REMEDI3S-TLD: Reputation Metrics Design to Improve Intermediary Incentives for Security of TLDs

A project in collaboration with SIDN and NCSC

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REMEDI3S-TLD

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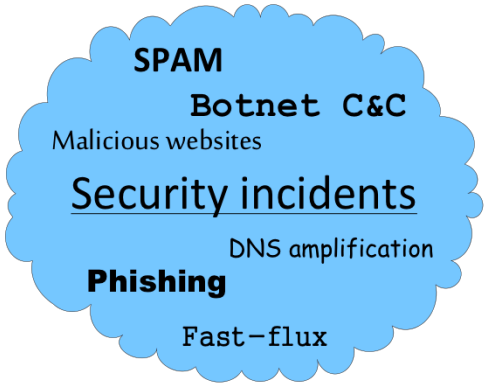
REMEDI3S-TLD



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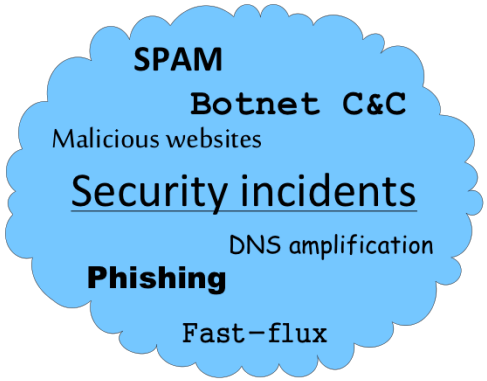

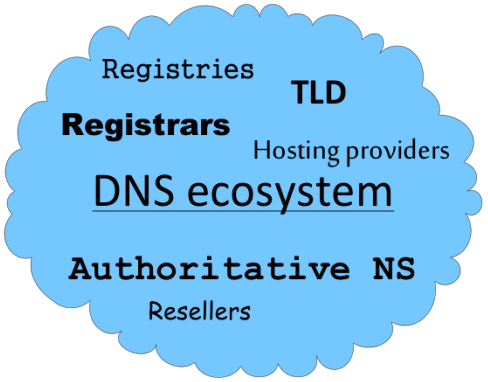

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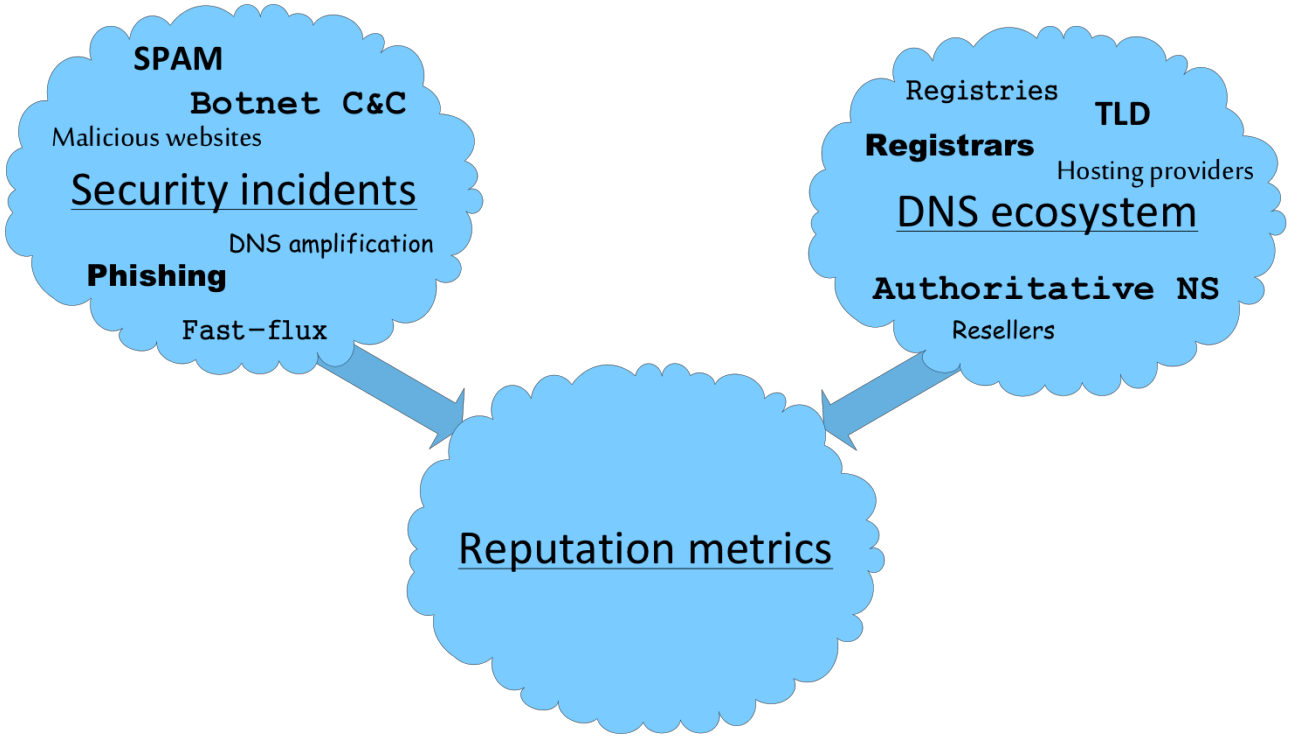

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Agenda

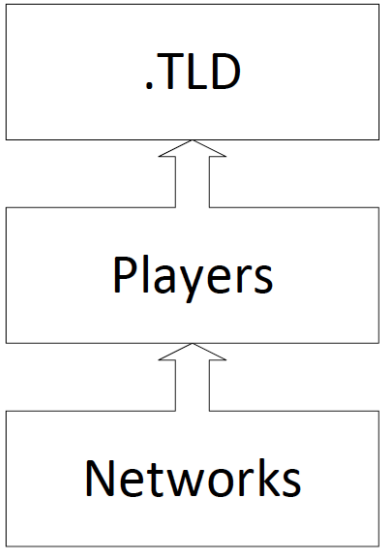
- REMEDI3S-TLD
- Security incidents
- Types of security metrics
- Security metrics for TLDs
- Security metrics for hosting providers
- Practical application
- Summary

Security incidents

- Blacklists
  - APWG
  - Shadowserver (botnet C&C, Sandbox URLs, etc.)
  - ESET, Sophos, Fortinet
  - Google's Safe browsing appeals
  - Malware Must Die
  - Phishtank
  - Zeus tracker
  - Dutch child pornography hotline
  - Etc.
- Farsight security (dns-db)

Types of security metrics

- Different layers of security metrics:
  - Top Level Domains (TLDs)
  - Market players related to the TLD (infrastructure providers): registrars, hosting providers, DNS service providers
  - Network resources managed by each of the players, such as resolvers, name servers



Security metrics for TLDs

- Size estimate for different market players, e.g. TLDs
  - Problem: access to zone files of all TLDs
  - Solution: zone files, APWG reports, DNS-DB

Security metrics for TLDs

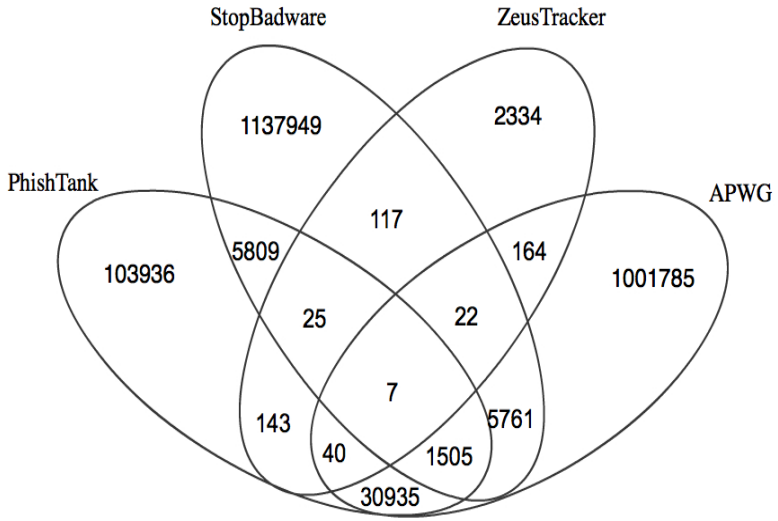
- Type of reputation metrics
  - Problem: estimation of the amount of badness
  - Solutions (TLDs):
    a) Number of unique domains
    b) Number of FQDN
    c) Number of URLs

Security metrics for TLDs

- Type of reputation metrics
  - Problem: up-times of maliciously registered/compromised domains
  - Solutions:
    a) DNS-based scanner
    b) Content-based scanner

Results

- Estimation of the amount of badness for TLD
  - Datasets: suitability, coverage



Dataset	# domains	# FQDNs	# URLs
StopBadware	760035	1137949	2357260
APWG	150525	1001785	10474045
Phishtank	83206	103936	—
ZeusTracker	2220	2334	—

Table 1: Dataset statistics: unique 2nd– and 3rd–level domains, FQDNs, and URLs for the 4 datasets from 2014.

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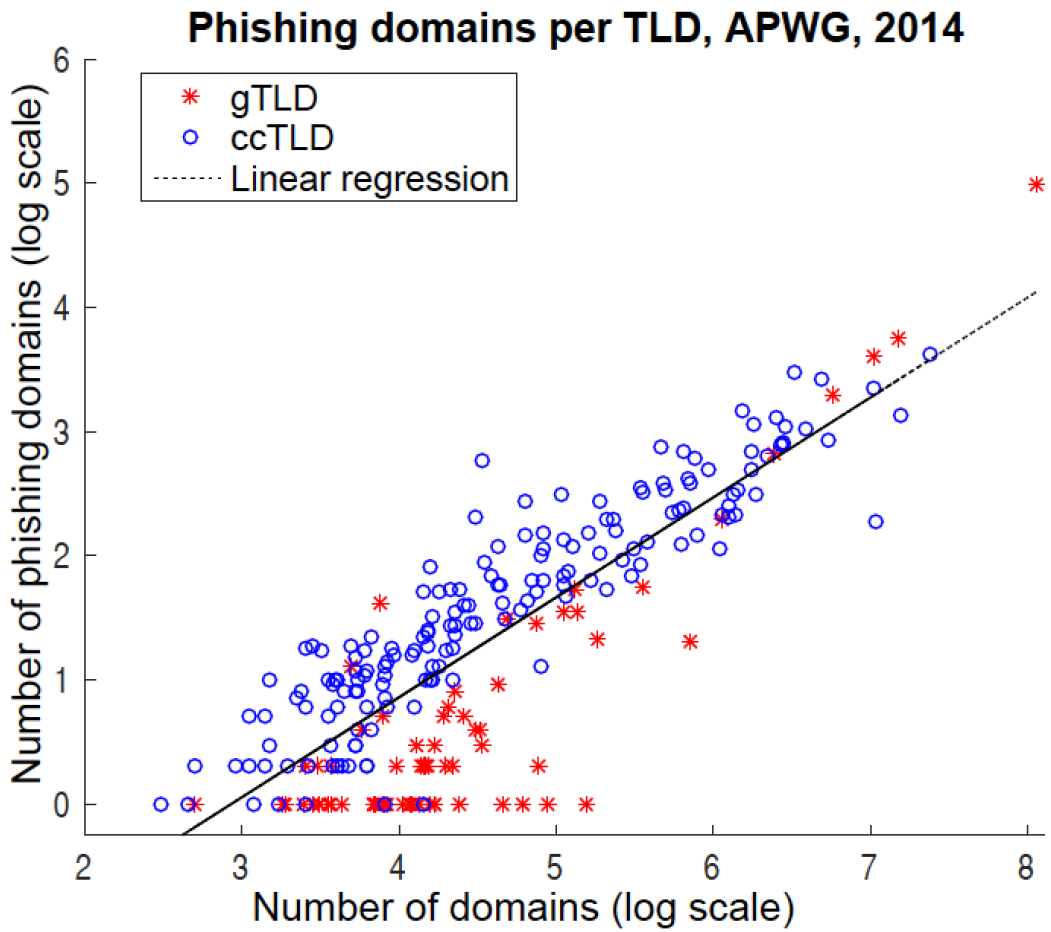
Results

- Estimation of the amount of badness



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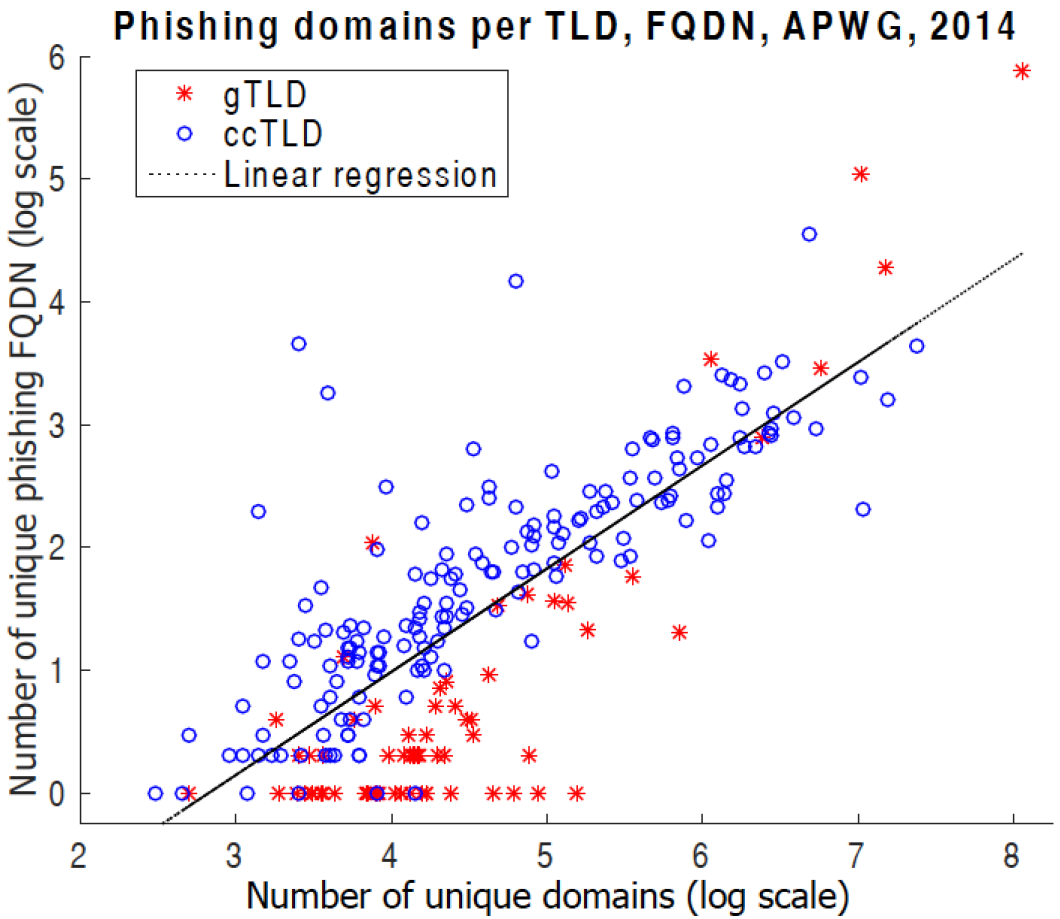
Results

- Estimation of the amount of badness



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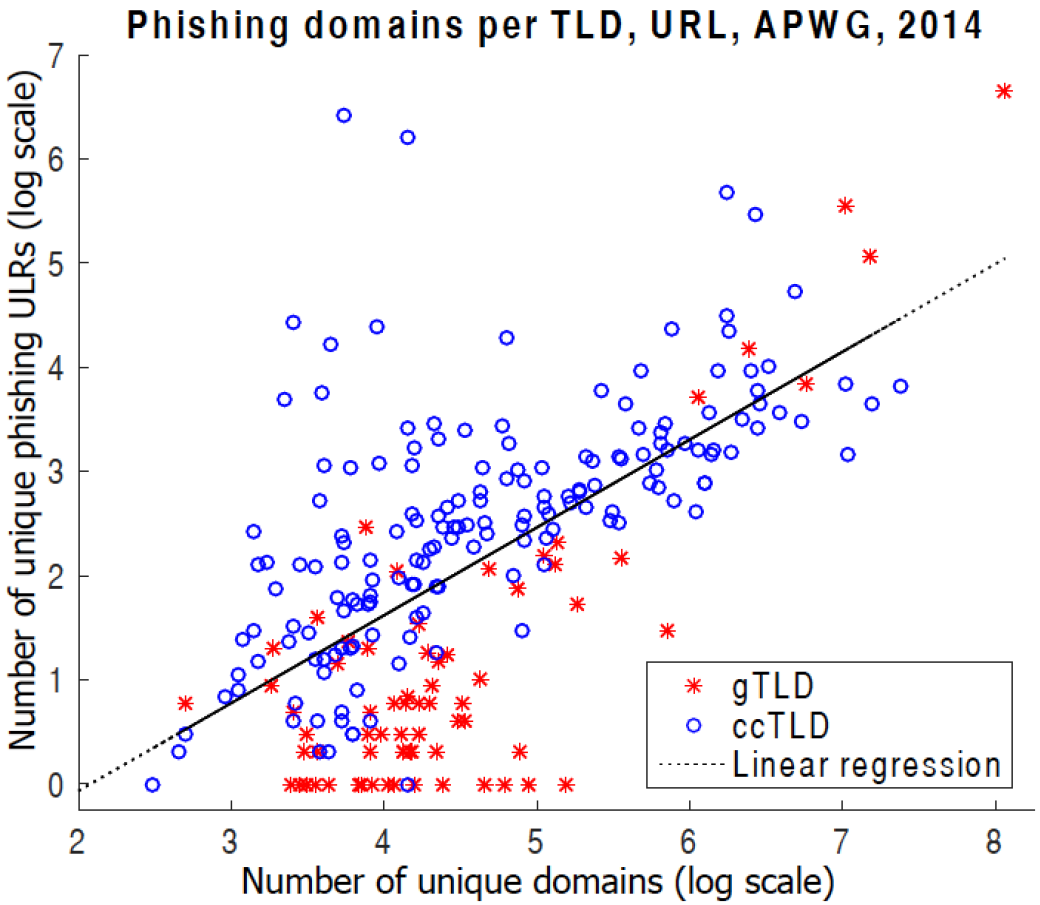
Results

- Estimation of the amount of badness



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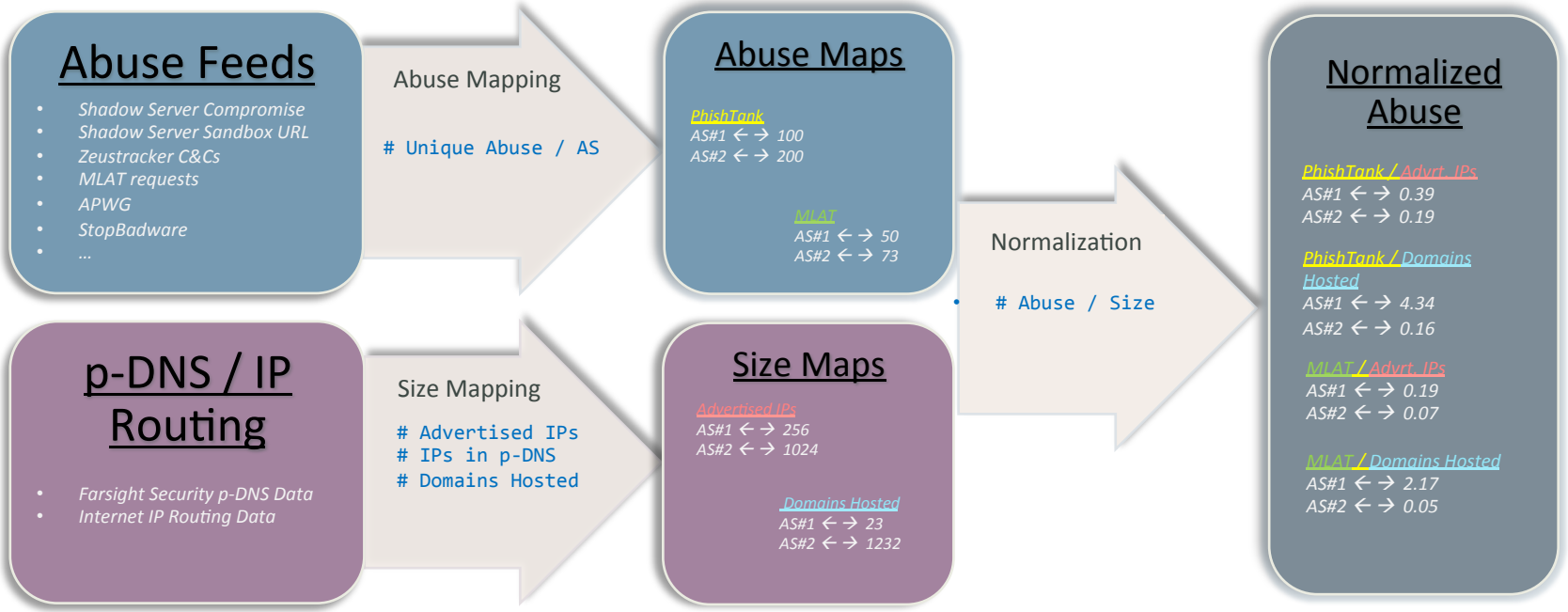
Security metrics for hosting providers

1. Count badness per AS across different data sources
2. Normalize for the size of the AS (in 3 ways)



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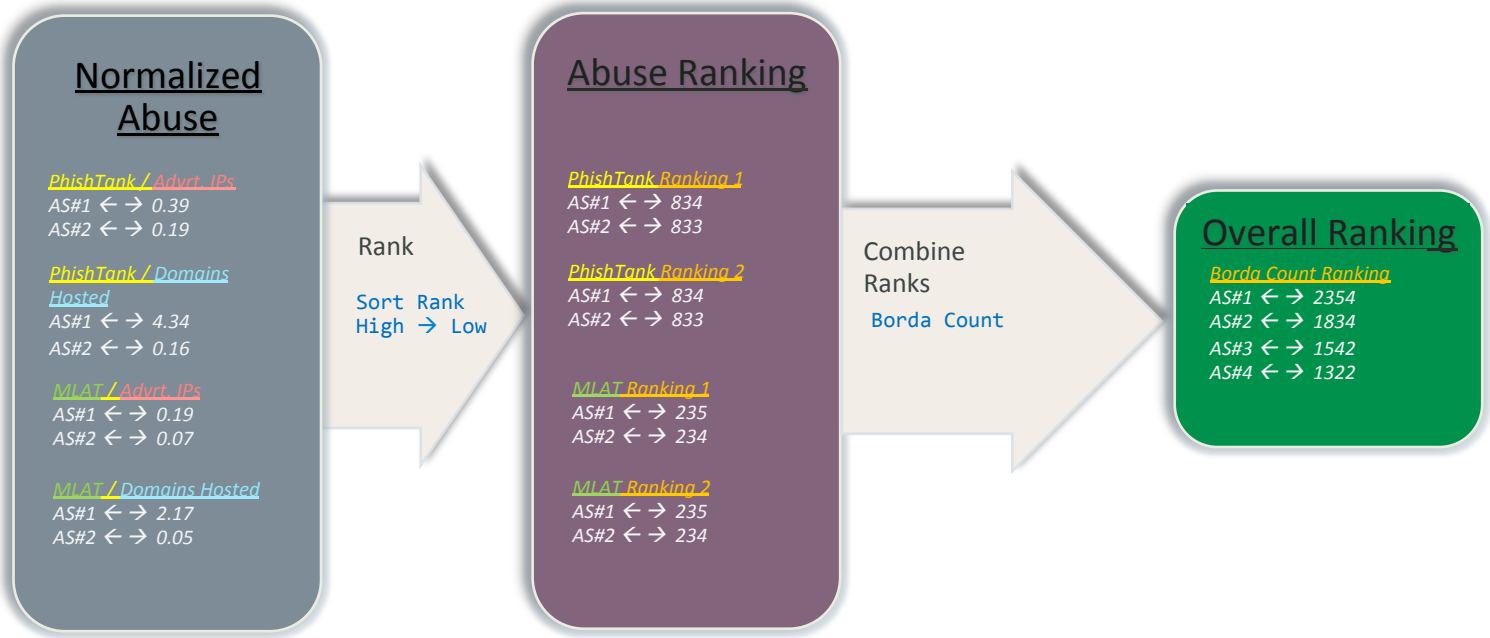
Security metrics for hosting providers

3. Rank ASes on amount of badness
4. Aggregate rankings (Borda count)
5. Identify ASes with consistently high concentrations of badness



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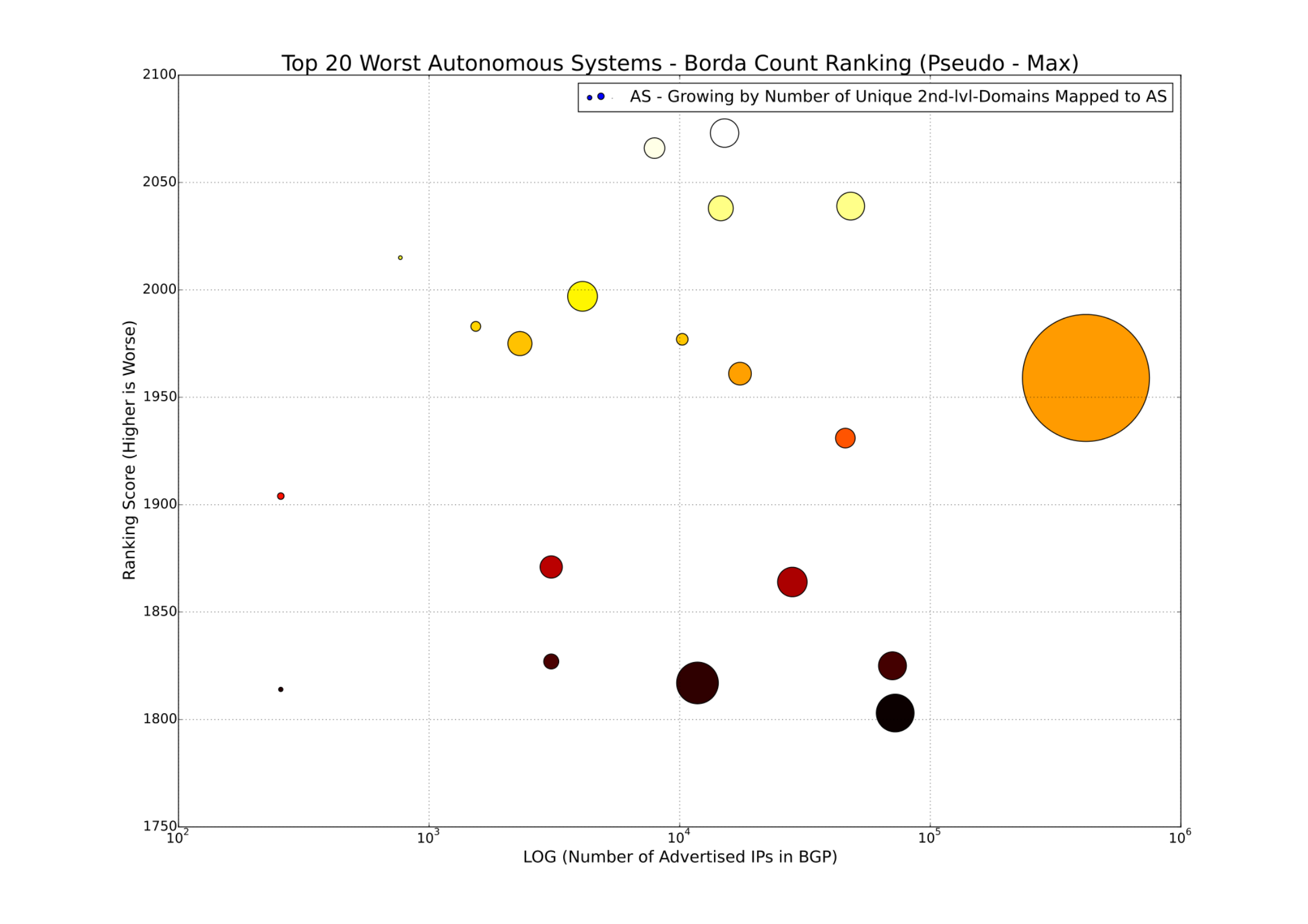
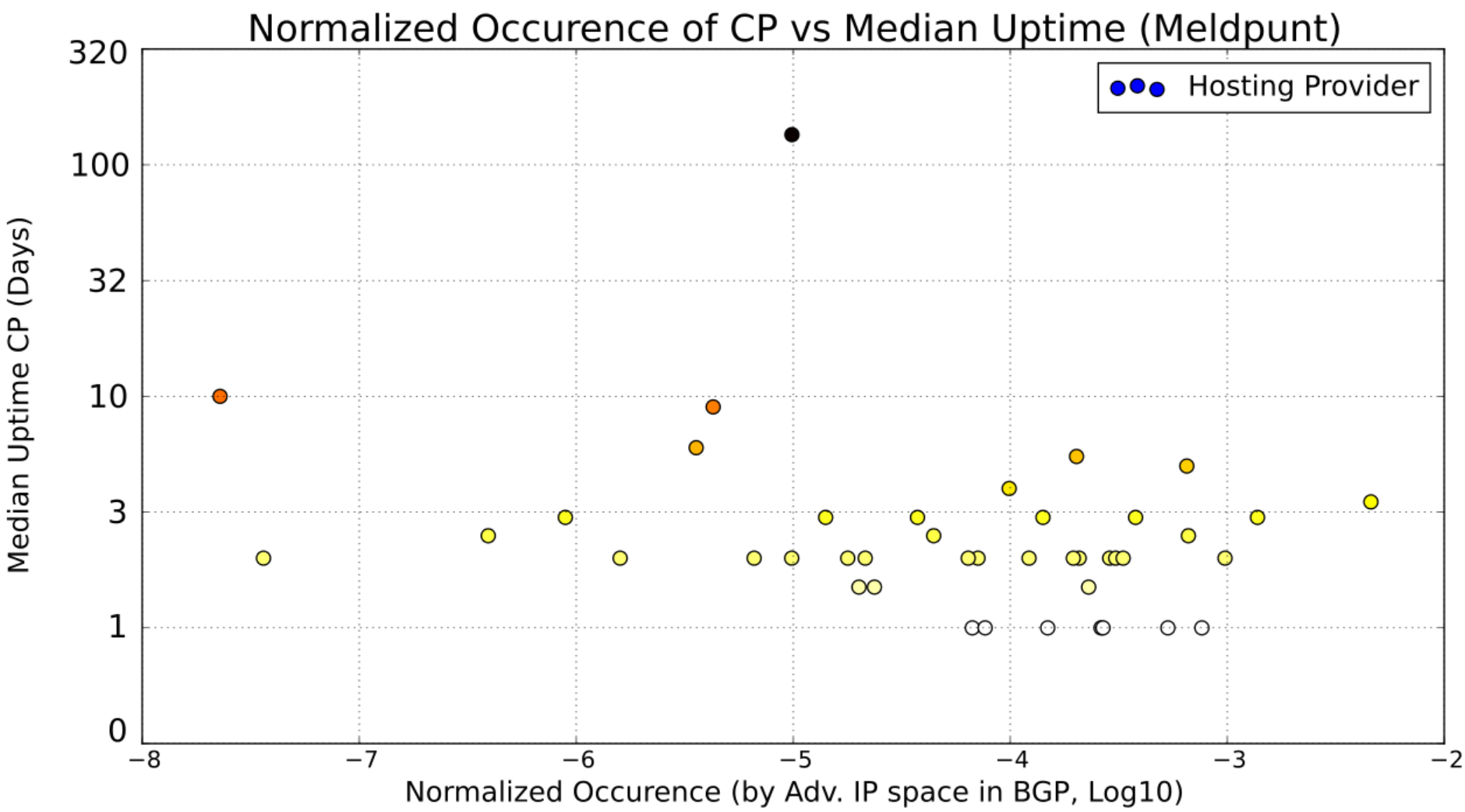

Top 20 Worst Autonomous Systems - Borda Count Ranking (Pseudo - Max)
AS - Growing by Number of Unique 2nd-lvl-Domains Mapped to AS
Ranking Score (Higher is Worse)
LOG (Number of Advertised IPs in BGP)
2100
2050
2000
1950
1900
1850
1800
1750
10^2
10^3
10^4
10^5
10^6


Normalized Occurence of CP vs Median Uptime (Meldpunt)
Hosting Provider
Median Uptime CP (Days)
320
100
32
10
3
1
0
−8
−7
−6
−5
−4
−3
−2
Normalized Occurence (by Adv. IP space in BGP, Log10)

Practical application

- Incentive structures that drive the DNS ecosystem
- "Clean Netherlands": Enhance self cleansing ability of the Dutch hosting market by
    - promoting best practices and awareness
    - pressuring the rotten apples

Summary

- REMEDI3S-TLD
- Security metrics for TLDs
- Security metrics for hosting providers
- Practical application

ACKNOWLEDGEMENTS

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