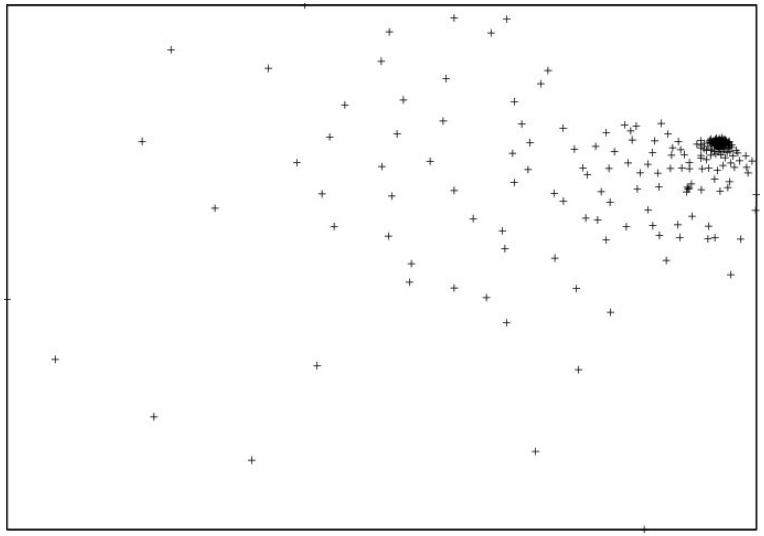
# Detection and Identification of BotNets



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# Early Warning System for BotNets (1)

„Revisiting DarkNets“

- Analyzes traffic sent to unused IPs (DarkNet)
- Completely passive, relies on botnet propagation
- Very efficient! (~ 300,000 IPs analyzed in RT)

How?

- Reference data about known bots / botnets
- Feature construction at several levels
- Machine learning: Traffic patterns of specific bots
- Validation & Test


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# Early Warning System for BotNets (2)

Demonstrating a three-level (passive) approach

- **Level 1:** Analysis of single packets
  *Spambot identification system*
- **Level 2:** Analysis of network traffic
  *Analyzing access patterns of spambots*
- **Level 3:** Analysis of traffic contents
  *Correlating spam content and spambot type*


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# Reference Data & Features

Reference Data

- Contributed by Marshal via their TRACE system
- IP, Timestamp, Spambot Type - matched to our logs

Data collection

- Learn spambot type from single(!) packet
- No packets outgoing (not even SYN/ACK)

Features

- ICMP, TCP and UDP traffic indicators
- IP destination port (no source!)
- 2-byte-gram of payload for ICMP/UDP
- 2-byte-gram of TCP options for TCP (no payload)


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# Matching Reference Data to DarkNet IPs

Static vs. Dynamic IPs

- Dynamic IPs only valid for limited time periods
- 4.38% static IPs, 95.62% dynamic IPs in our data
- Matching to reference data within +/- 1h (~ 5%)

DNSBL overlap

- At time of access to our darknet, only 2.75% of Spambots are listed in the Spamhaus XBL.
- Indicates possible usage of our system as DNSBL


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# Performance

Spambot identification based on single packets

| Spambot | Prec. | Rec. | F-m. |
|---|---|---|---|
| Unknown (4) | 1,000 | 1,000 | 1,000 |
| Unknown (11) | 0,947 | 0,973 | 0,960 |
| Srizbi (3) | 0,847 | 0,981 | 0,909 |
| Rustock (7) | 1,000 | 0,263 | 0,416 |
| Unknown (9) | 1,000 | 0,143 | 0,250 |
| Hacktool.Spammer (6) | 0,500 | 0,313 | 0,385 |
| Pushdo (2) | 0,000 | 0,000 | 0,000 |
| Mega-D (1) | 0,000 | 0,000 | 0,000 |


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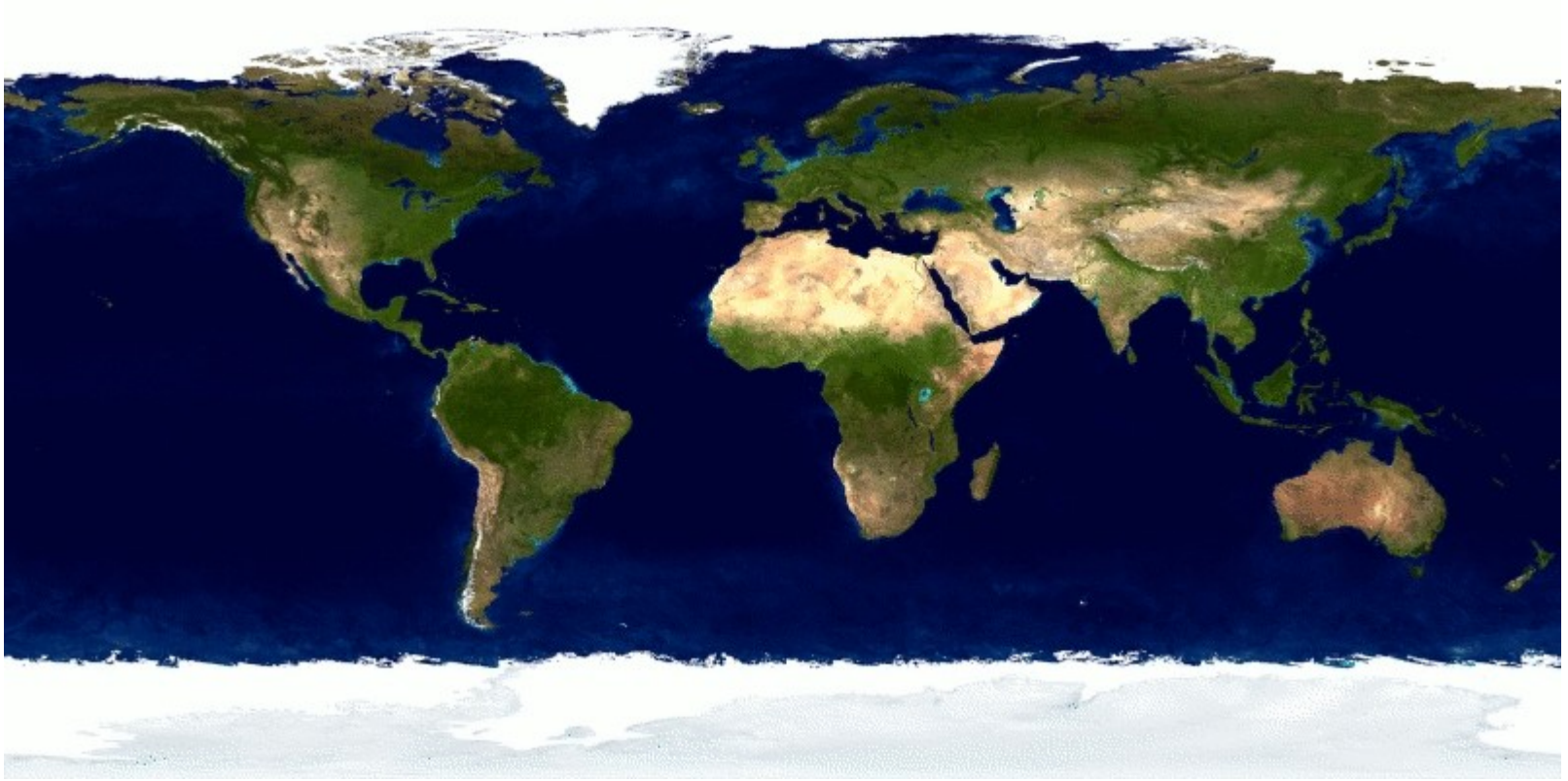
# Activity Overview (24h compressed)



Different colors indicate access by different spambots. Background: Visible Earth (NASA), IP-localization by IP Address Location. Reference data by Marshal Trace.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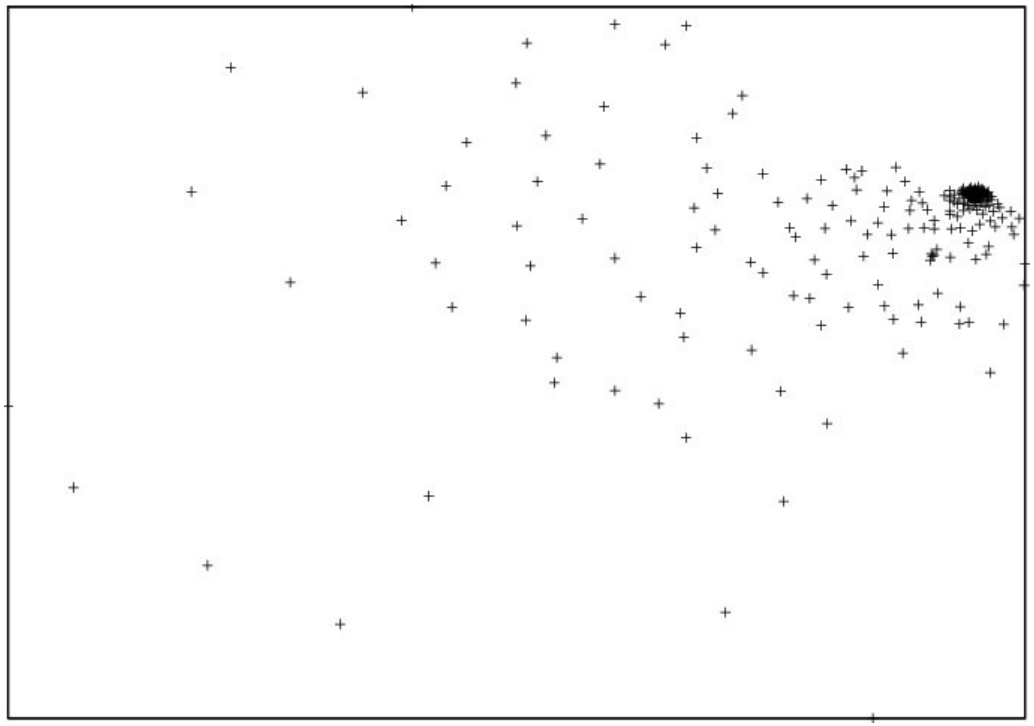
# Level 2: Access patterns (1)

Multiple accesses from same IP

- Pattern type: random, consecutive, stepping, ...
- Some variability in access patterns (edit distance)

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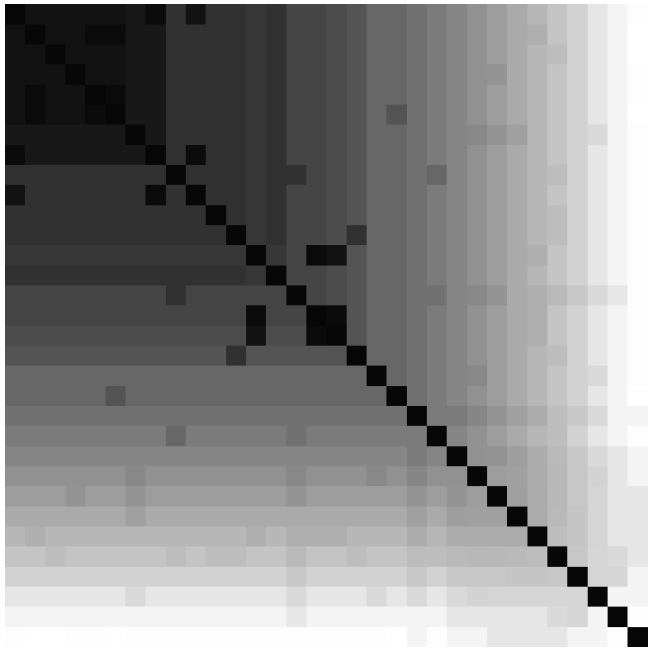
# Level 2: Access patterns (2)

Patterns vs. Spambot types

- No spambot-specific patterns – all patterns are shown by at least three different spambots.
- Possibly hinting at underlying control systems?





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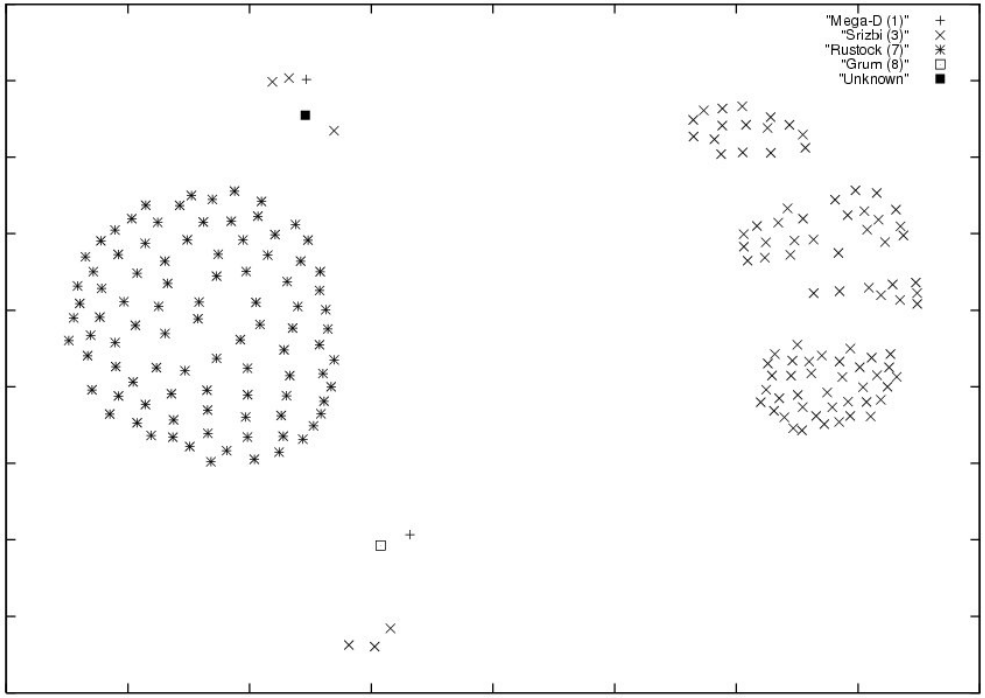
# Level 3: Spam content vs. spambot type

Matching Spambot reference data to spam contents

- Allows to find correlations between spambot type and the contents of a spam mail.
- Different spambots send out different spam mails.





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# Outlook & Future Work

We have...

- Server with capacity up to 300,000 darknet IPs
- Working prototype for Spambot identification
- Lots of ideas ;-)

We are lacking...

- Sufficient reference data, especially for BotNets
- A large darknet (1.5 million IPs would suffice ;-)
- Minor funding (network traffic / server bills etc.)

**Thanks for your attention!**


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