Identification and abuse characteristics of batch registered gTLD domains

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Structure of presentation

1. What are domain registration batches? How to identify them?
2. How common are batch registrations?
3. What are the **abuse profiles** of batch registered domains?
4. Conclusions and future work

What Are Domain Registration Batches?

Motivation

- Attackers often **register domains in bulk** to support large-scale malicious campaigns (Vissers et al., 2017, Spooren, 2019) including phishing, malware delivery & botnet C2.
- Prior work hypothesizes a **preference for APIs or bulk registration tools** to streamline and automate these registrations (Nosyk, 2025).
- Use of APIs introduces **detectable patterns**—e.g., bursty, time-bound batches of registrations.
- Batch patterns may reveal attacker infrastructure **early in the attack lifecycle**.
- Understanding these patterns enables more **effective detection, intervention, and mitigation**.

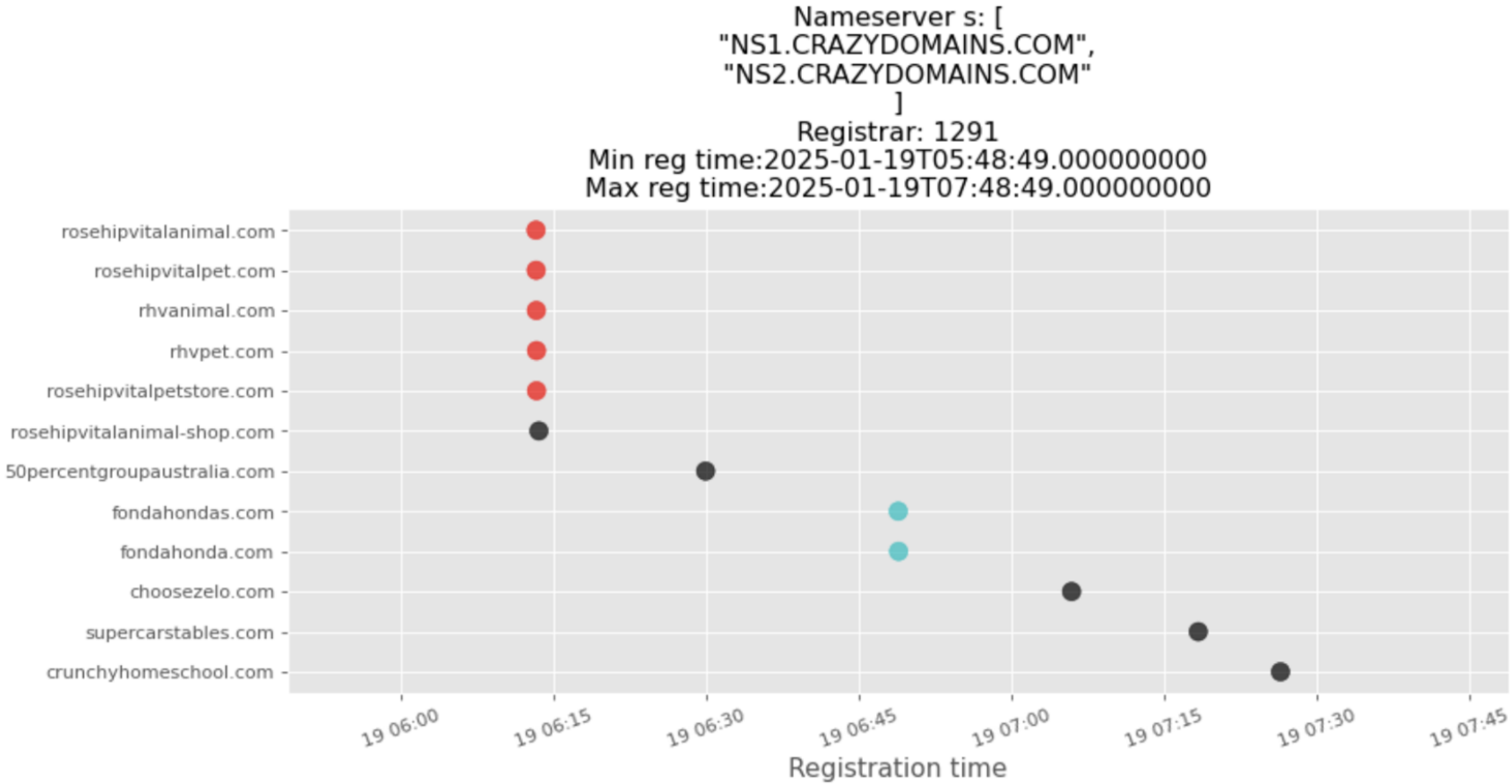
Method

- Perform batch registration clustering using **limited features**:
  - Registrar
  - Authoritative Nameservers
  - Creation date (full timestamp)
- Exclude **common shared nameservers** (e.g. default registrar nameservers)
- Density-based spatial clustering of applications with noise (**DBSCAN**) used as the clustering algorithm

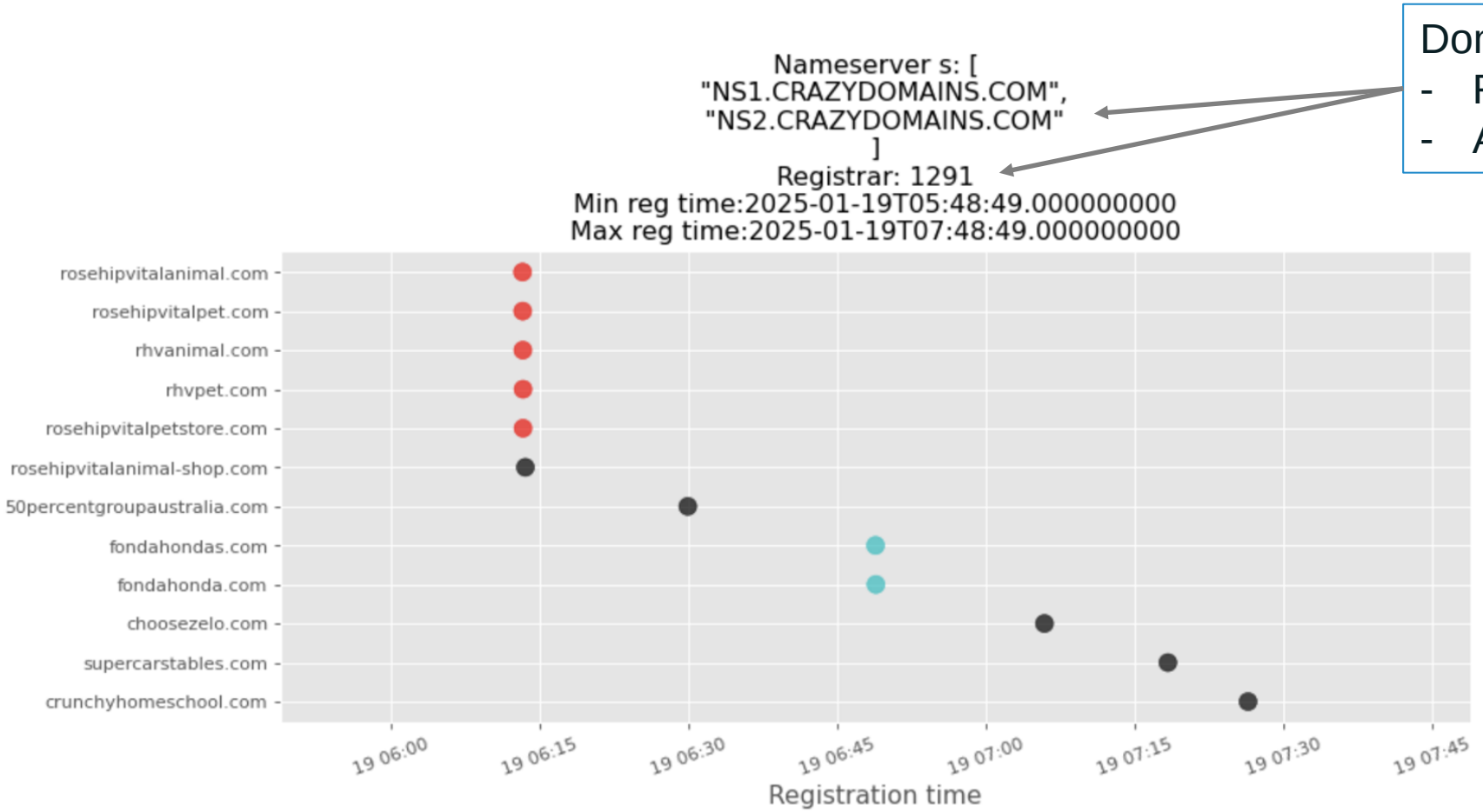
Data sources

- gTLDs Registration Data
  - Bulk registration data access (BRDA data)
- Reputation Block Lists (RBLs)
  - Spamhaus, SURBL, WMCGlobal, Phishtank, Urlscan, APWG, Urlhaus

Example batches – Plot A

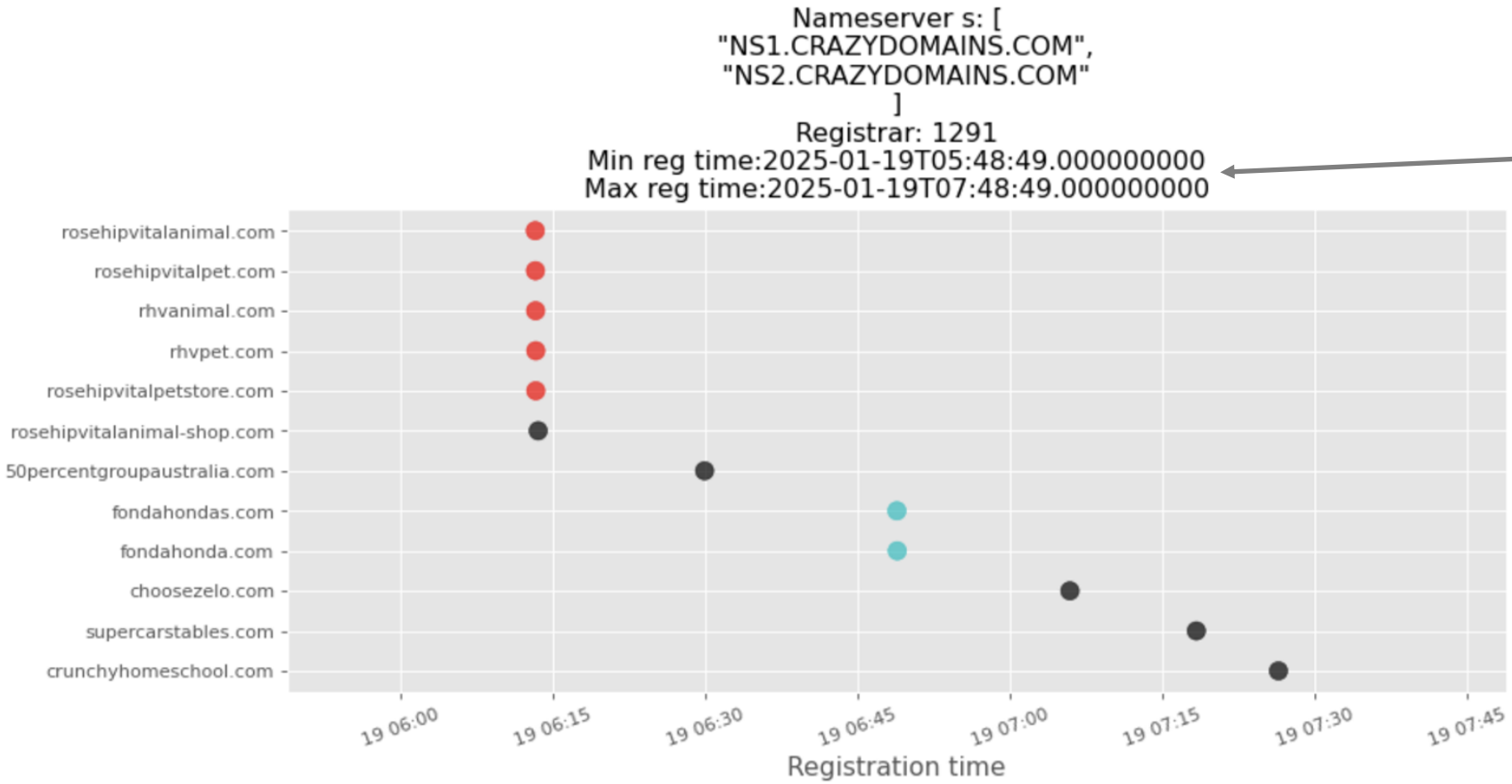


Example batches – Plot A



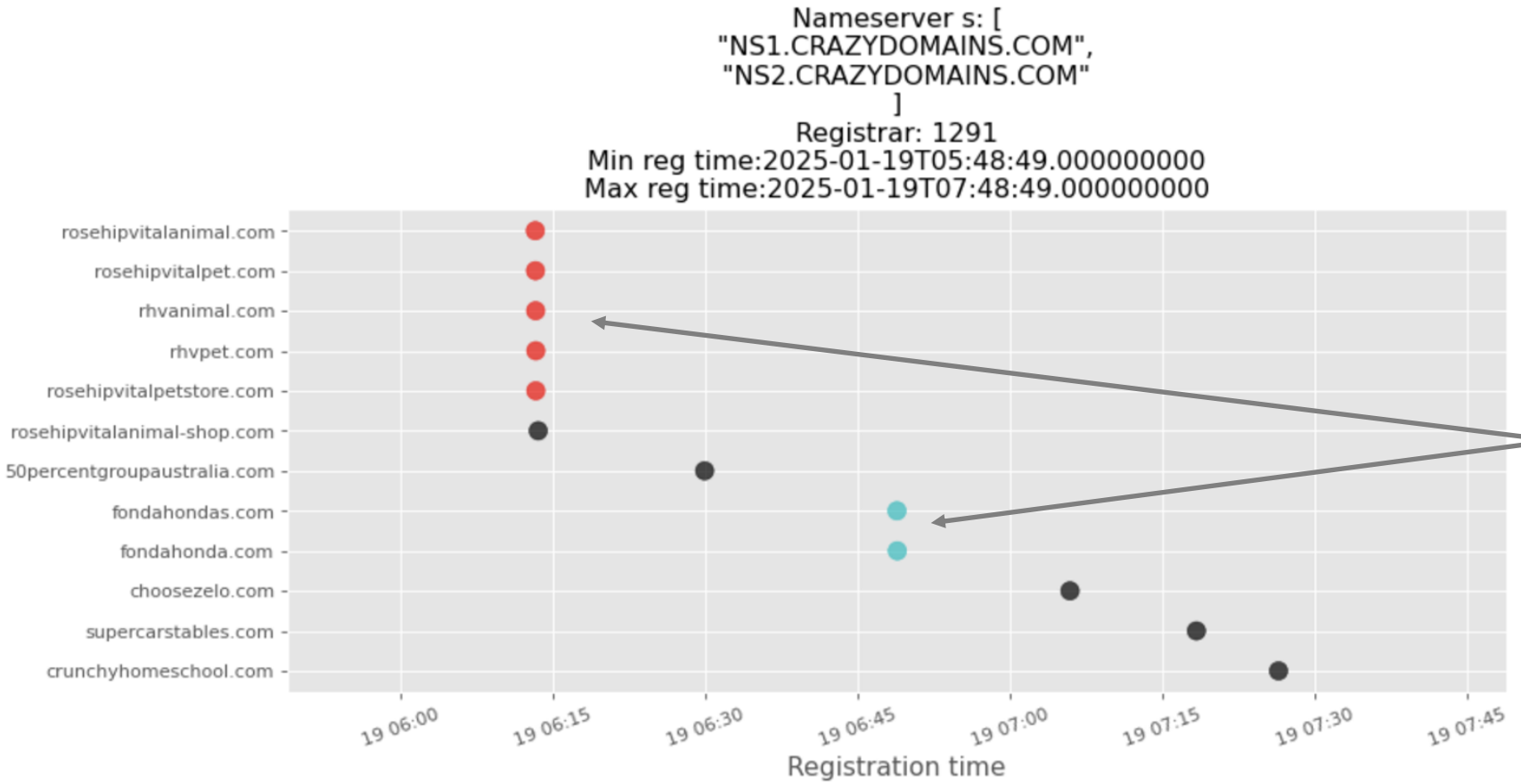
Domain registrations split by
- Registrar (IANA ID)
- Auth Nameservers

Example batches – Plot A



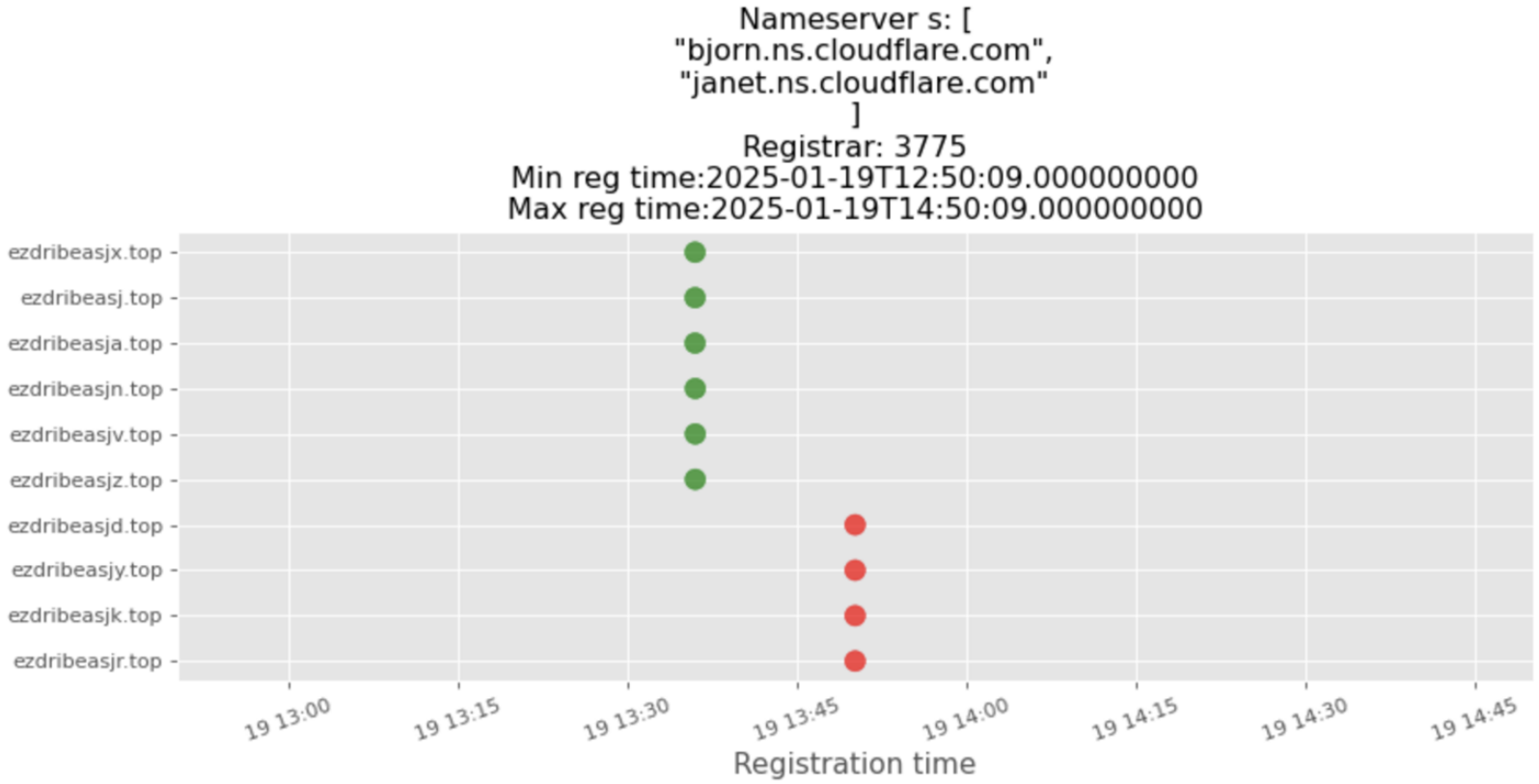
2 hour time window

Example batches – Plot A

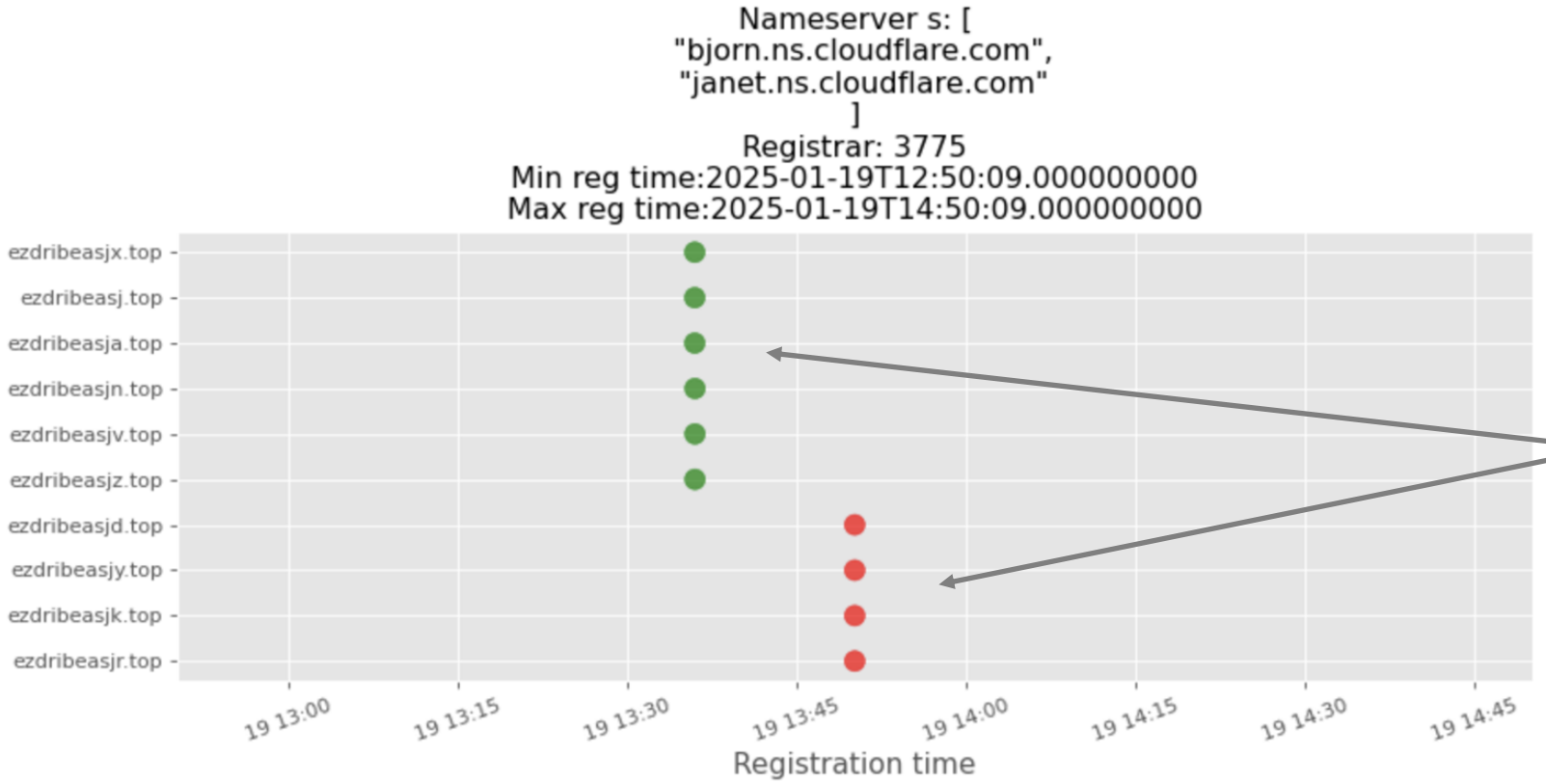


Clustered ‘batch registrations’

Example batches – Plot B



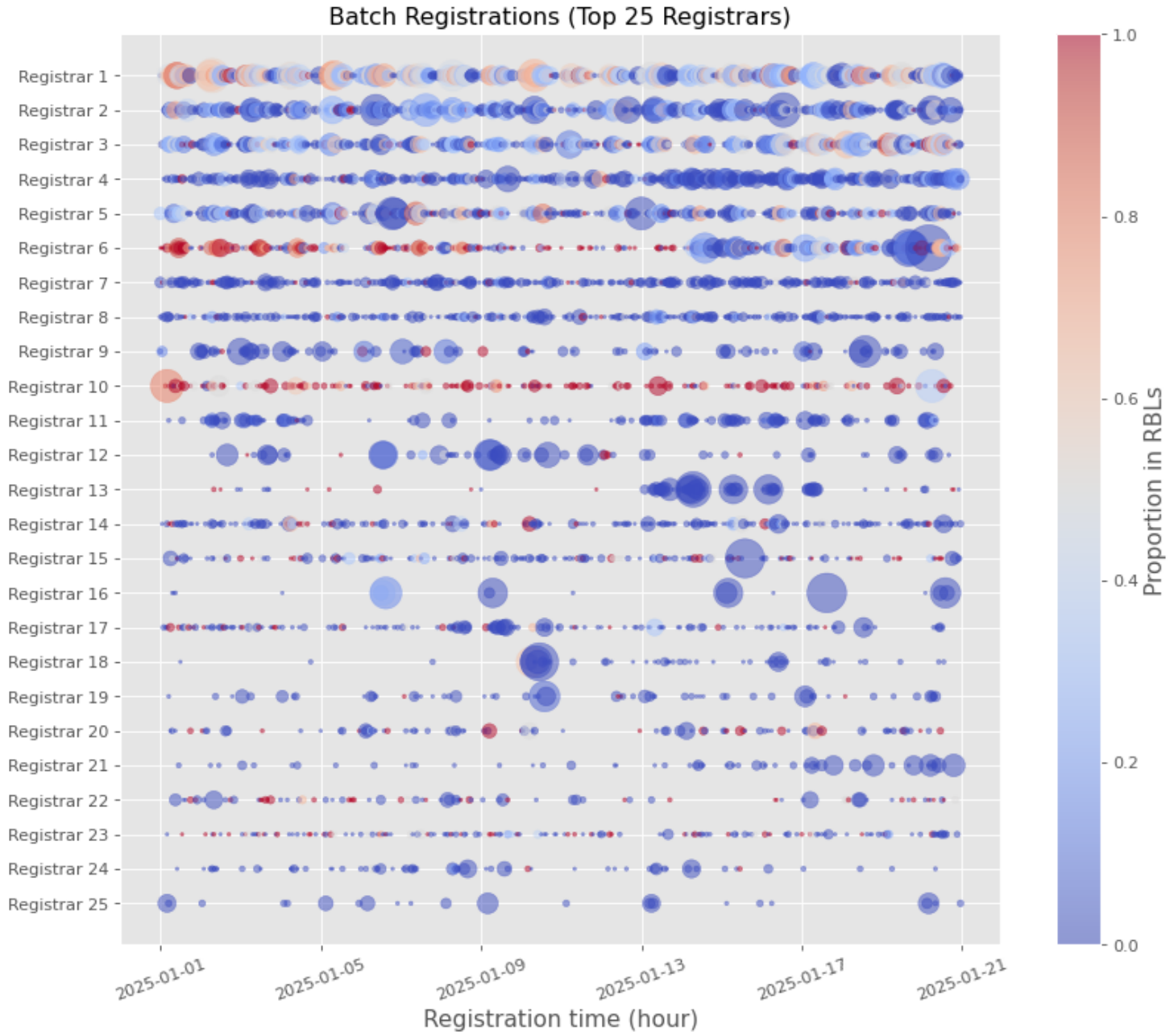
Example batches – Plot B



Distinct batches, but related ongoing campaign

Visualising batch volumes across registrars

- Hourly counts of batch registrations, for the top 25 registrars
- Highest reputation block list (RBL) overlap is shown in red
- 3-week time-period



How Common Are Batch Registrations?

How common are batch registrations?

- Analysis period: 2024-12-25 - 2025-02-18
- Total number of newly registered gTLD domains (ICANN centralized data): 10,351,522
- Total number of batch registered domains: 2,543,473 (**25% of all registrations**)

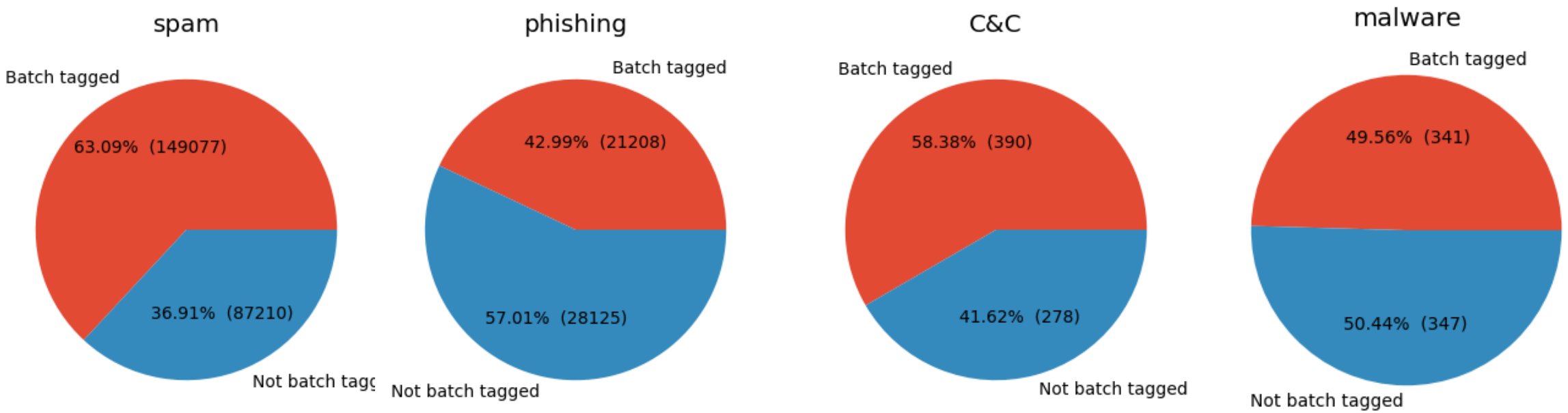
Abuse Profiles of Batch Registered Domains

Overlap with newly registered malicious domains

- Total number of RBL* domains: 288,218
- Total number of batch registered RBL domains: 171,662 (**60% of RBL domains**)

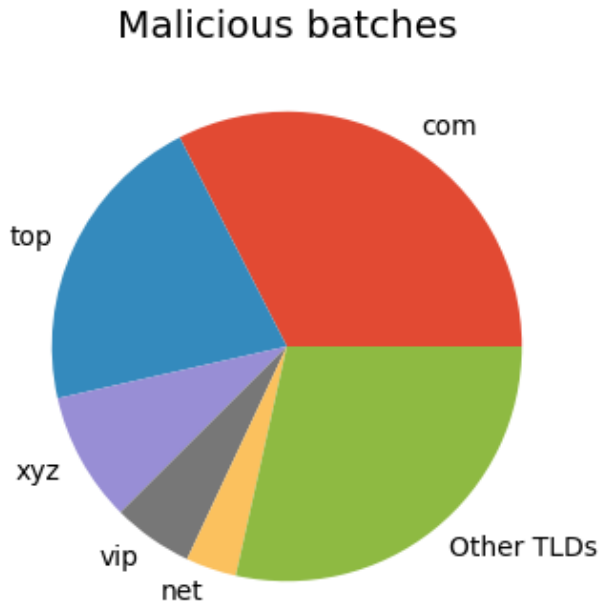
** newly registered within the analysis period*

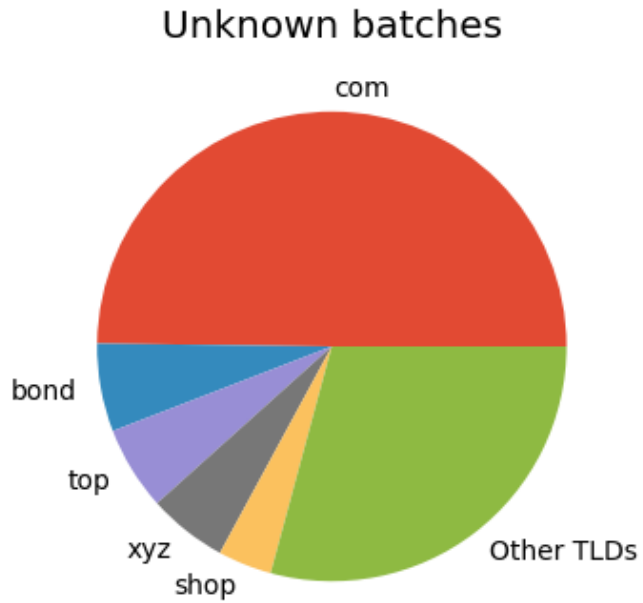
Overlap with newly registered malicious domains



- Spam domains - highest % tagged as batch registered (63.1%)
- Lowest % for phishing, but still > 40%
- Overall 60% of newly registered malicious domains tagged as batch registered

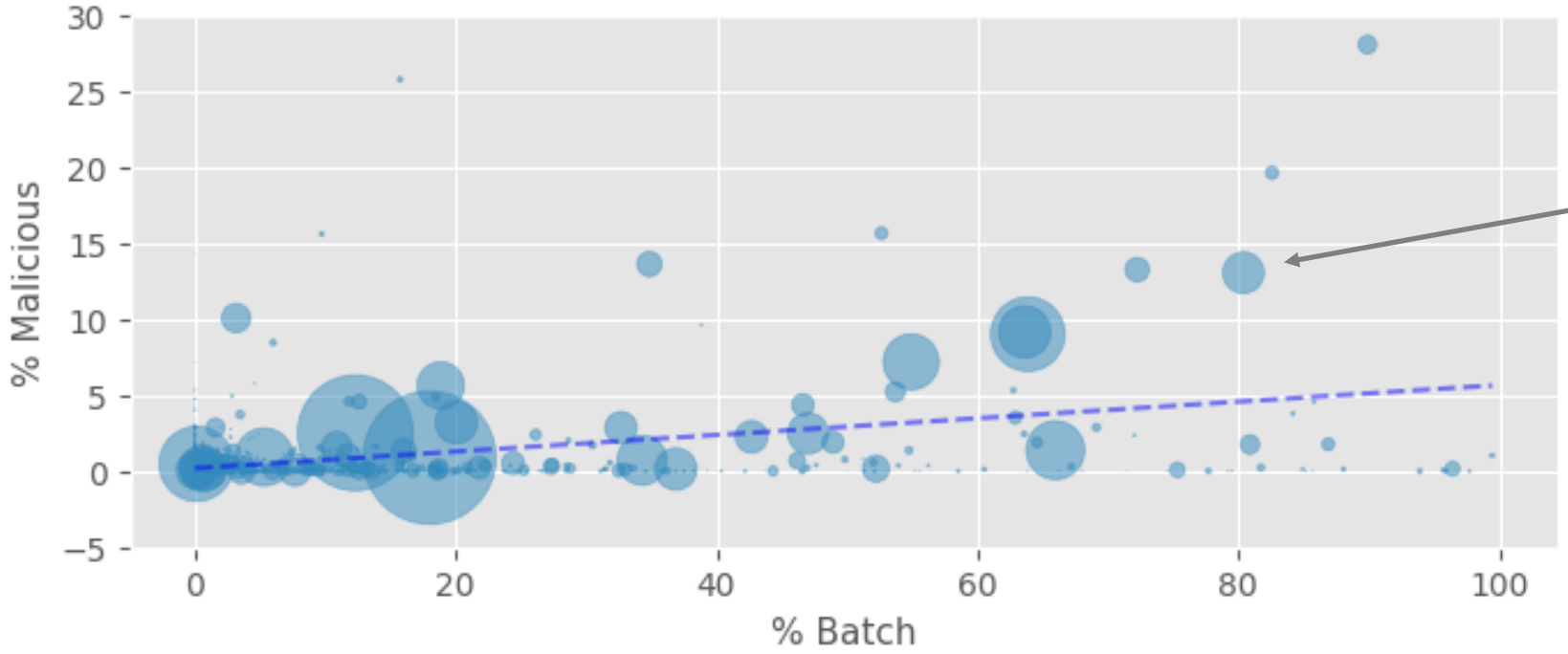
TLD composition breakdown – Top 5





- Majority of batch registered domains are under dot com
- Dot top is common within batches tagged as malicious
- gTLDs with known high abuse rates are common in both groups

Registrar level analysis



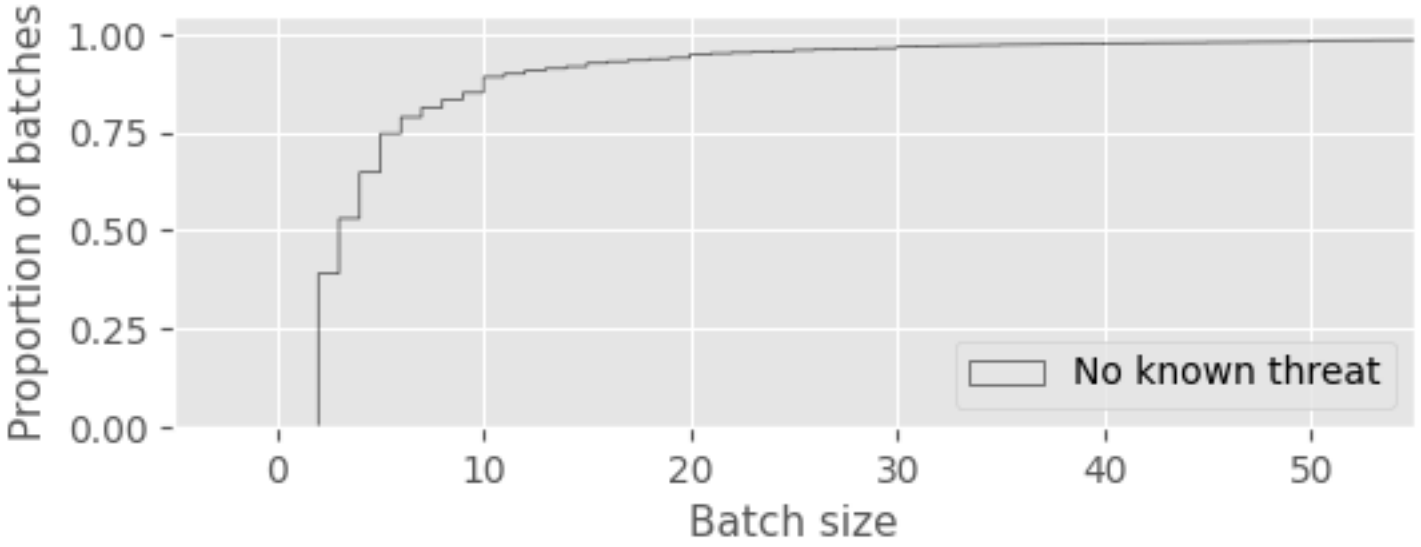
Each dot is a registrar

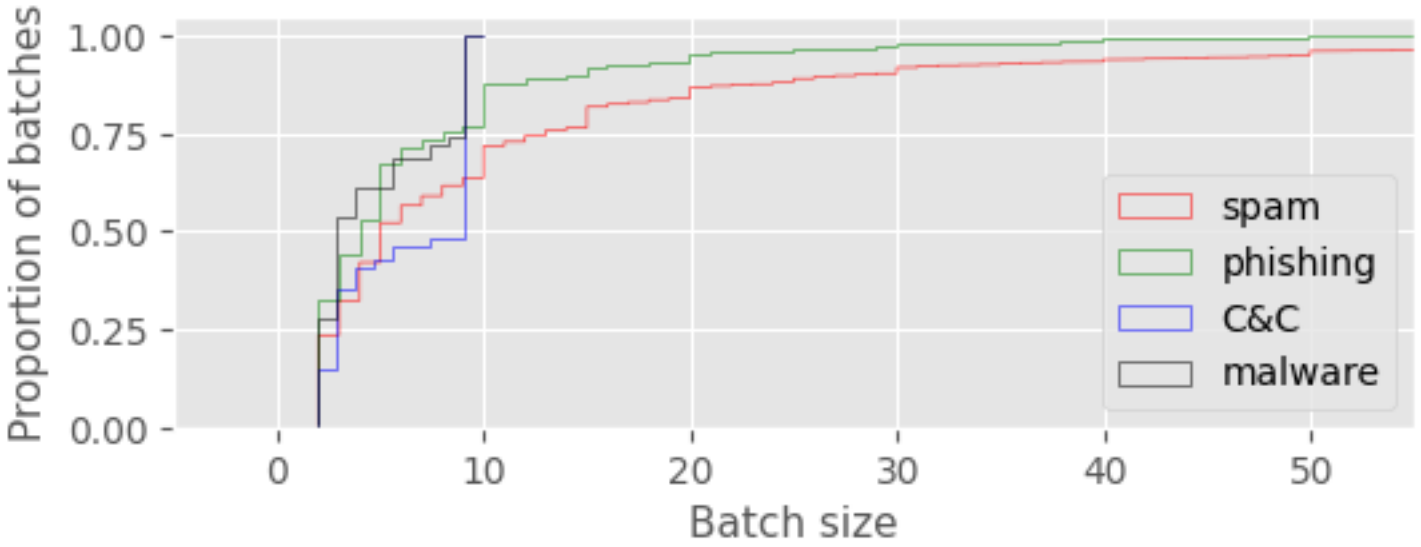
Size = DUM in sample

- What is the relationship between **batch** and **overall** abuse rates, per registrar?
- Statistically significant positive correlation (Spearman's r=0.422 p< 0.0001)

Distribution of batch sizes (CDF plots)

- Most batches are small (38% contain only 2 domains). Long tail distribution.
- Spam batches larger than phishing batches
- Malware, C&C batches – max size of 10, limited coverage
- Noticeable spikes at 10, 20, 30 etc





Abuse composition breakdown - individual batches

- Plot shows a sample of 300 malicious batches (min size: 10, max size: 500)
- Clusters sorted by size
- Known malicious / RBL domain count is shown in red

Abuse composition breakdown - individual batches

- **Expansion analysis**
- Total number of inferred (additional) malicious domains: 179,344
  - 104% increase on known batch RBL domains

Conclusions

- Clustering methods **effectively group batch registrations** based on limited but meaningful features.
- Most batches are small, but **certain sizes appear more frequently**, consistent with human selection preferences.
- **Larger batches** are more common for certain threat types (spam, phishing).
- There is a measurable link between batch registration activity and **abuse rates**.
- Expanding batch registration labels significantly increases the identification of **potentially malicious domains**.

Future work

- Validation / Ground Truth
  - Work with registrars to **validate reliability of the method**
  - E.g. Investigate impact of **reseller practices** (artificial batches?)
  - Interested registrars, please get in touch

- Broaden coverage to other types of **bulk registration patterns**
  - Identifying **non time-bound** registration patterns - e.g. time series analysis to pick out ongoing malicious campaign registrations

- **Monitor ongoing patterns** of abuse related to batch/bulk registrations

- Explore methods of **exposing the results** to the community

Engage with ICANN – Thank You and Questions

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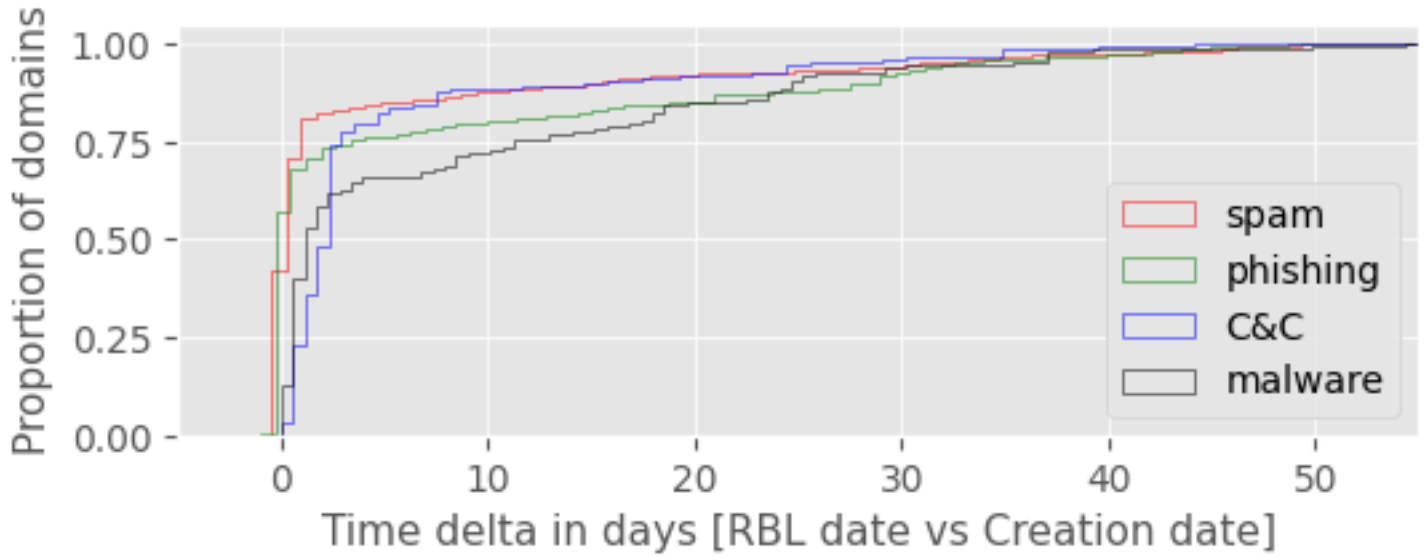
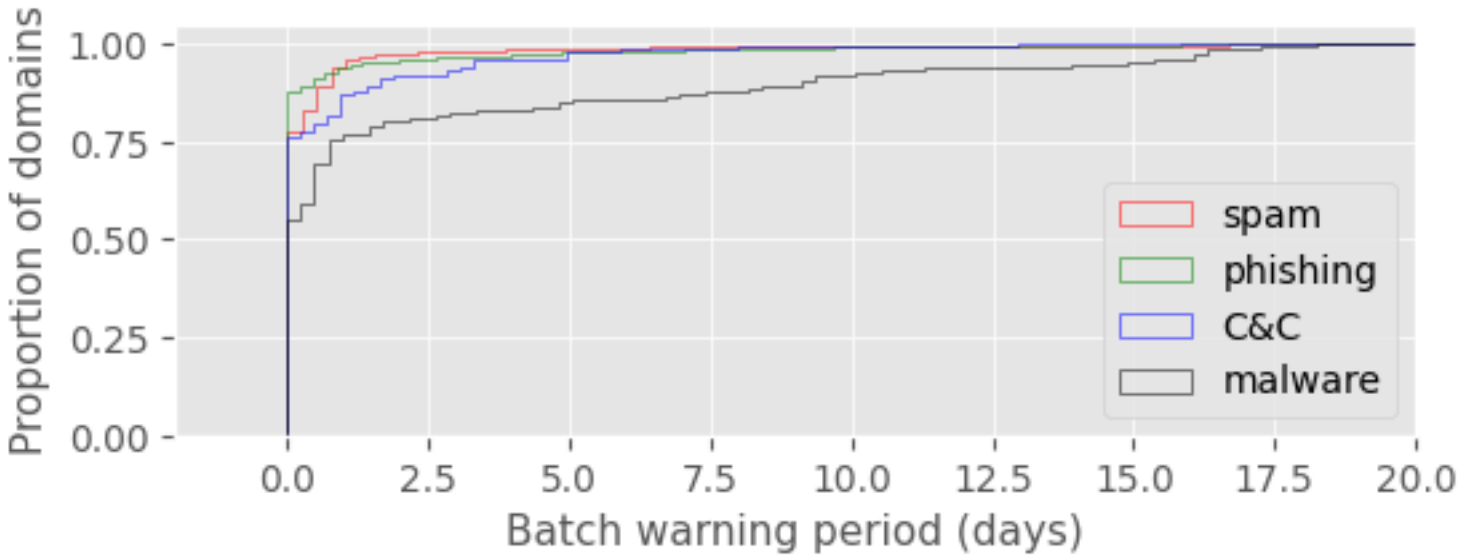
Domain Aging



- What is the time delta between domain creation and RBL flagging (weaponization)?
- The majority of domains are weaponized within 1-2 days of creation
- However, a substantial number of domains (20-30%) remain dormant for days or weeks

Warning period analysis



- How many batch registered RBL domains could have been **predicted earlier** by batch expansion? (Grace period of 12 hours)
- Total number of RBL domains with batch warning of 12 hours or more: 27,138
  - **16.0%** of all RBL batch domains