NINJA CORRELATION OF APT BINARIES

EVALUATING THE EFFECTIVENESS OF FUZZY HASHING TECHNIQUES IN IDENTIFYING PROVENANCE OF APT BINARIES

Bhavna Soman

Cyber Analyst/Developer, Intel Corp.

@bsoman3

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-GEORGE P. BURDELL

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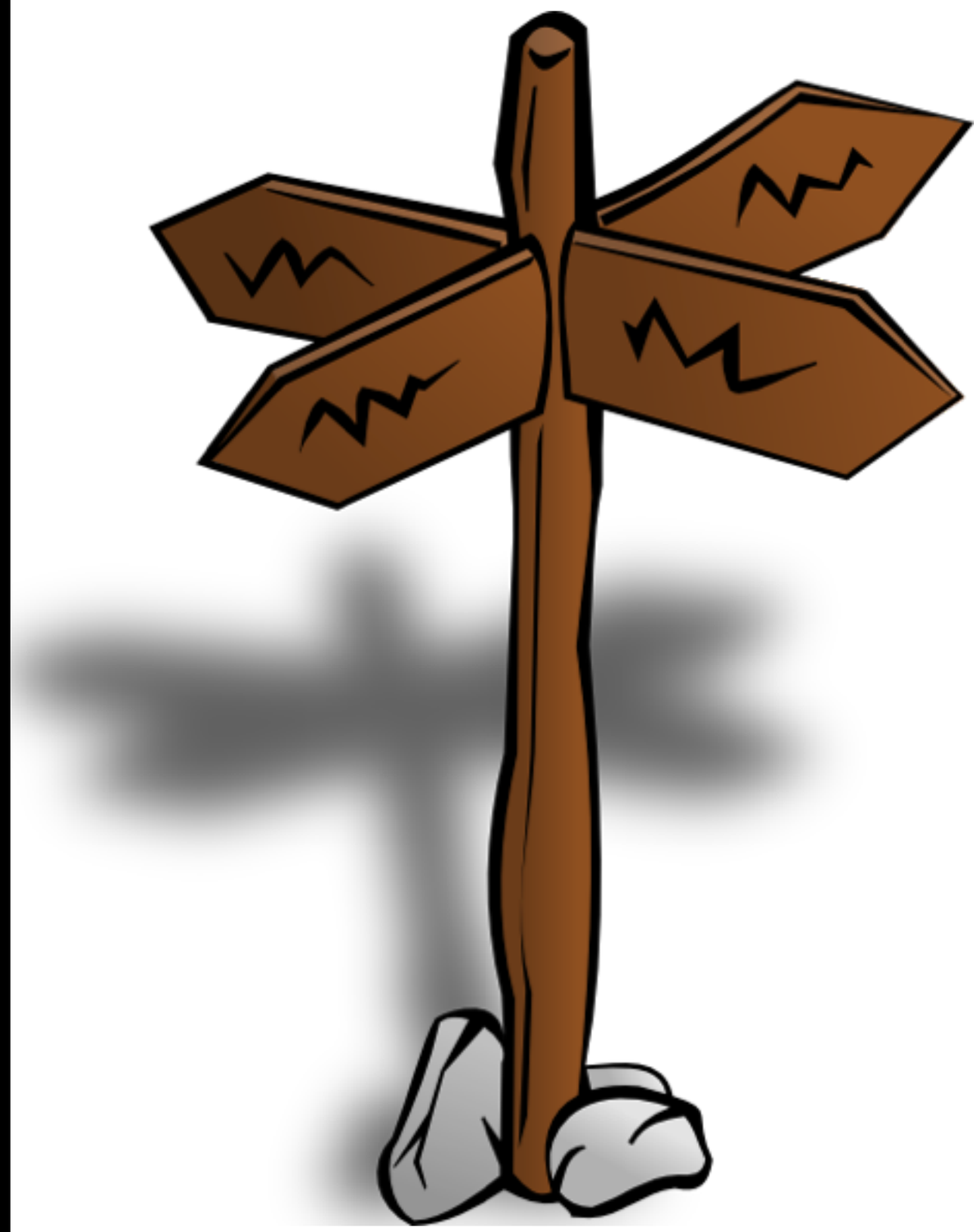
WHAT ADVANTAGE CAN KNOWING THE ORIGINS OF A MALICIOUS BINARY GIVE YOU??

- We can apply past analyses of motivations and capabilities of adversary
- Connect disparate events into one whole picture
- So what’s the best way to connect the dots?

AGENDA

- Methods to connect binaries
- Getting a test dataset and ground truth
- Results
- Sample clusters found
- Takeaways and Future direction



WHAT IS THE BEST WAY TO CONNECT SIMILAR BINARIES??

- Imphash— md5 hash of the import table
- ssdeep— Context triggered piecewise hashing
- SDhash— Bloom filters

How to :

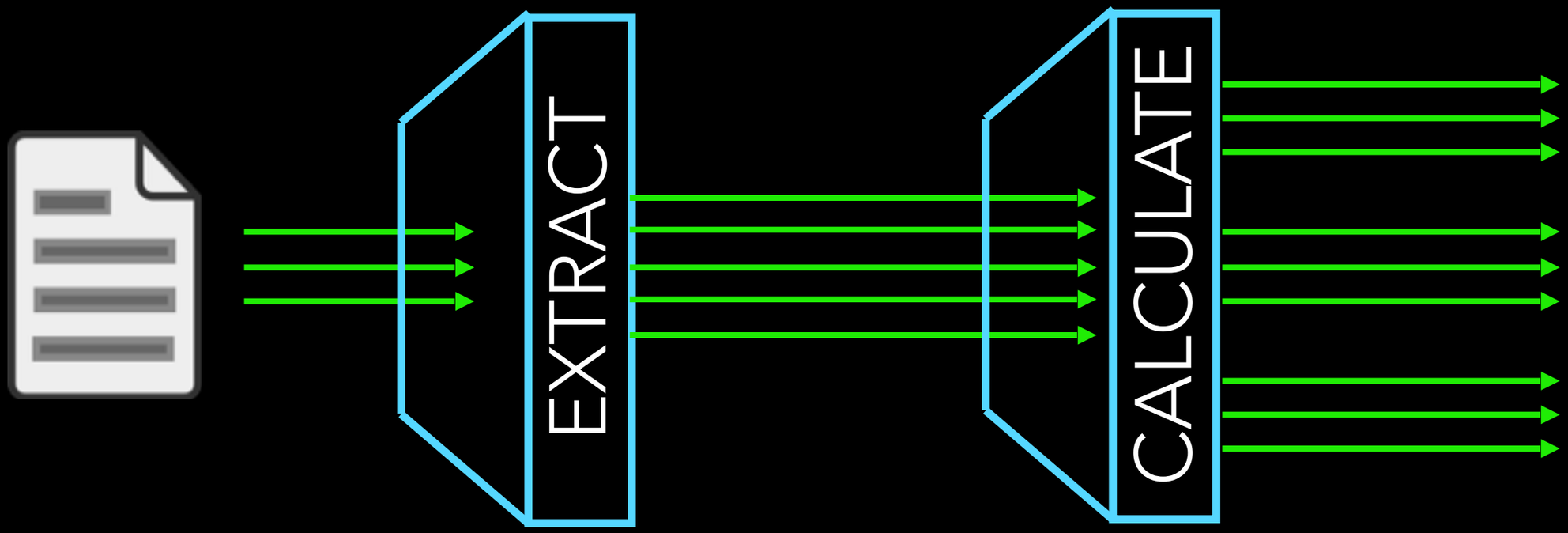
1. *Get non-trivial dataset of binaries related to targeted campaigns*
2. *Establish ground truth without static/dynamic analyses of hundreds of binaries?*

GATHERING DATA

APT Whitepapers

MD5s

Similarity Metrics



- Published Jan-March 2015
- e.g. “Project Cobra Analysis”, “The Desert Falcon Targeted Attacks”

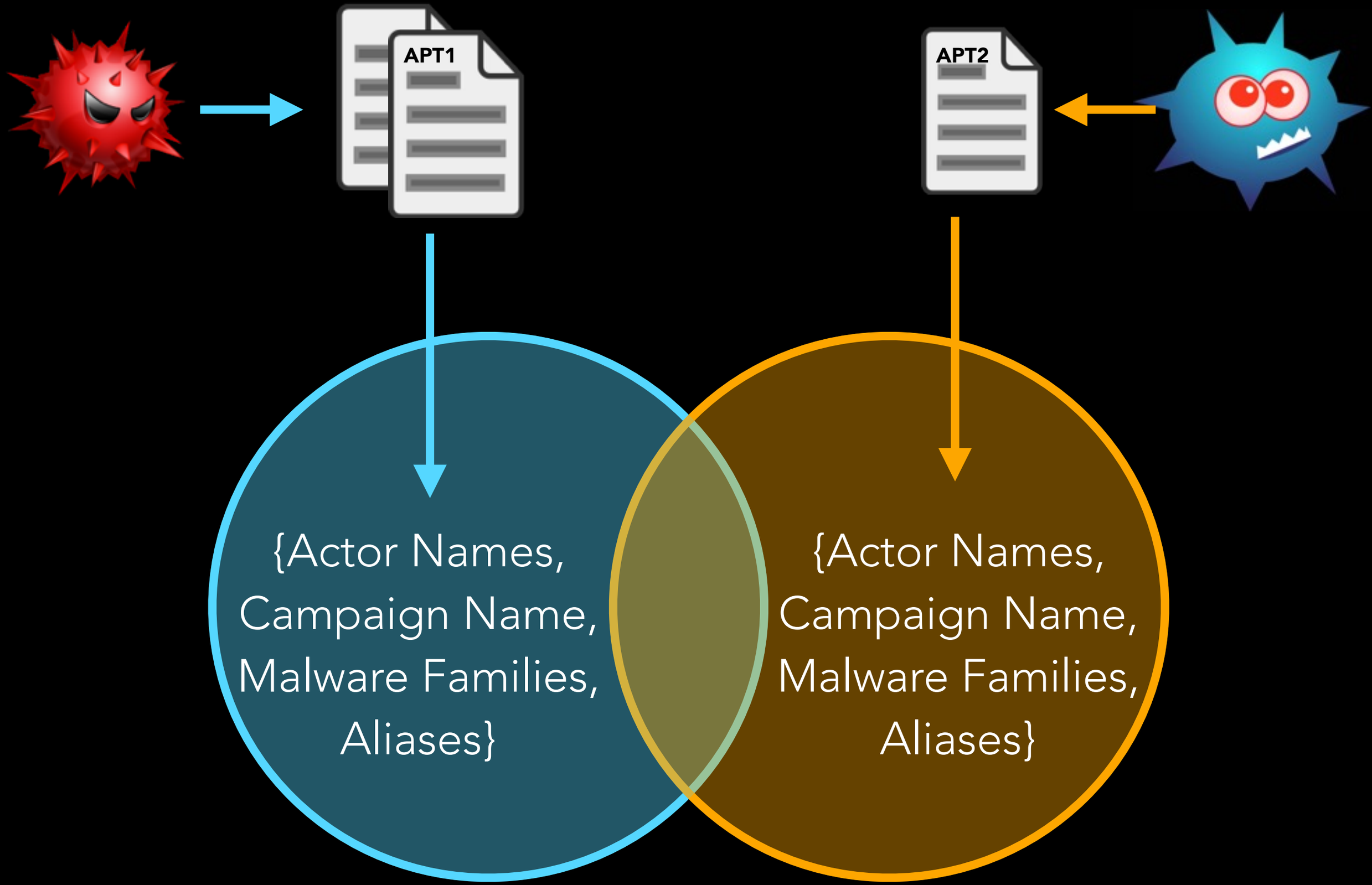
- Extract MD5s
- >10% Malicious on Virus Total

- Calculate for each binary
  - Import hash
  - ssdeep
  - SDhash

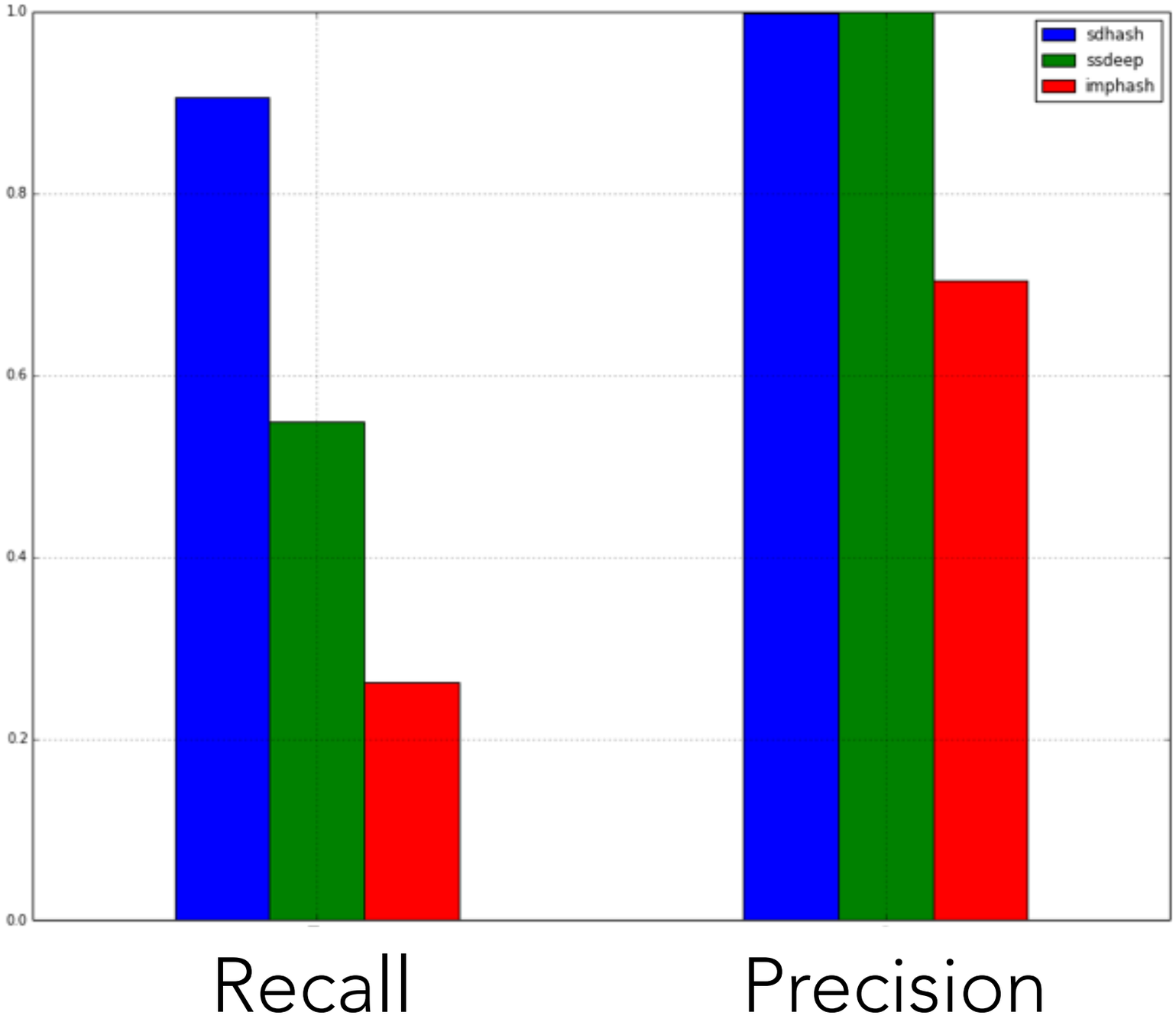
ASSESSING CORRELATIONS

Are these malware related?

ASSESSING CORRELATIONS



SUMMARY RESULTS

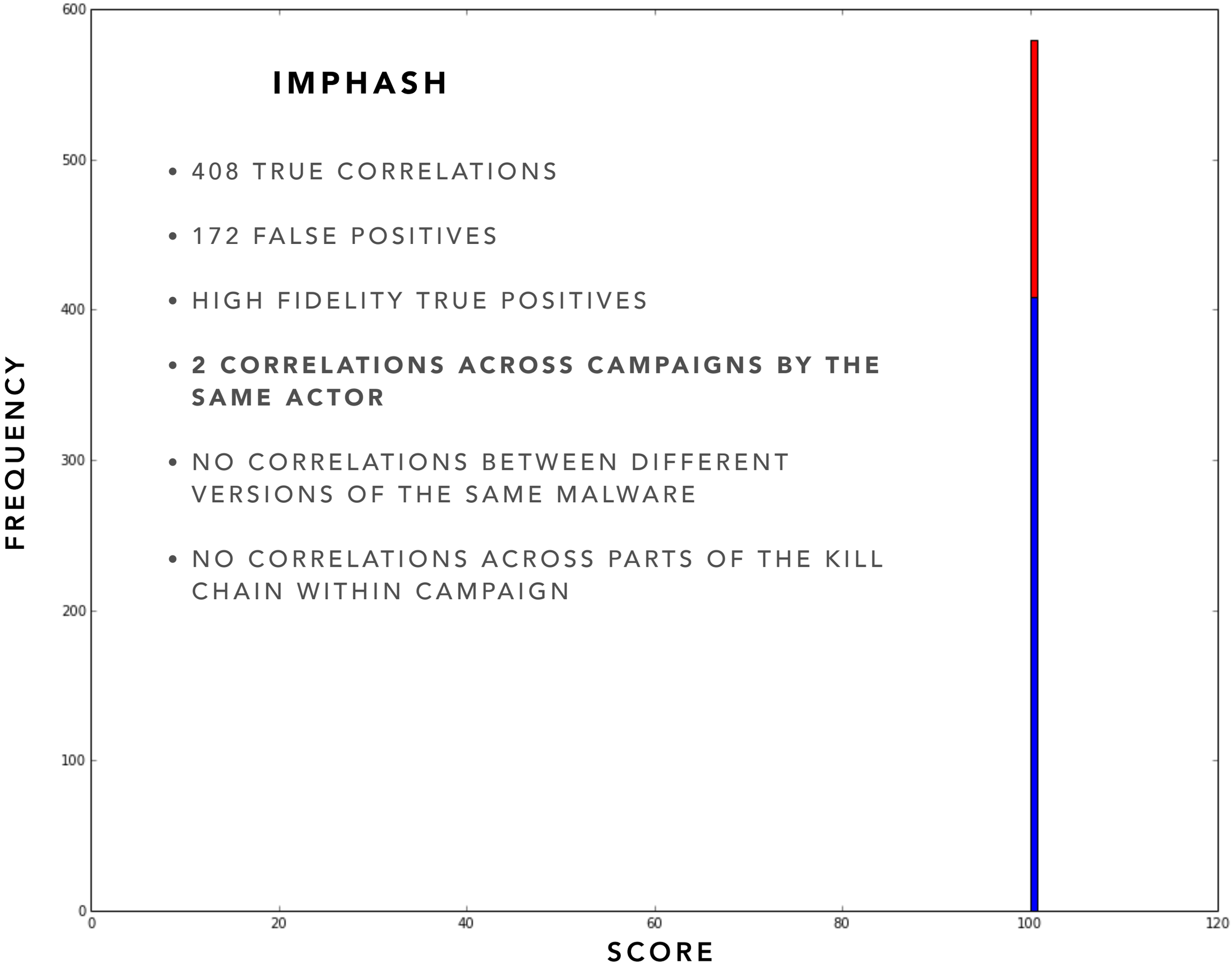


- No one method found all the correlations
- Imphash had the most false positives
- Sdhash had maximum recall
- Both ssdeep and SDhash had near perfect precision

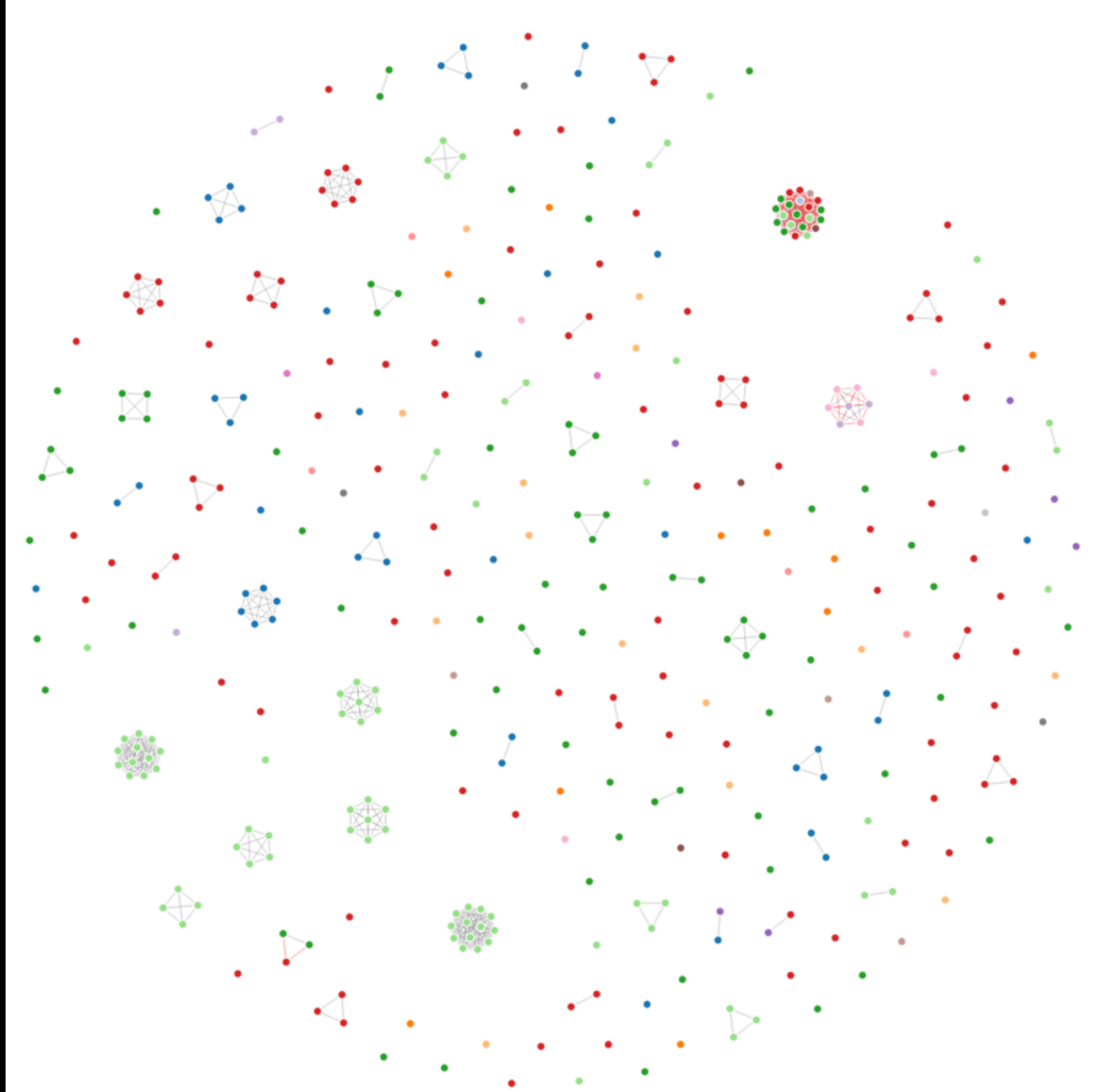
IMPHASHES

IMPHASH

- 408 TRUE CORRELATIONS
- 172 FALSE POSITIVES
- HIGH FIDELITY TRUE POSITIVES
- **2 CORRELATIONS ACROSS CAMPAIGNS BY THE SAME ACTOR**
- NO CORRELATIONS BETWEEN DIFFERENT VERSIONS OF THE SAME MALWARE
- NO CORRELATIONS ACROSS PARTS OF THE KILL CHAIN WITHIN CAMPAIGN



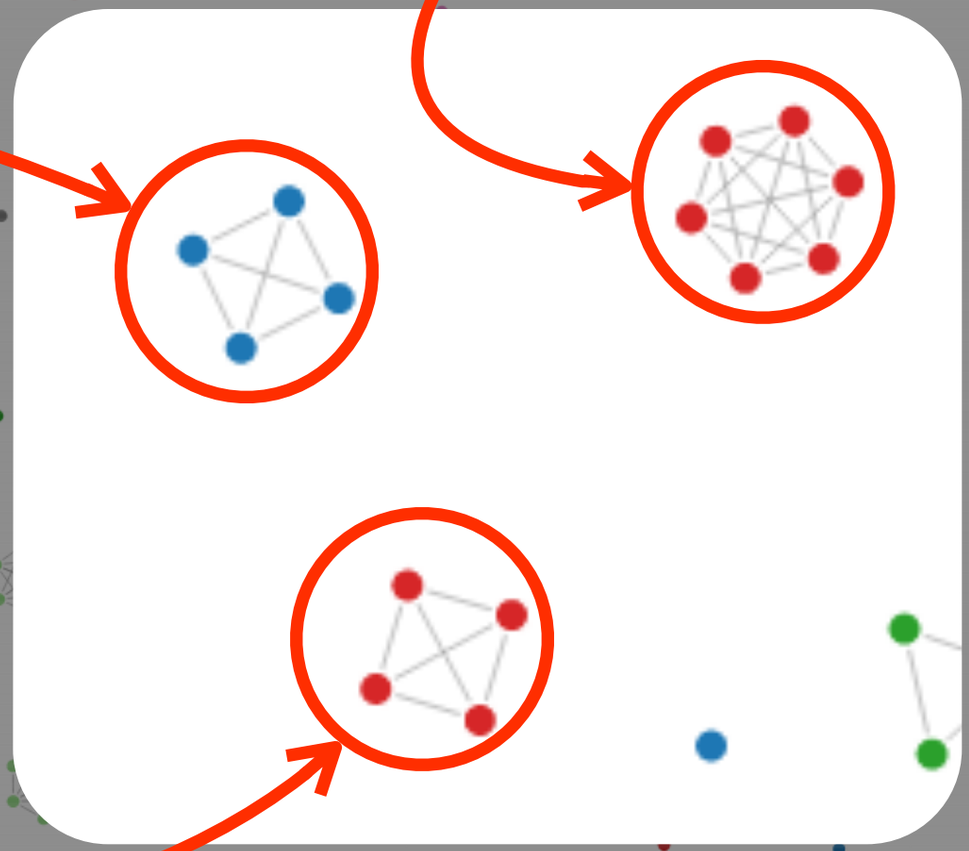
IMPHASH



IMPHASH

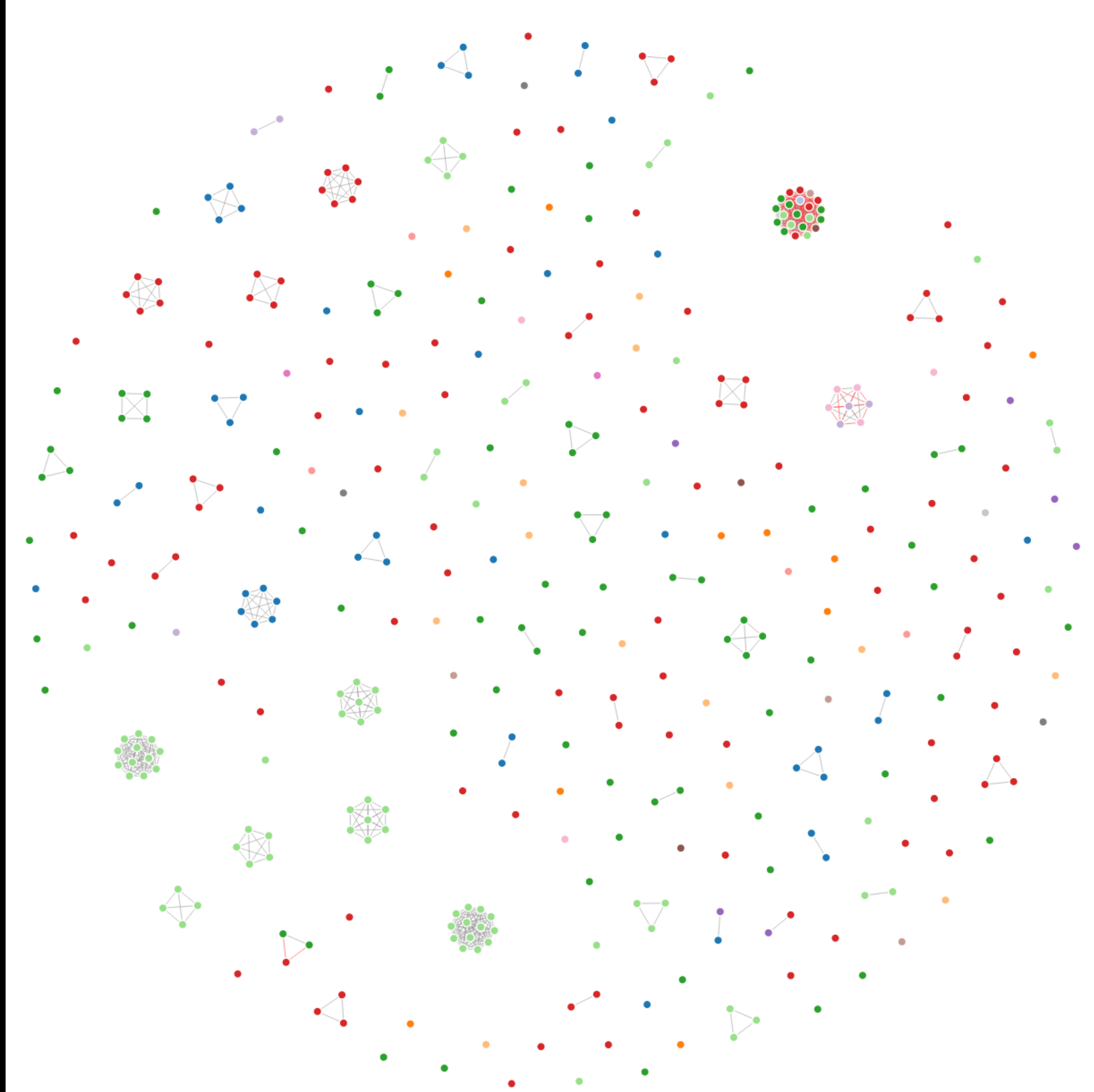
- Version 1.5 of ComRAT (Turla Attackers)
- Compiled on March 25, 2008
- Other versions of the RAT in the dataset were not connected

- Wipbot 2013 Samples
- Used by the Waterbug attack Group
- Compiled on 15-10-2013
- Also referred to as Tavdig/ WorldCupSec/Tadj Makhal



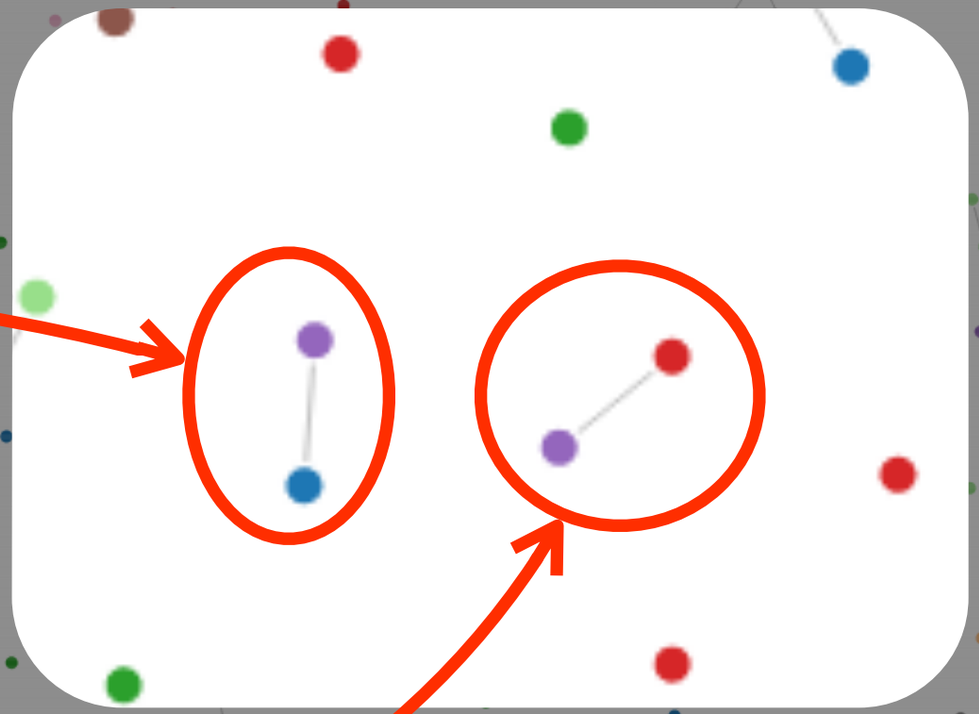
- SAV samples circa 2011
- Used by the Waterbug Attack group
- AKA Turla/Uruboros

IMPHASH



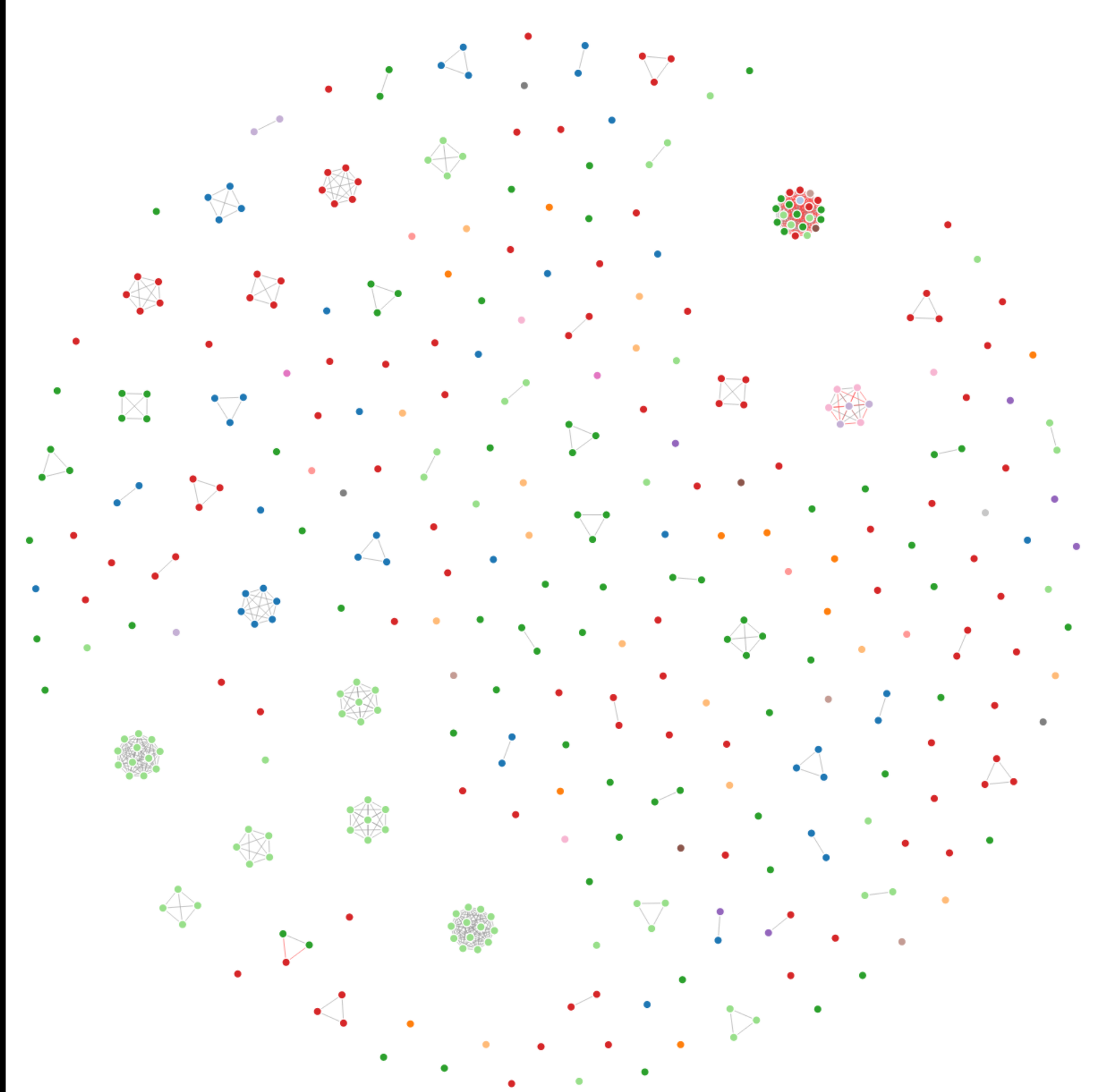
IMPHASH

- Both samples of ComRAT
- Associated with Waterbug Group and Turla Attackers respectively



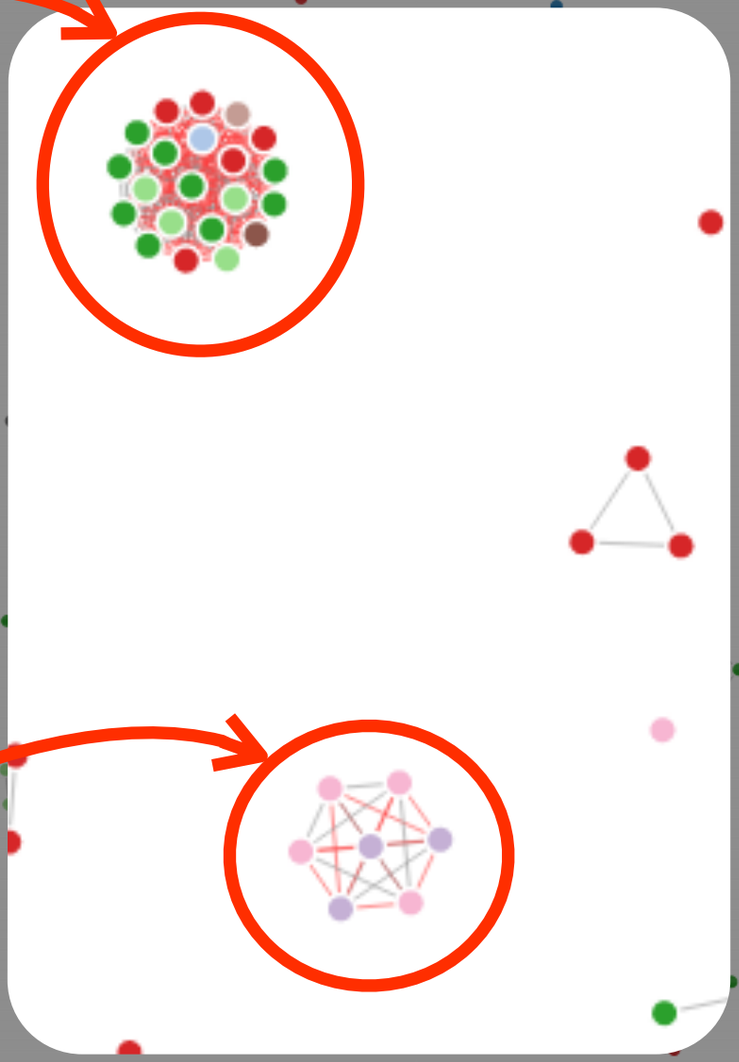
- Samples of the Carbon Malware
- Related to Project Cobra and The Waterbug Attack Group

IMPHASH



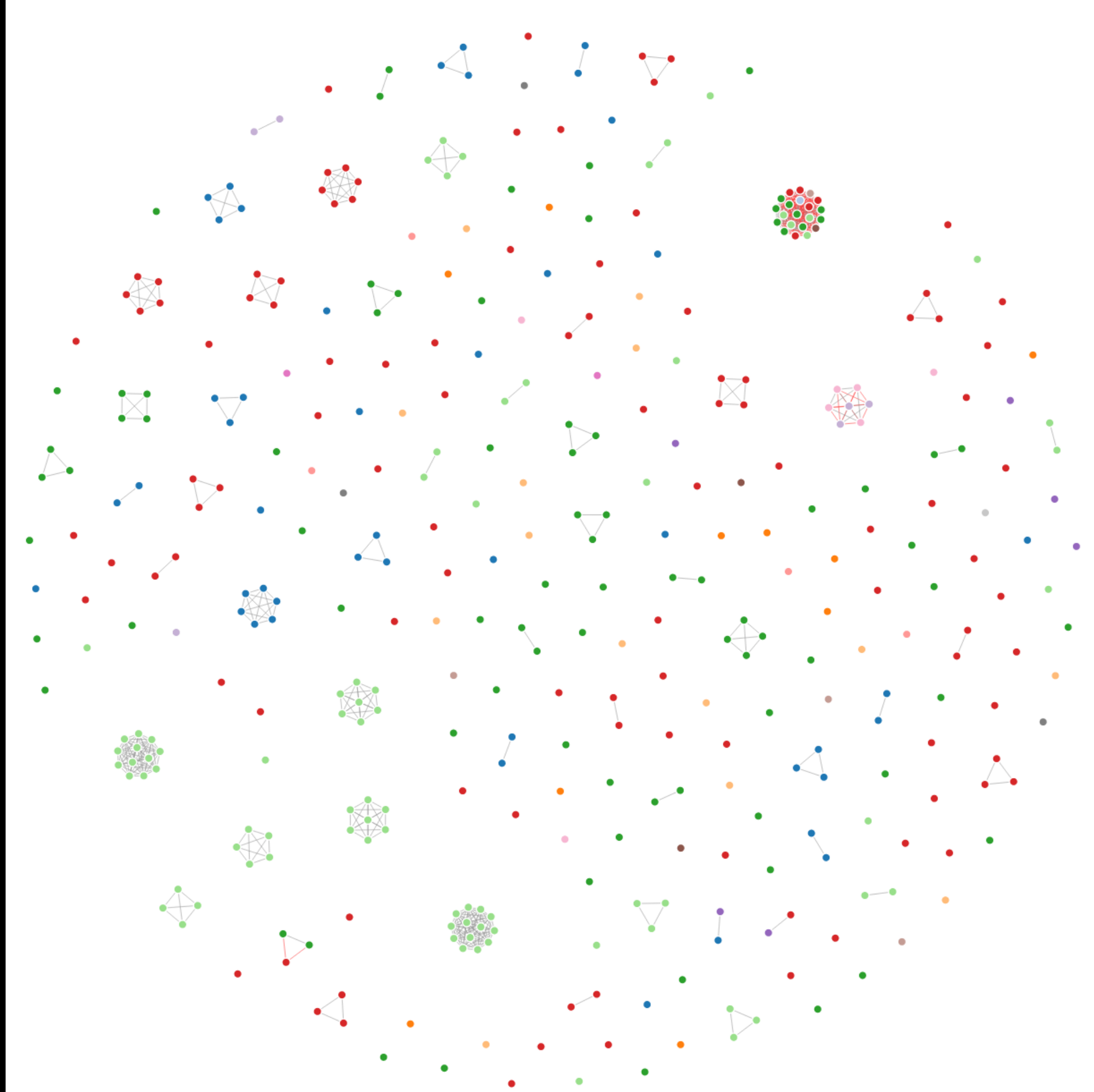
IMPHASH

- Binaries from SIX different campaigns
- No common Actor or Malware Family
- Different parts of the Kill chain



- Credential stealer and dropper from OP Arid Viper
- Vs. Droppers used by Attacks on the Syrian Opposition Forces
- No common attribution or KNOWN link

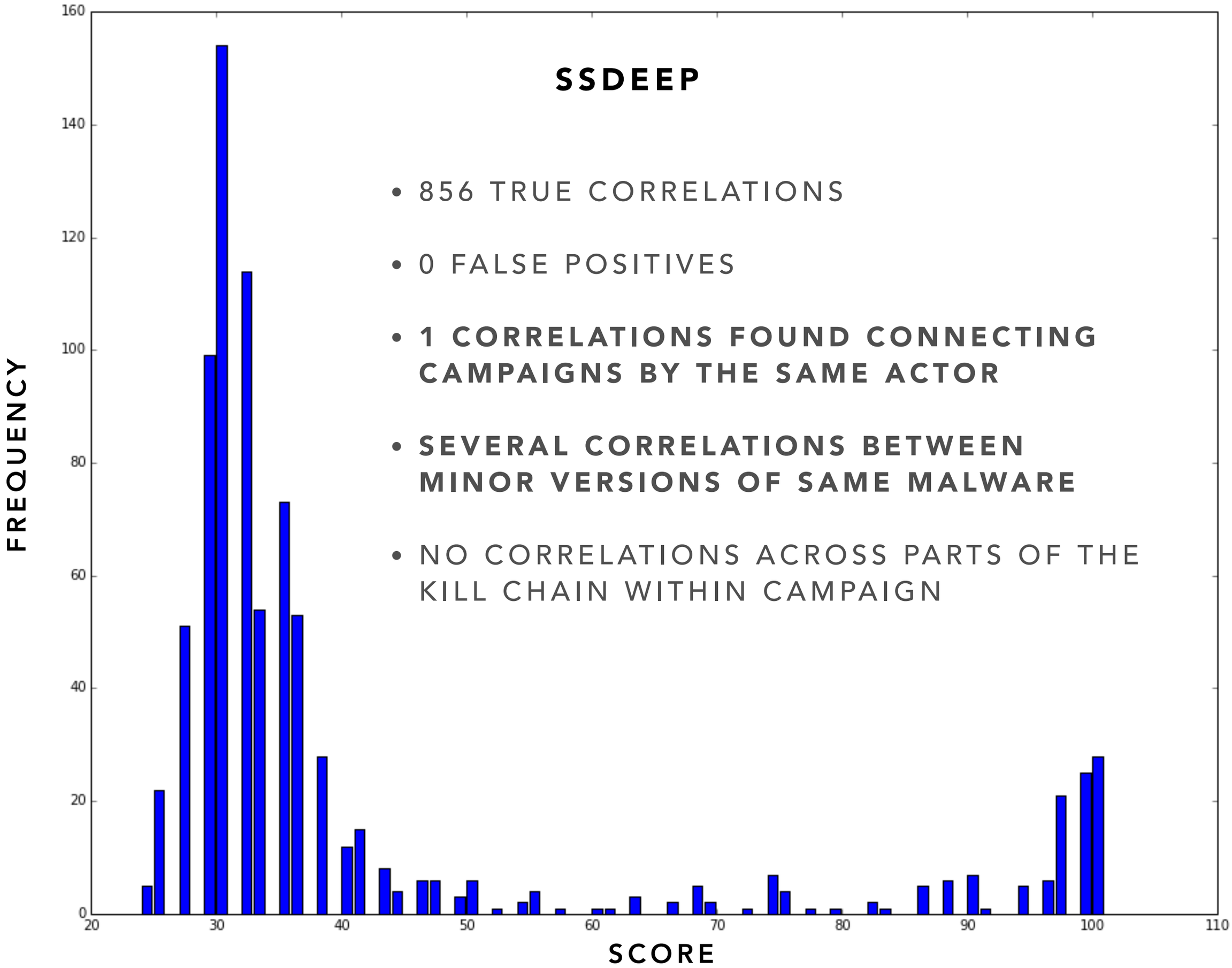
IMPHASH



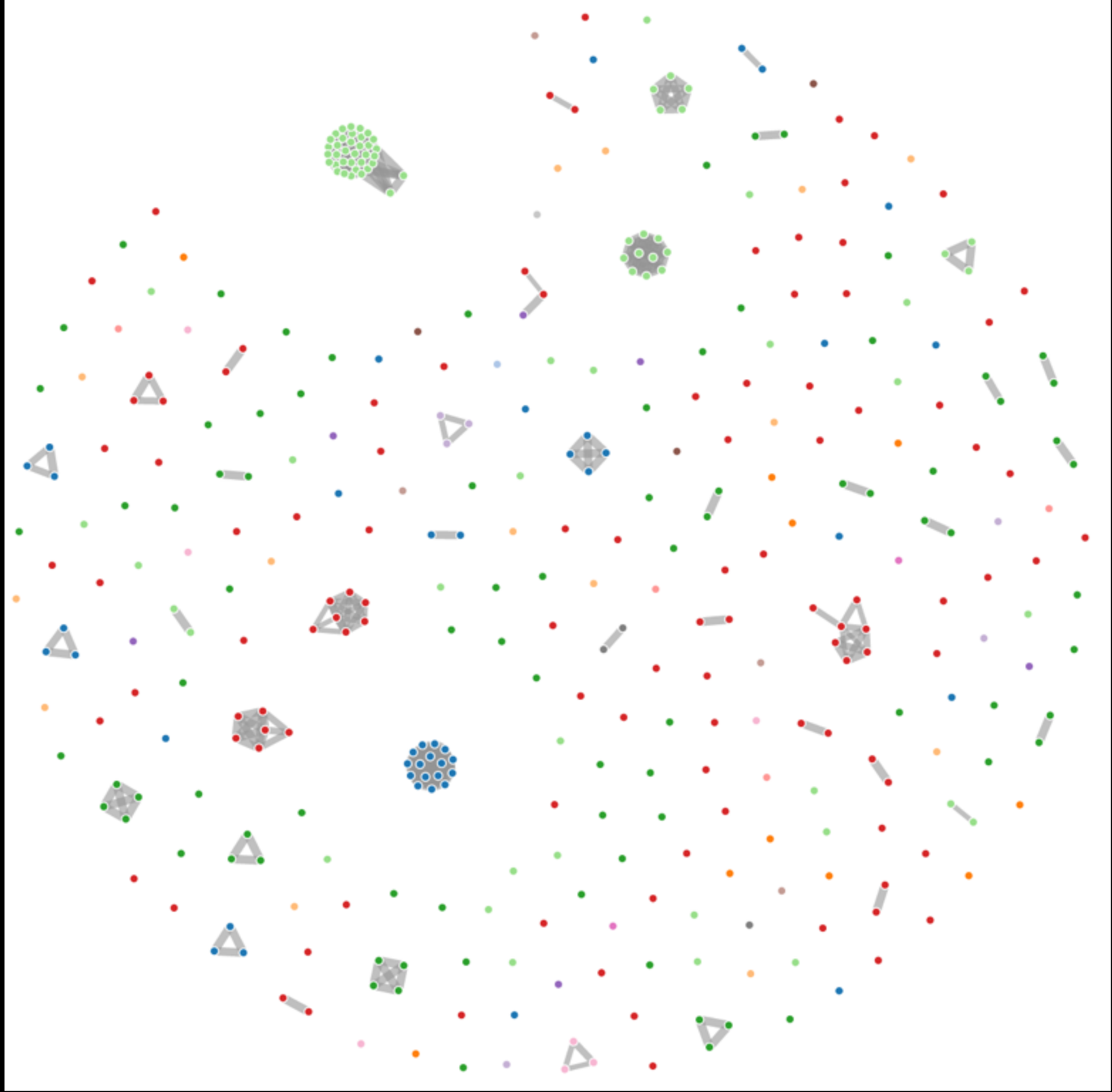
SSDEEP

SSDEEP

- 856 TRUE CORRELATIONS
- 0 FALSE POSITIVES
- **1 CORRELATIONS FOUND CONNECTING CAMPAIGNS BY THE SAME ACTOR**
- **SEVERAL CORRELATIONS BETWEEN MINOR VERSIONS OF SAME MALWARE**
- NO CORRELATIONS ACROSS PARTS OF THE KILL CHAIN WITHIN CAMPAIGN



SSDEEP

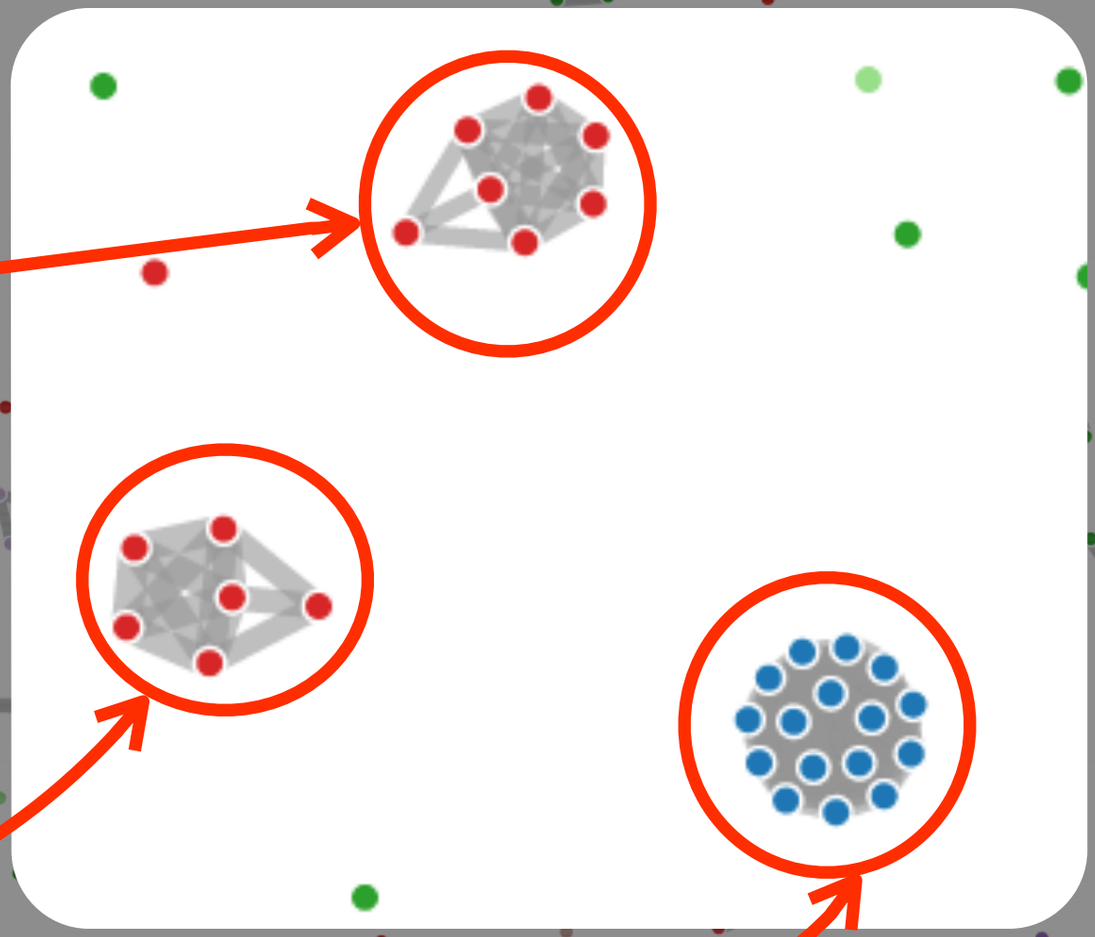


SSDEEP

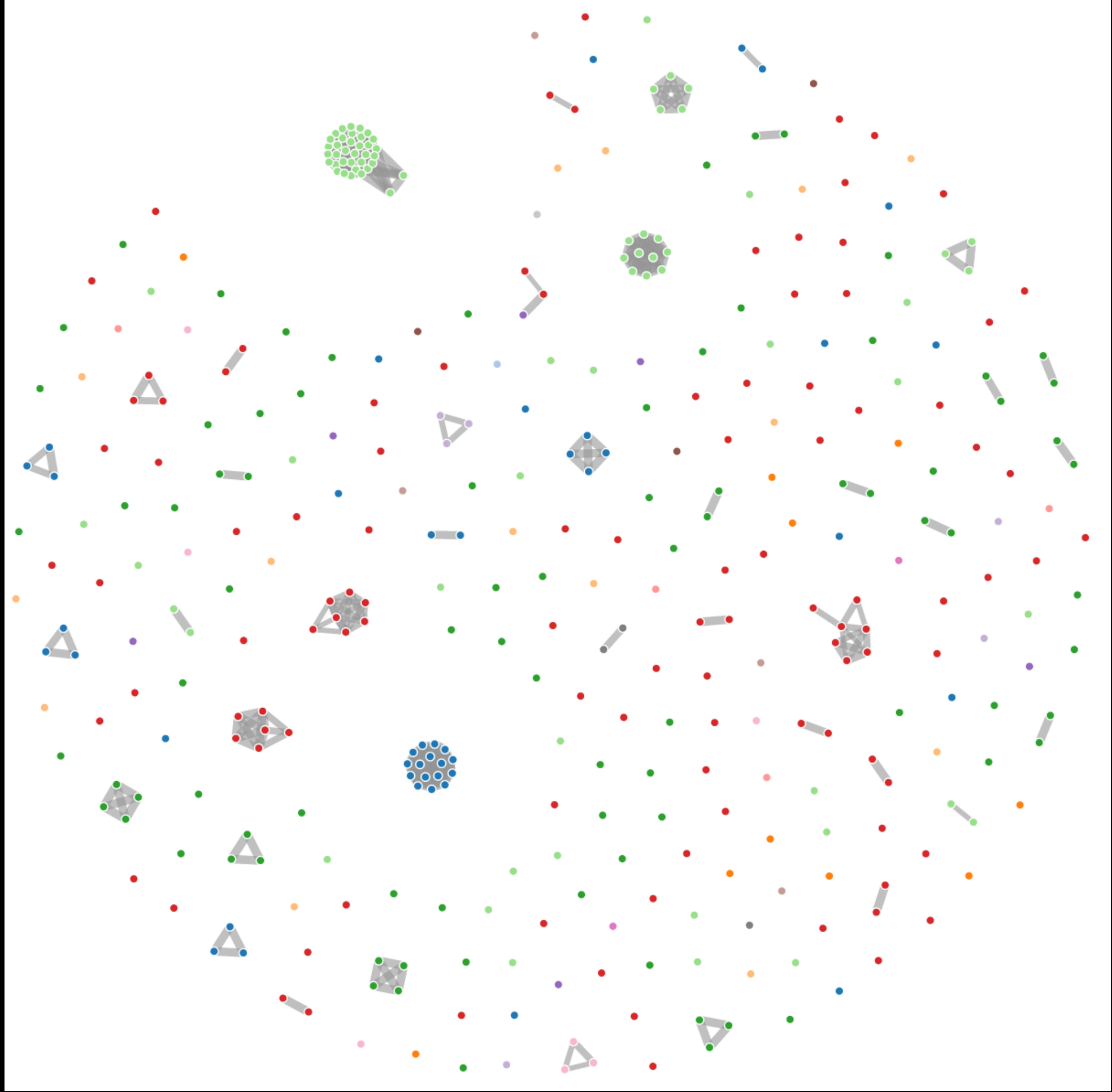
- SAV/Uruboros samples
- Used by the Waterbug Attack group
- Timestamped 2013

- Wipbot 2013
- Used by the Waterbug attack group

- Correlation across minor versions of ComRAT
- Compile dates span over 3 years

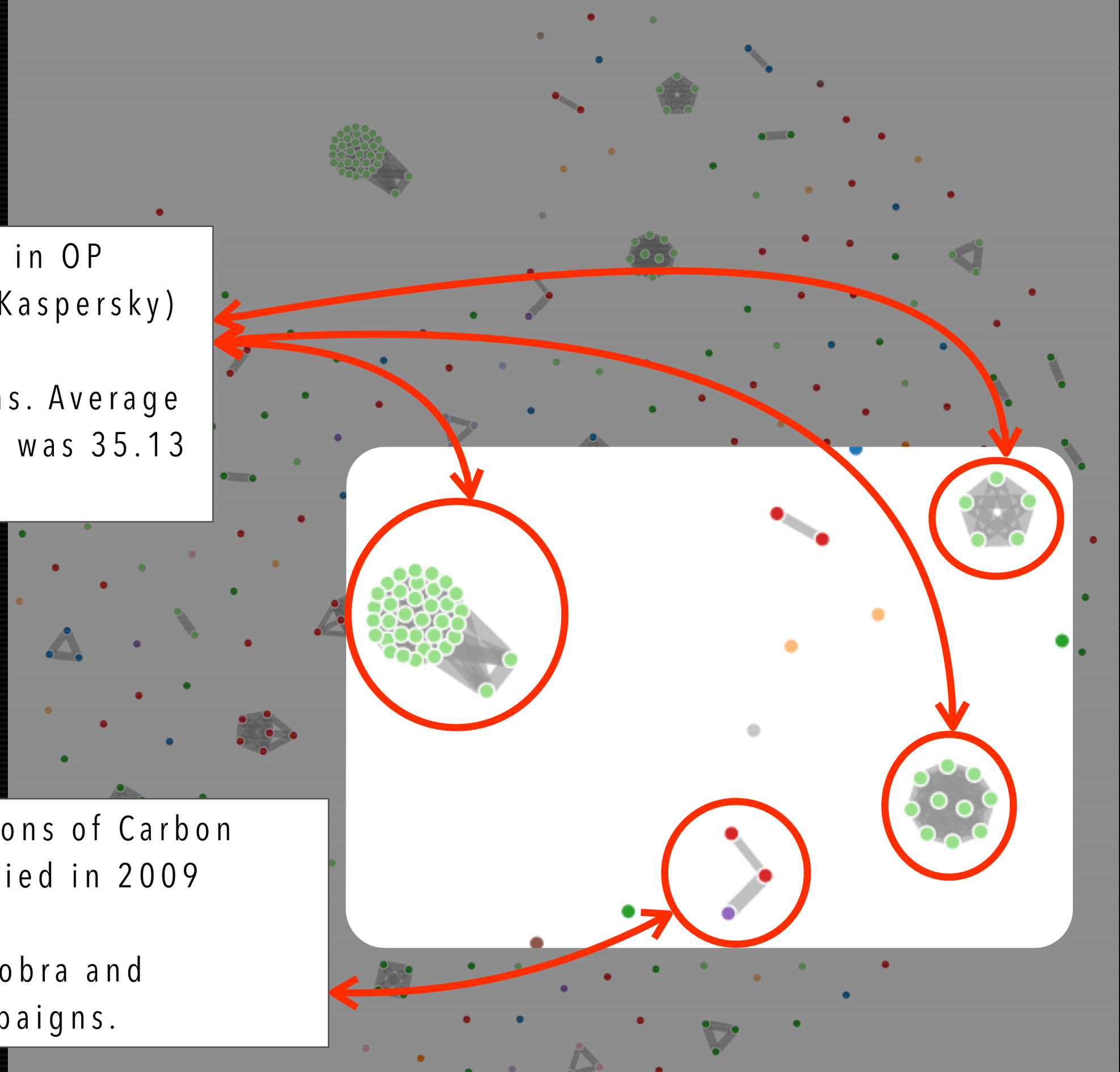


SSDEEP



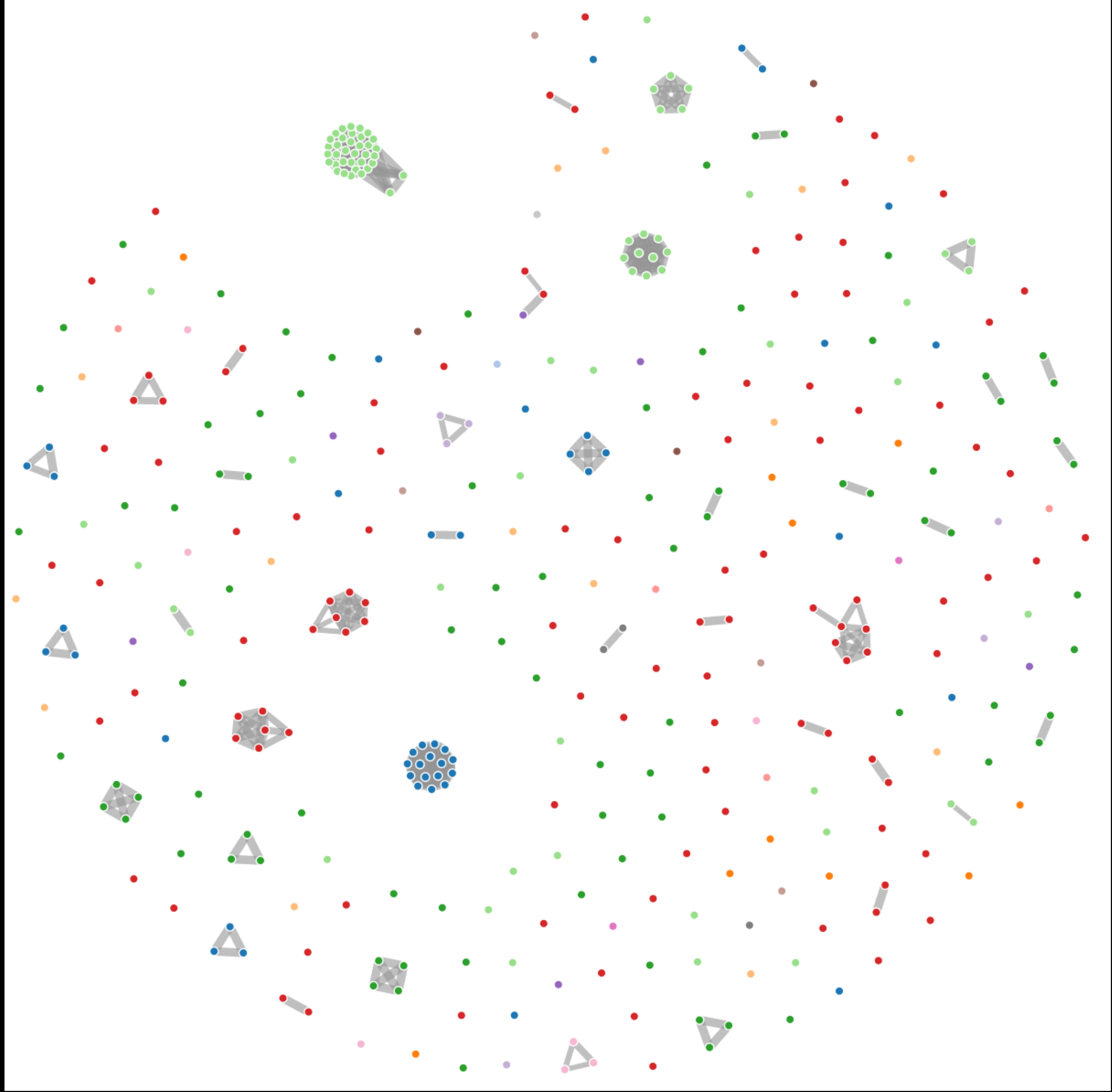
SSDEEP

- Backdoors used in OP Desert Falcon (Kaspersky)
- 630 Correlations. Average similarity score was 35.13



- Different Versions of Carbon Malware complied in 2009
- From Project Cobra and Waterbug Campaigns.

SSDEEP



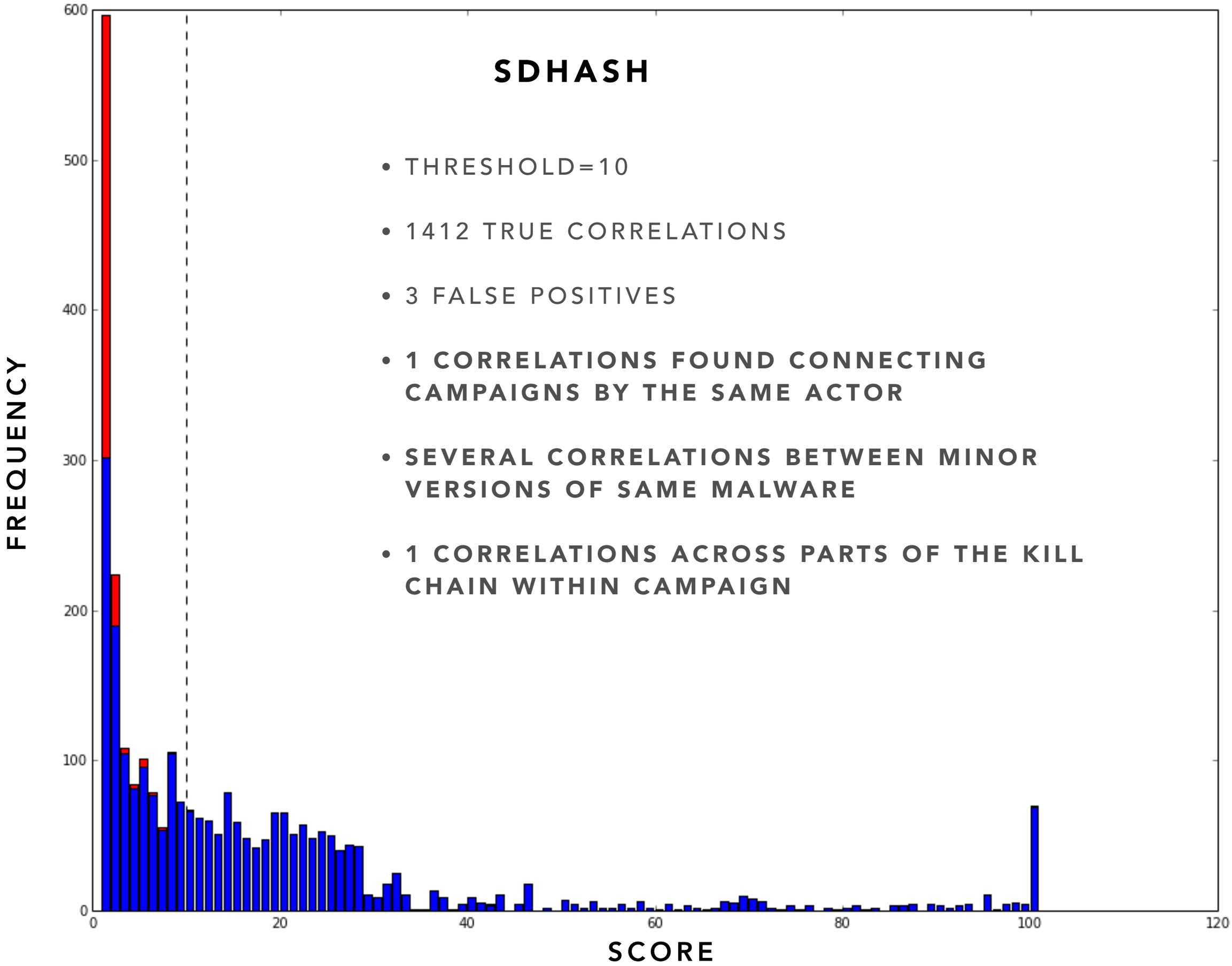
SSDEEP

NO FALSE POSITIVES

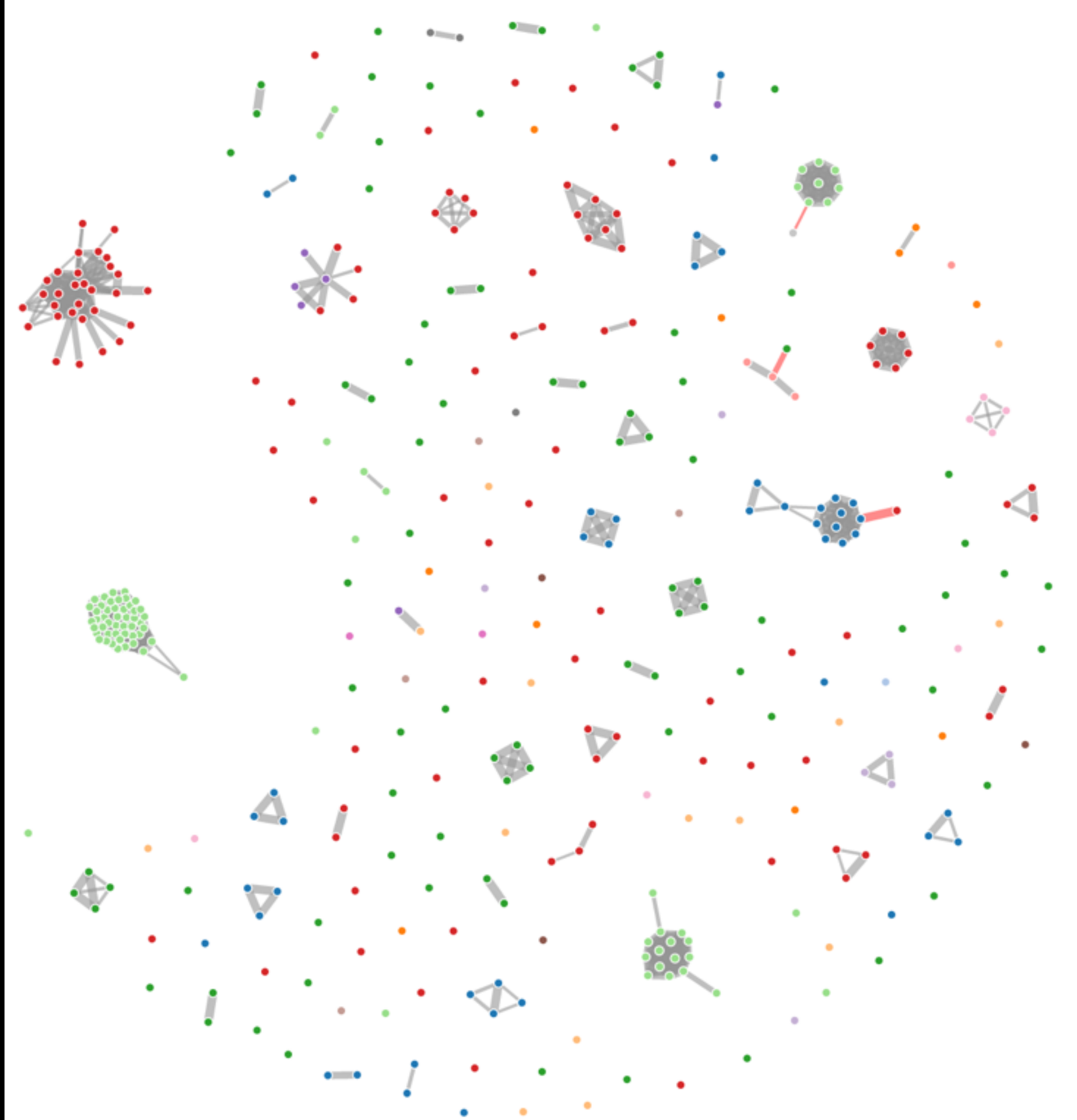
SDHASH

SDHASH

- THRESHOLD=10
- 1412 TRUE CORRELATIONS
- 3 FALSE POSITIVES
- **1 CORRELATIONS FOUND CONNECTING CAMPAIGNS BY THE SAME ACTOR**
- **SEVERAL CORRELATIONS BETWEEN MINOR VERSIONS OF SAME MALWARE**
- **1 CORRELATIONS ACROSS PARTS OF THE KILL CHAIN WITHIN CAMPAIGN**

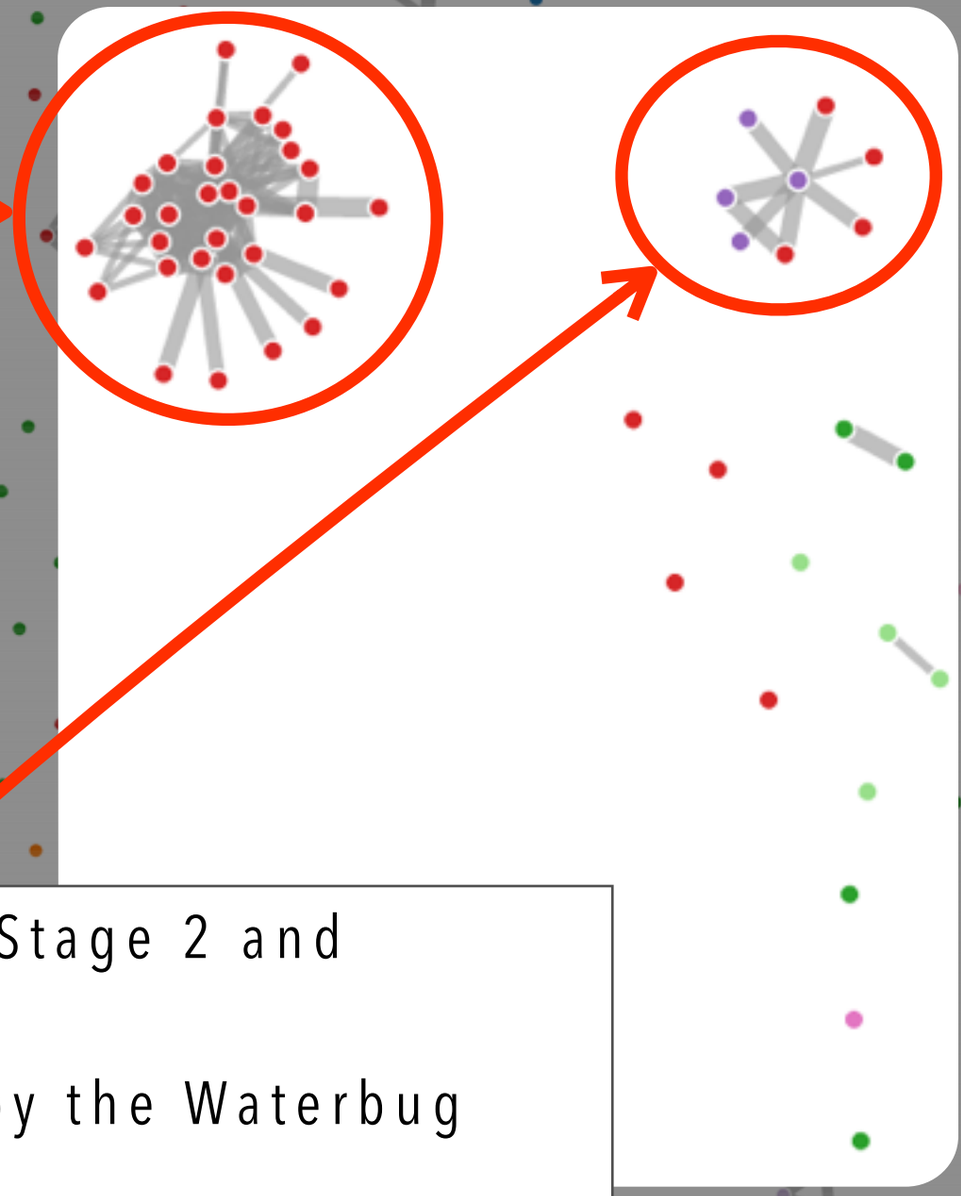


SDHASH



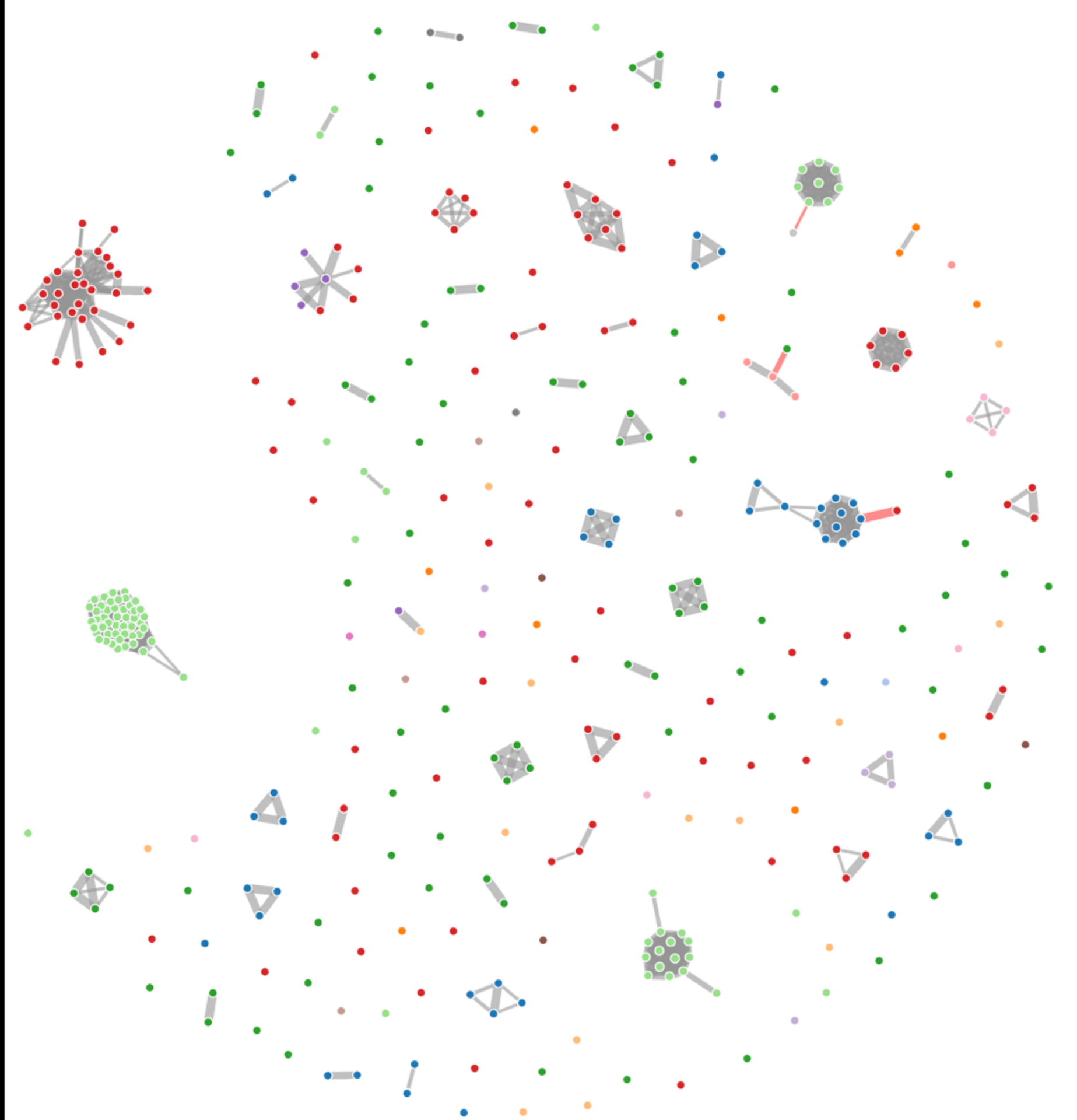
SDHASH

- SAV/Uruboros samples
- 30 different Binaries compiled over 3 months in 2013



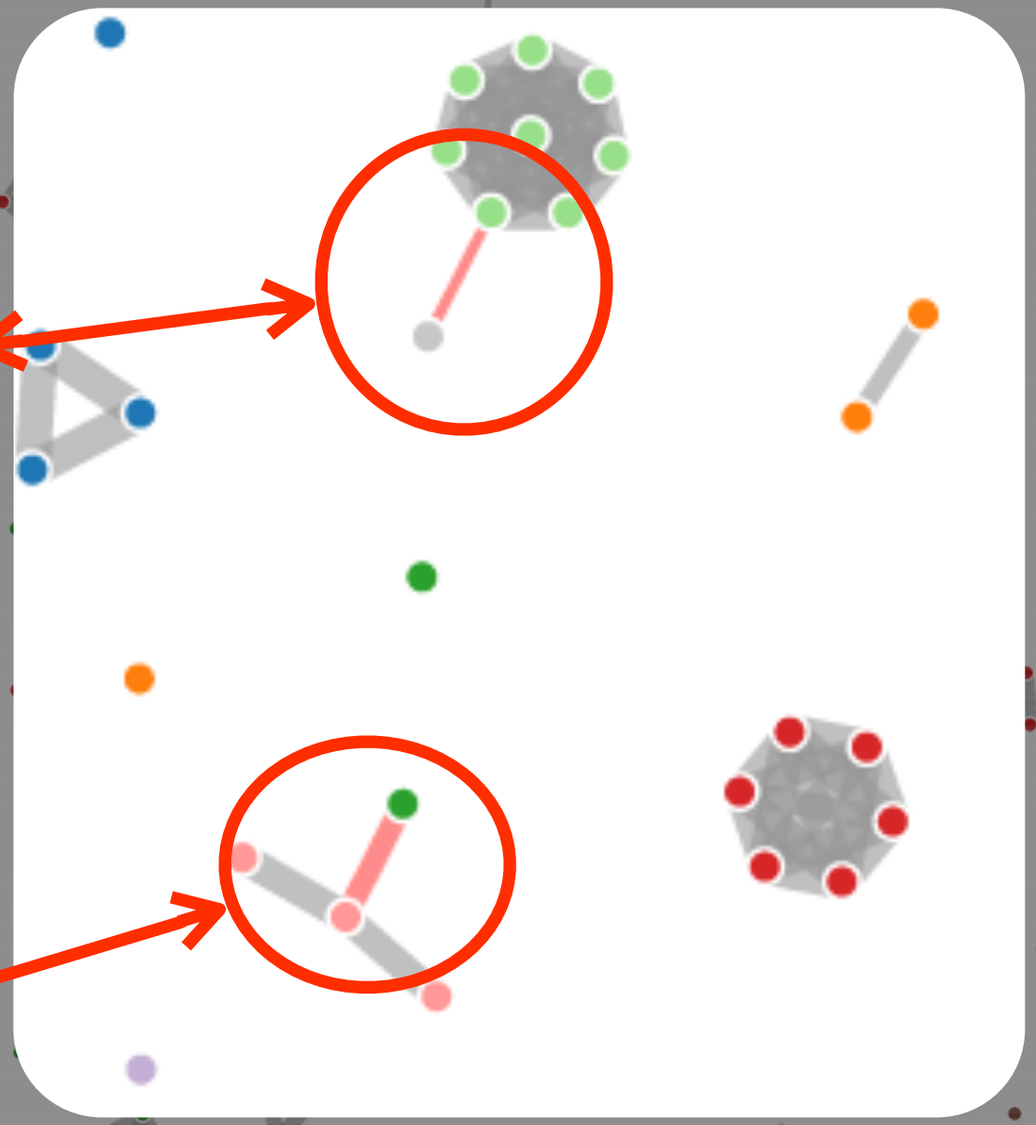
- Correlation between Dropper, Stage 1, Stage 2 and Injected Library of Cobra Campaign
- High similarity with Carbon Tool used by the Waterbug group
- Widely varying AV labels even controlling for vendor
- **Correlations made by sdhash only**

SDHASH



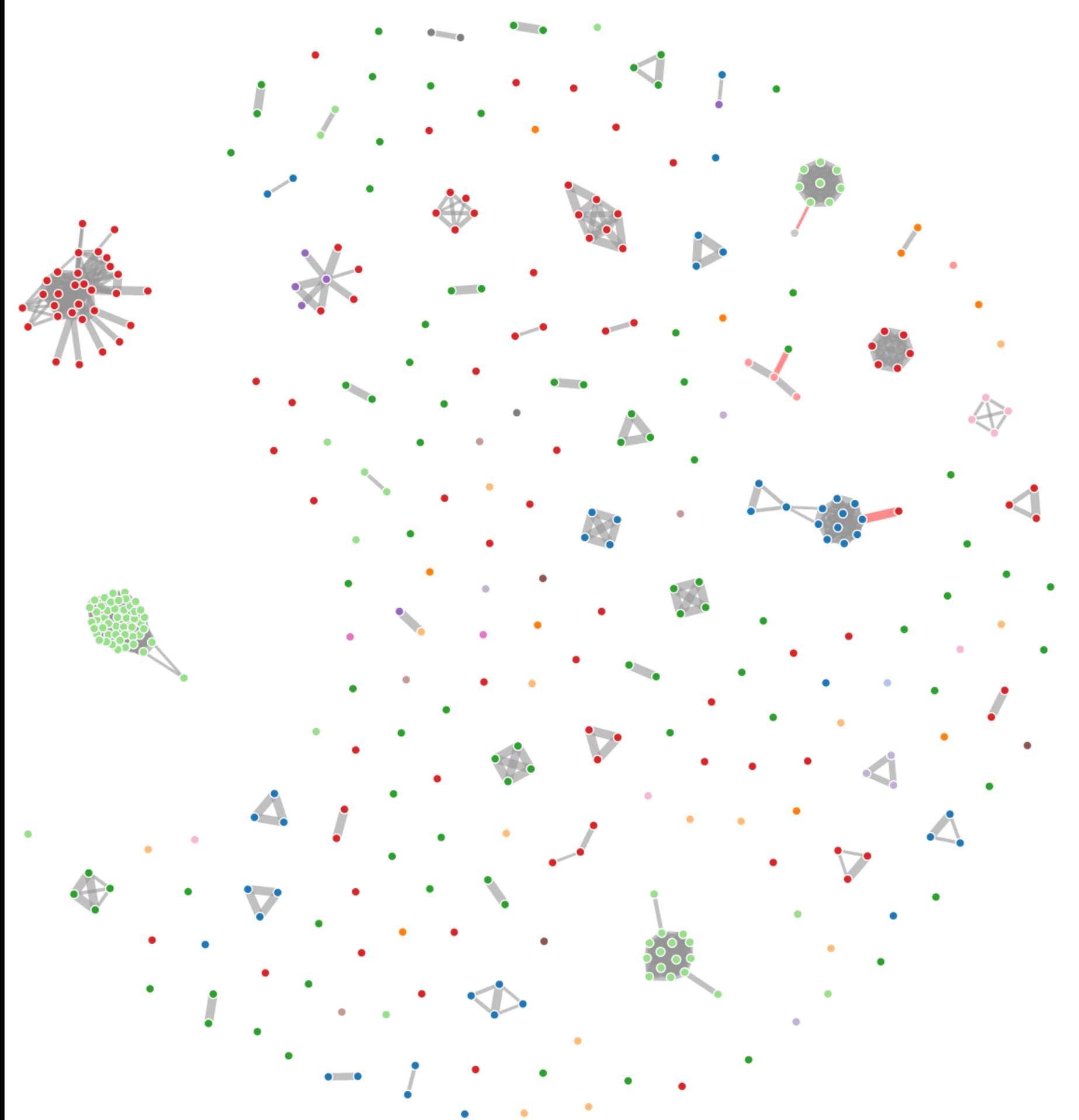
SDHASH

- Backdoor used by OP Desert Falcon
- Vs. Scanbox sample (known to be related to Anthem attacks and Deep Panda)
- No known relationship between those actors/campaigns/malware families



- "HttpBrowser"malware used in Anthem attack
- "AmmyAdmin" tool used by the Carbanak group

SDHASH



WHAT NEXT?

- Imphash, ssdeep, SDhash— which is best?
- It pays to know your adversary
- APT binaries may share code within campaign and actor— Code similarity can be used to connect binaries from the same source.
- Connections can help make strategic decision to respond to an adversary, NOT infection.

ACKS/Q&A/THANKS!

- Chris Kitto and Jeff Boerio for helping me make better slides.
- Wonderful folks that write Security white papers
- @kbandla for creating and maintaining APTNotes
- Virus Total for the great data they provide

@bsoman3, bhavna.soman@ {intel.com, gmail.com}