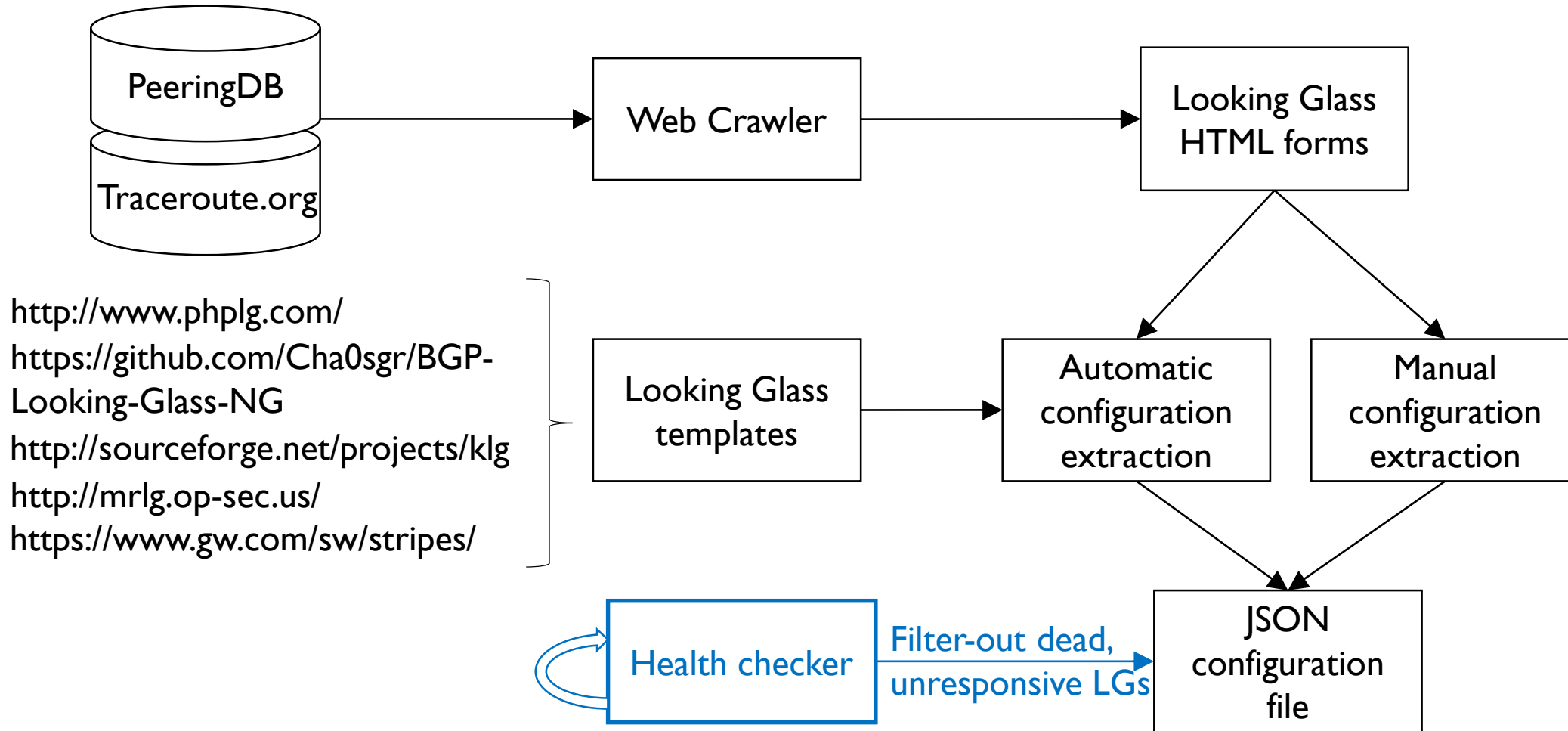
Looking glass discovery methodology



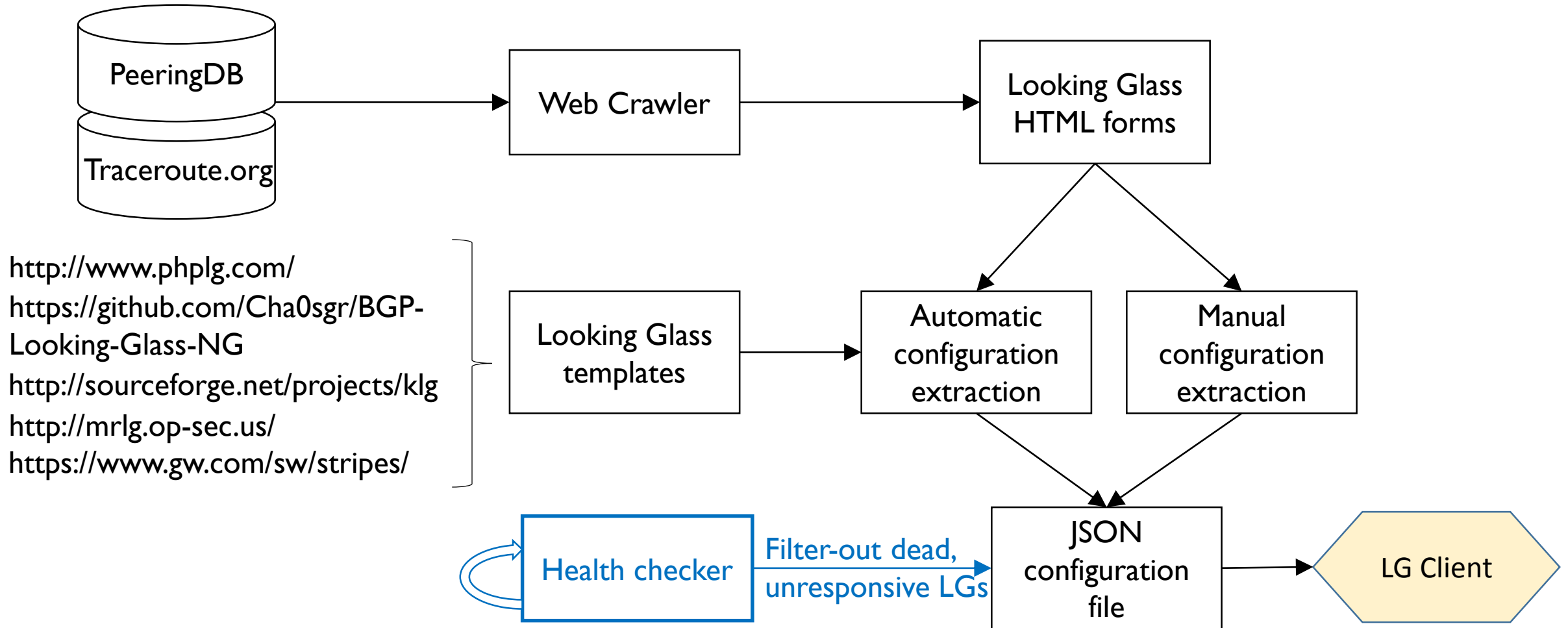
Looking glass discovery methodology



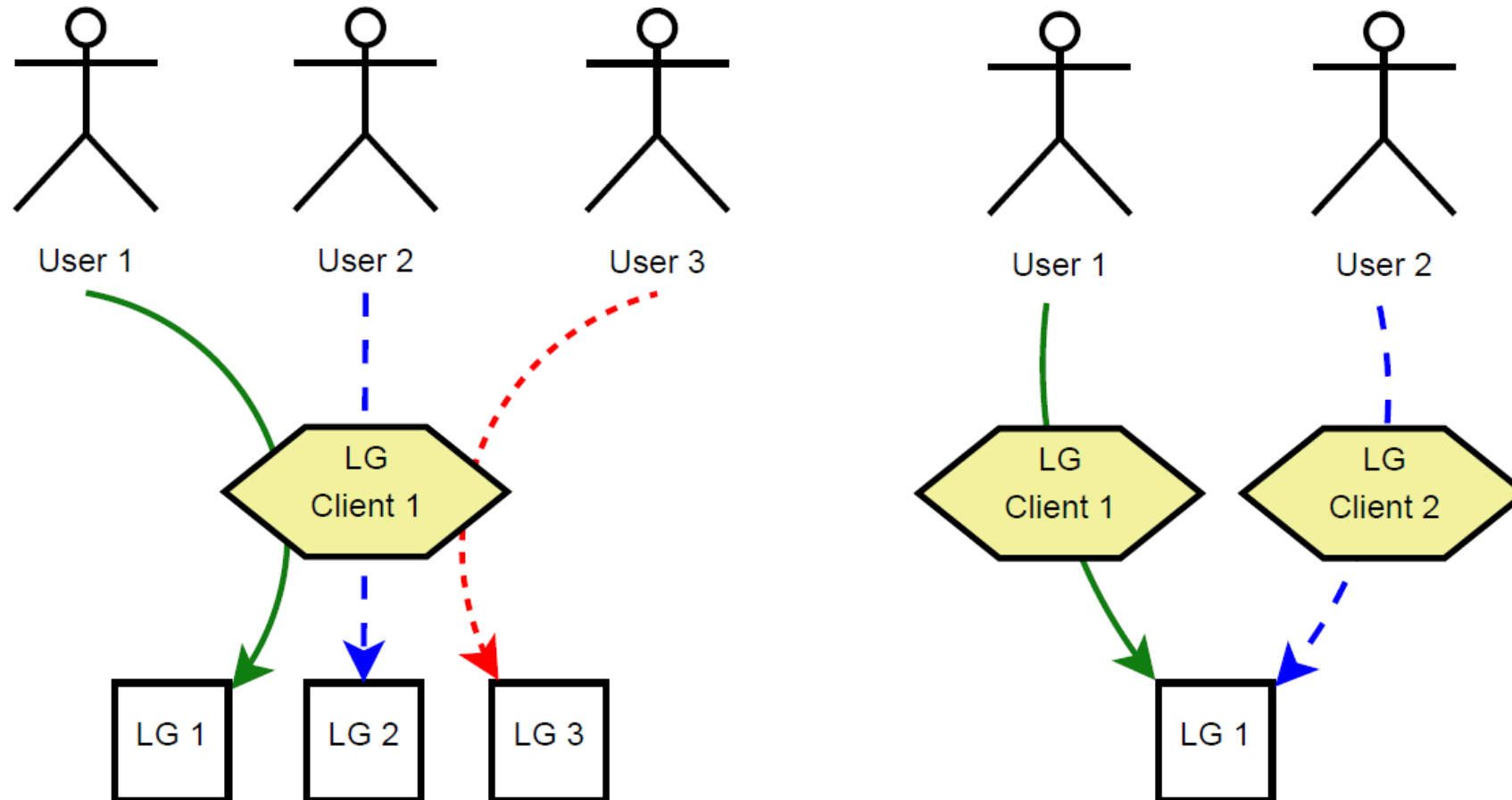
Looking glass discovery methodology



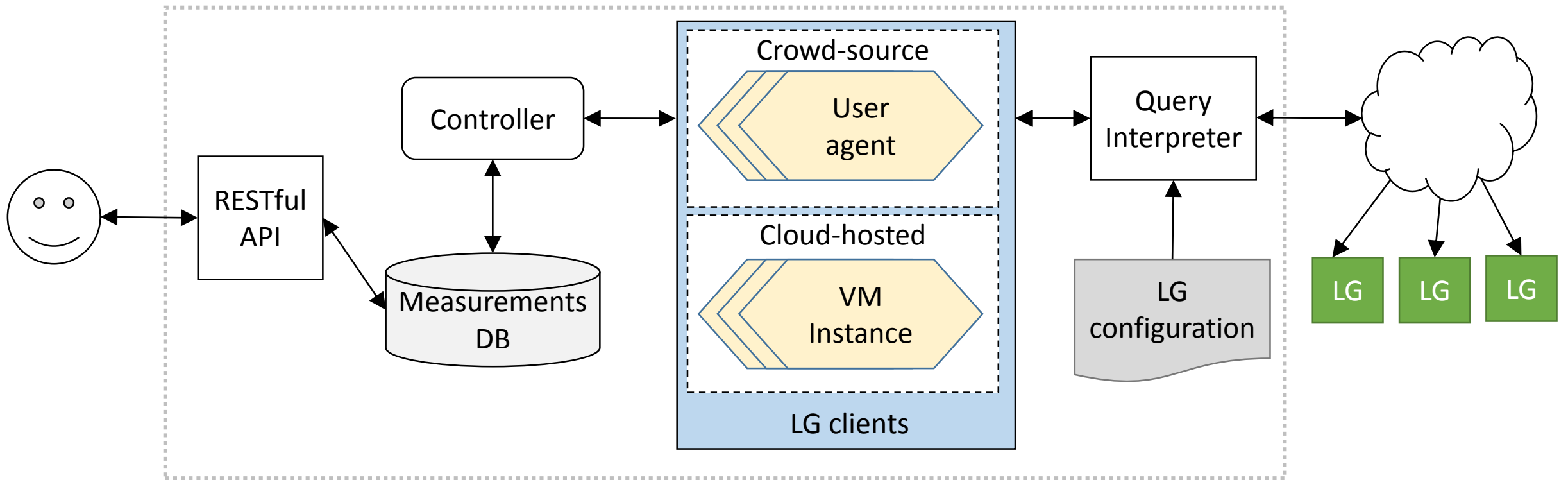
Looking glass discovery methodology



To enable querying by multiple concurrent users we need multiple LG querying clients

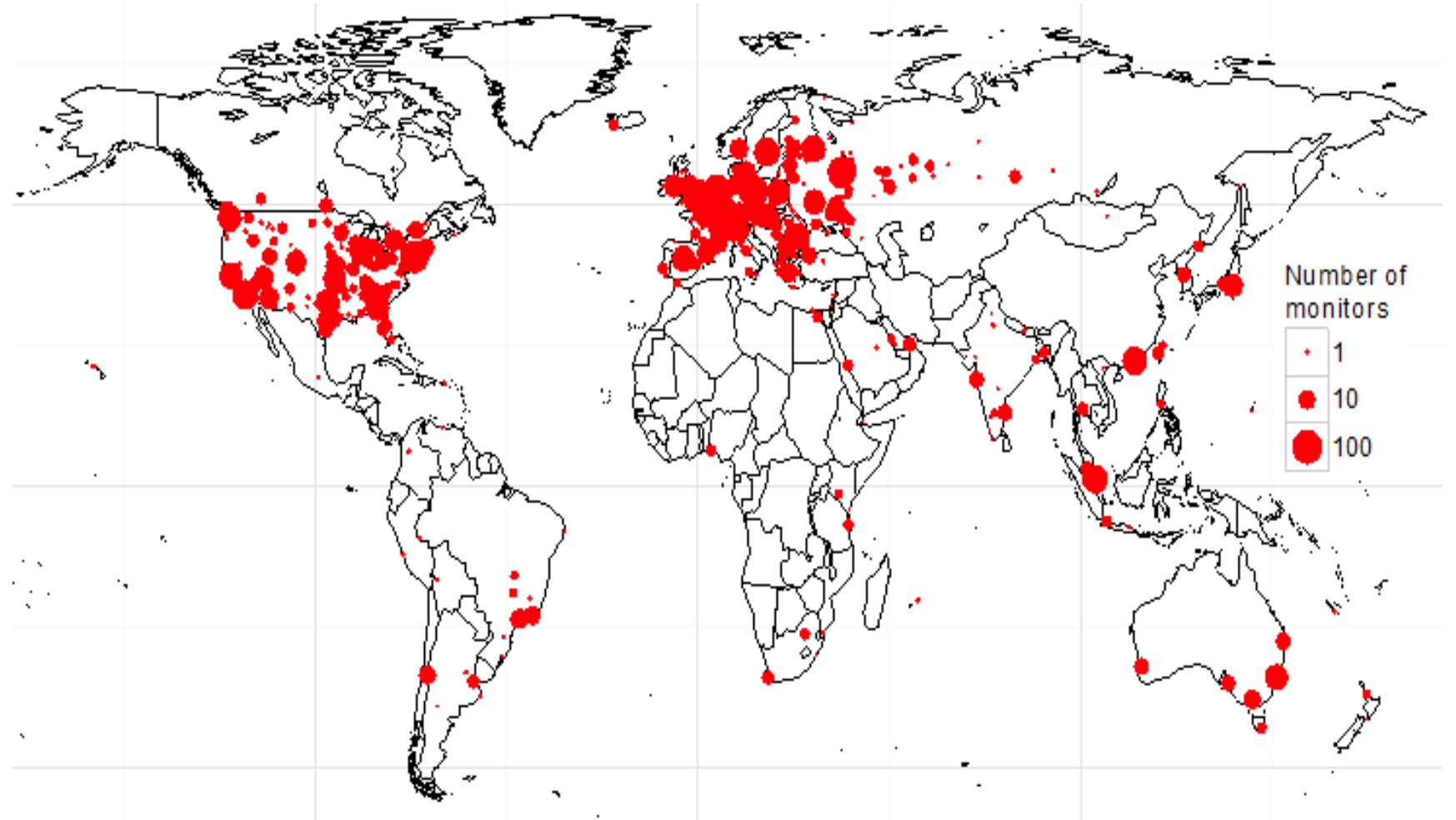


Periscope's querying architecture

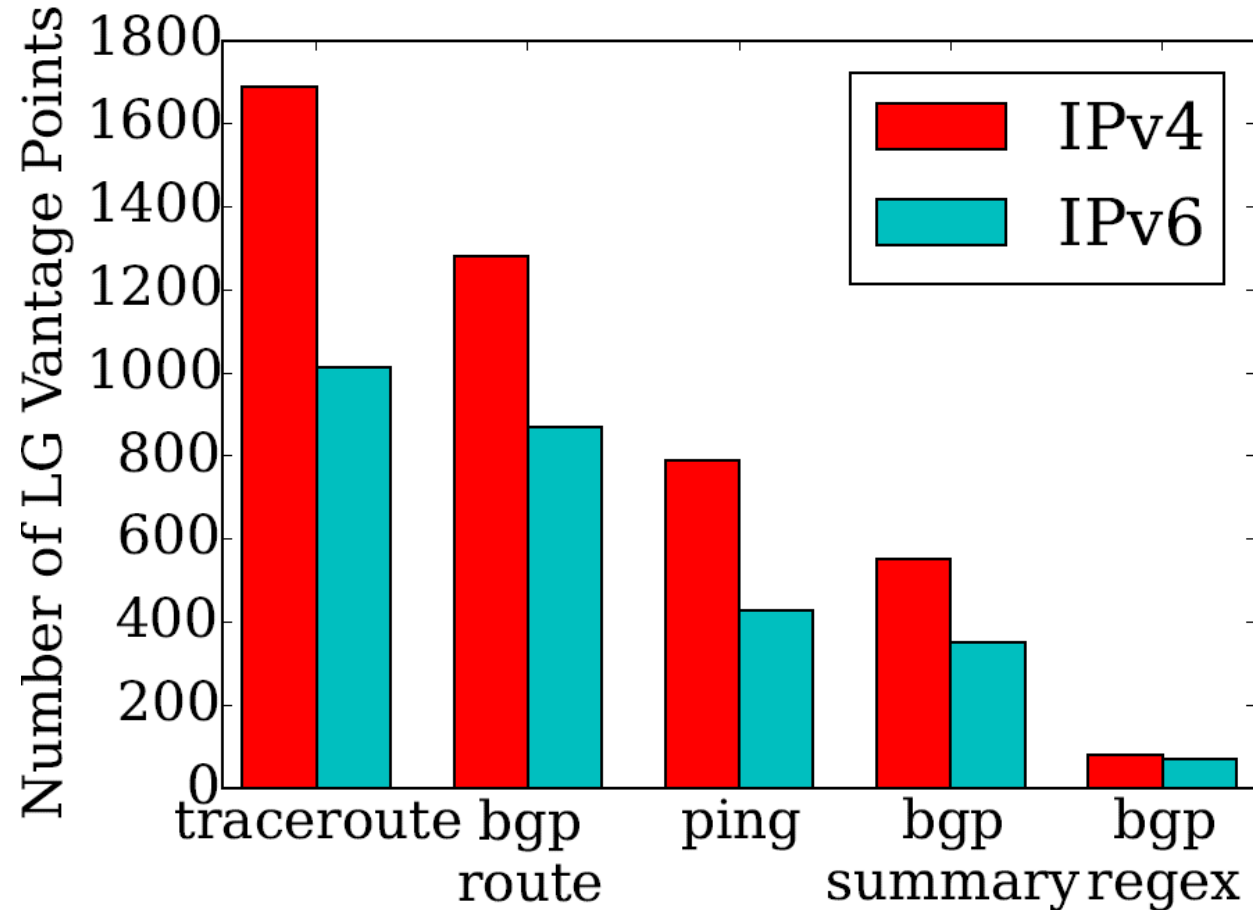


Coverage of Looking Glasses

- **263** ASNs
- **1,640** VPs
- **77** countries



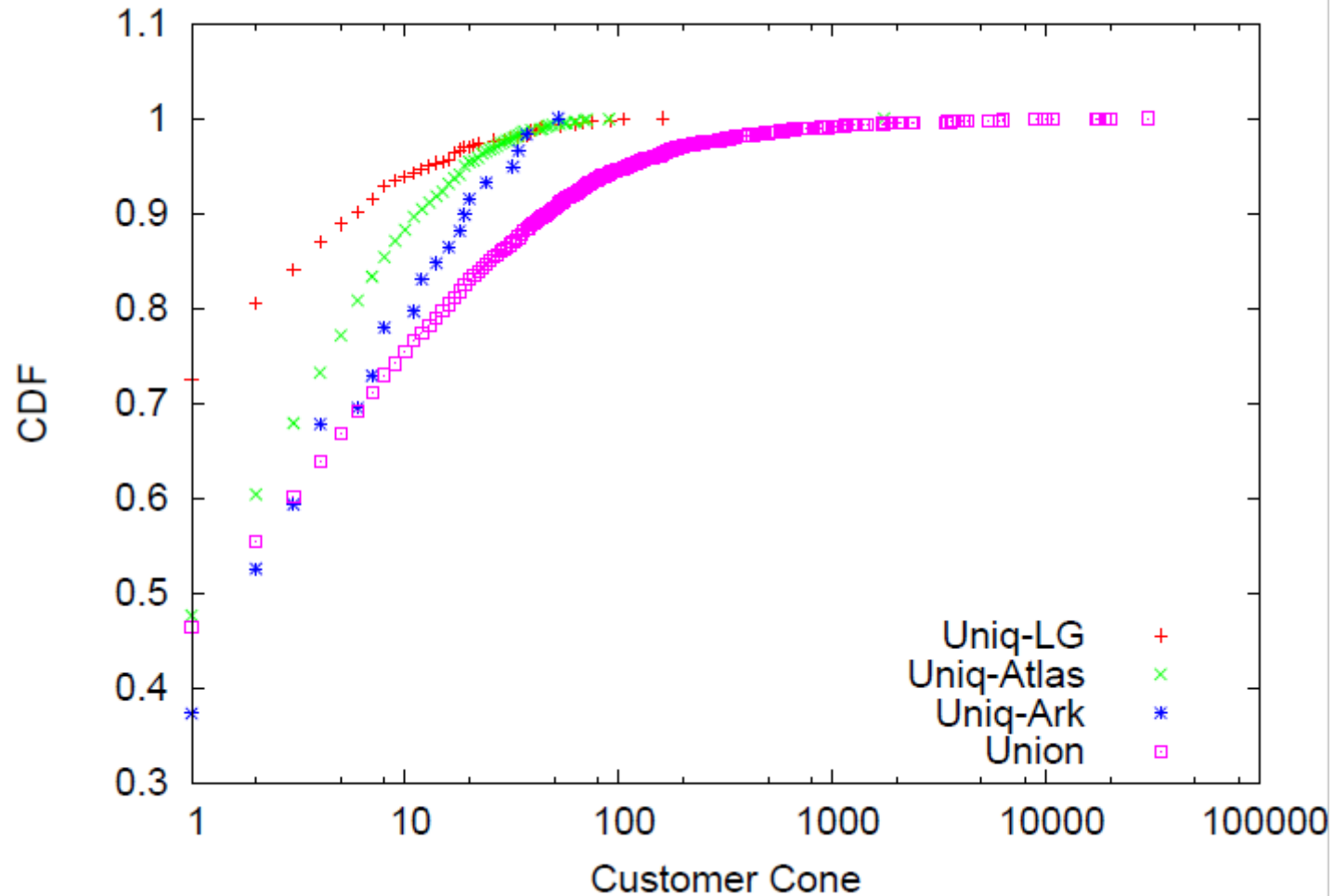
Commands supported by Looking Glasses



Overlap with other platforms

Datasets	ASes		AS links		IXPs	
	Observed	Unique	Observed	Unique	Observed	Unique
LG	3109	809 (17%)	29525	13969 (19%)	167	16 (8%)
Atlas	3369	1464 (31%)	55936	40620 (55%)	171	21 (10.4%)
Ark	1608	59 (1.2%)	10237	1625 (2.2%)	136	8 (4%)
All	4657	-	73348	-	202	-

Overlap with other platforms



Current status

- Periscope is publicly accessible after email request:

vgiotsas@caida.org

- API documentation:

<http://www.caida.org/tools/utilities/looking-glass-api/>

- Current projects:

- Facility mapping
- Inference of complex relationships
- Sibyl: A Practical Internet Route Oracle
- IP-to-ASN mapping