Towards Detecting and Geolocalizing Web Scrapers with Round Trip Time Measurements

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Background

- A **persistent battle** takes place between e-commerce websites detecting scrapers and scraping bots trying to evade detection [1].
- Lately, scrapers exploit **Residential IP provider** (RESIP) services.
- RESIP providers supply **tens of millions** residential IPs as exit points, **shared with real users**. → Risk to block legitimate users that share IPs with scrapers.

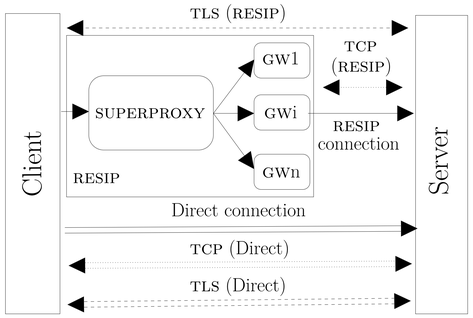

Figure: Client sending direct and RESIP connections. The TCP and TLS sessions are built between different parties in the two scenarios.

- In [2], we proposed RTT_DETECTION a **server-side detection method** based on the **difference** in the Round Trip Times (RTTs) at the TLS and TCP layer of RESIP connections.

$$\delta_{RTT} = \text{RTT}_{TLS} - \text{RTT}_{TCP} > 50ms \implies \text{RESIP}$$

- We run a **4-months measurement campaign** (92M+ connections). The technique showed **99.01%** accuracy.

Machines Proximity Impact

- **Close proximity**: client, server, SUPERPROXY and GW not further than 1,000km from each other (**0.07%** of RESIP connections in our experiment).
- $\delta_{RTT} >$ 50ms in **3 out 4** of cases.
- Only **3.07%** of connections show $\delta_{RTT} <$ 20ms where 97% of direct connections.
- The machines proximity **influences** the technique but there is still a **significant difference** between RESIP and direct connections.

Measurements Representativeness

- RTT =measure of time → we need the **speed** to find the distance.
- An **idealized common value** for the average packet speed (s_{avg}) **does not exist** for connections across different areas of the world.
- **Does our data reflect this?**
- s_{avg} (RESIP) $= d_{server-\text{GW}}/$ ($1/2$ RTT$_{TCP}$).
- s_{avg} (Direct) $= d_{server-client}/$ ($1/2$ RTT$_{TCP}$).

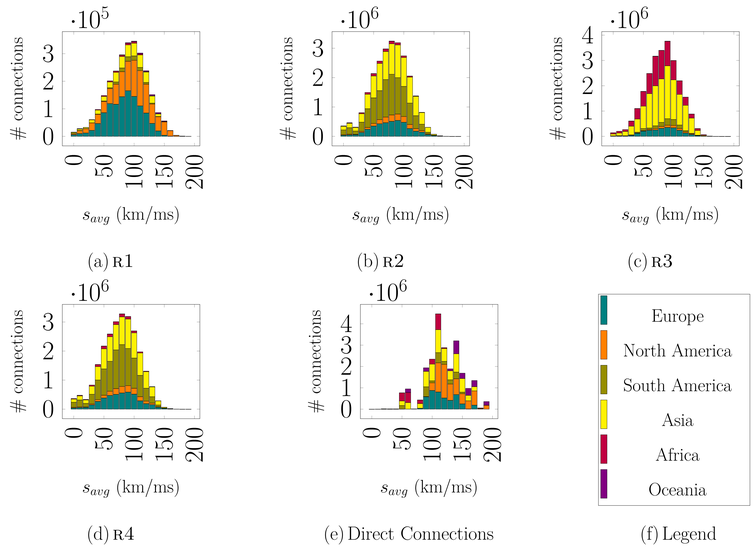

Figure: Distribution of the mean speed of packets for each RESIP provider and direct connections.

Real World Implementation

- Implementation of the RTT_DETECTION in front of **real-world domains** suffering from web scraping.
- Early results: the δ_{RTT} is a **strong parameter** to check when a connection passes through a RESIP.
- In two representative months, the detection was used in **74.32%** of investigations.
- **Ongoing study** of the flagged connections to assess the impact of the detection and possible false positives.

Geolocalizing Behind the RESIP

- **Idea:** using the δ_{RTT} to **geolocalize the client**.
- The δ_{RTT} gives information about the **"distance" client-GW**.
- If the same client uses multiple GWs to send requests to the same server, we can find the **intersection of the circles** whose centers are the GWs locations and whose radii are half of the δ_{RTT} multiplied by the average packet speed (s_{avg}).

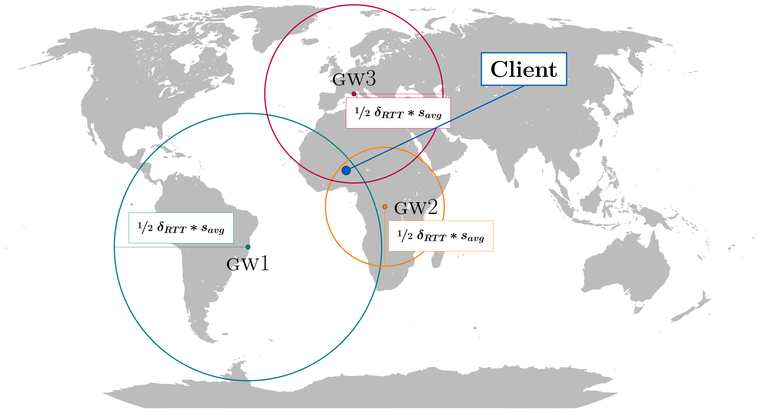

Figure: Example of geolocalization of a client that uses 3 GWs.

- **Challenges** in achieving our goal:
  - The s_{avg} has **no average value**.
  - **Current geolocalization algorithms** are **not able** to correctly put into practice our theoretical idea [3].
- **Ongoing implementation** of a new algorithm that overcomes previous limitations.

[1] E. Chiapponi, M. Dacier, O. Thonnard, M. Fangar, M. Mattsson, and V. Rigal, "An industrial perspective on web scraping characteristics and open issues," in *2022 52nd Annual IEEE/IFIP International Conference on Dependable Systems and Networks - Supplemental Volume (DSN-S)*, pp. 5–8, 2022.

[2] E. Chiapponi, M. Dacier, O. Thonnard, M. Fangar, and V. Rigal, "BADPASS: Bots Taking ADvantage of Proxy as a Service," in *Information Security Practice and Experience: 17th International Conference (ISPEC 2022)*, p. 327–344, 2022.

[3] M. Champion, M. Dacier, and E. Chiapponi, "ImMuNE: Improved Multilateration in Noisy Environments," in *2022 IEEE 11th International Conference on Cloud Networking (CloudNet)*, pp. 1–6, 2022.