CYBER SECURITY DIVISION

2013 PRINCIPAL INVESTIGATORS'

Comprehensive Understanding of Malicious Overlay Networks

Georgia Institute of Technology

Wenke Lee

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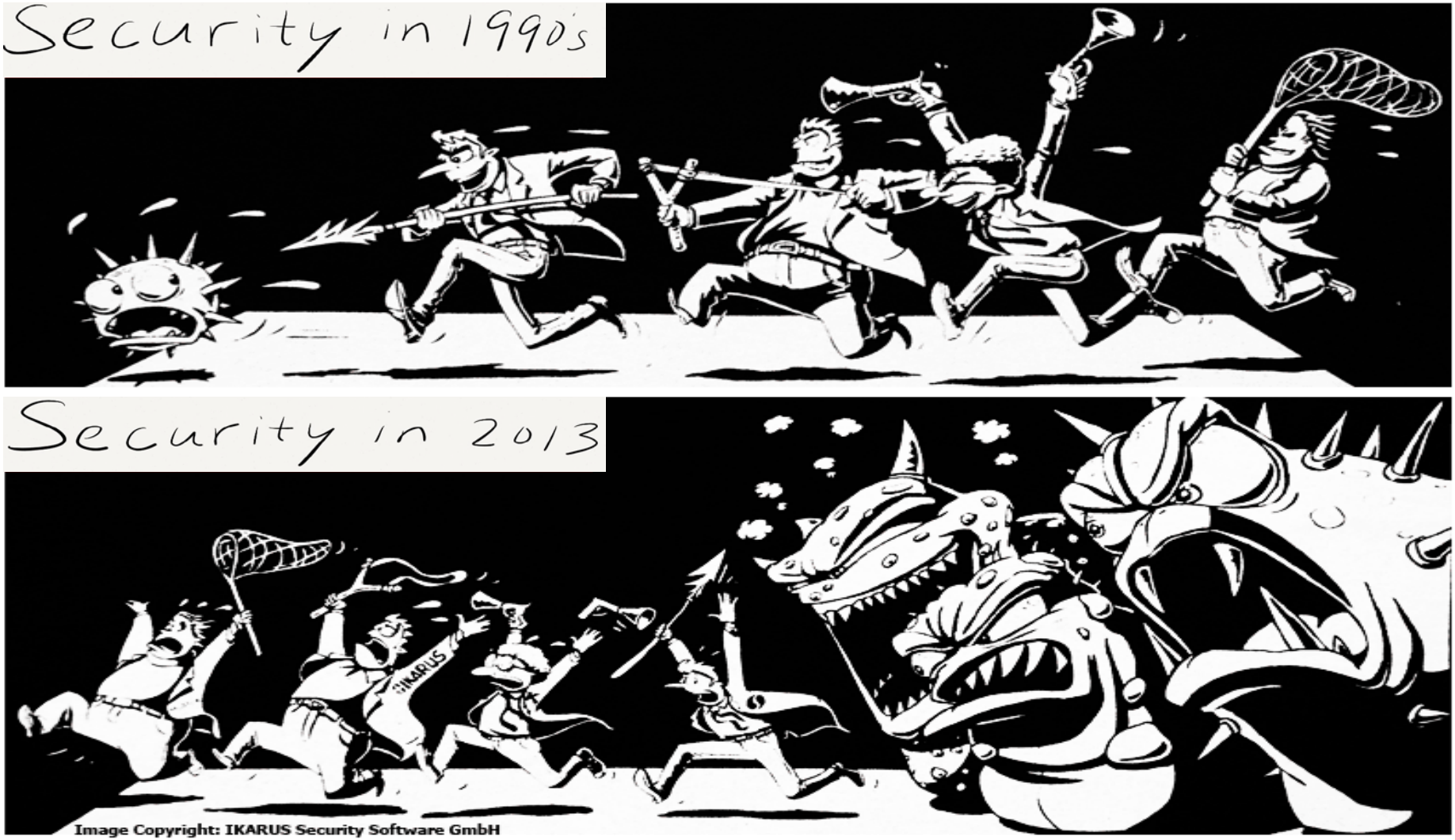
Homeland Security

Science and Technology

Team Profile

- *Georgia Tech and GTRI*
  - Wenke Lee, David Dagon, and Chris Smoak
- *University of Georgia*
  - Roberto Perdisci
- *Dissect Cyber*
  - April Lorenzen
- *Global Cyber Risk LLC*
  - Jody Westby
- *Open Information Security Foundation*
  - Matt Jonkman
- *Farsight Security*
  - Paul Vixie

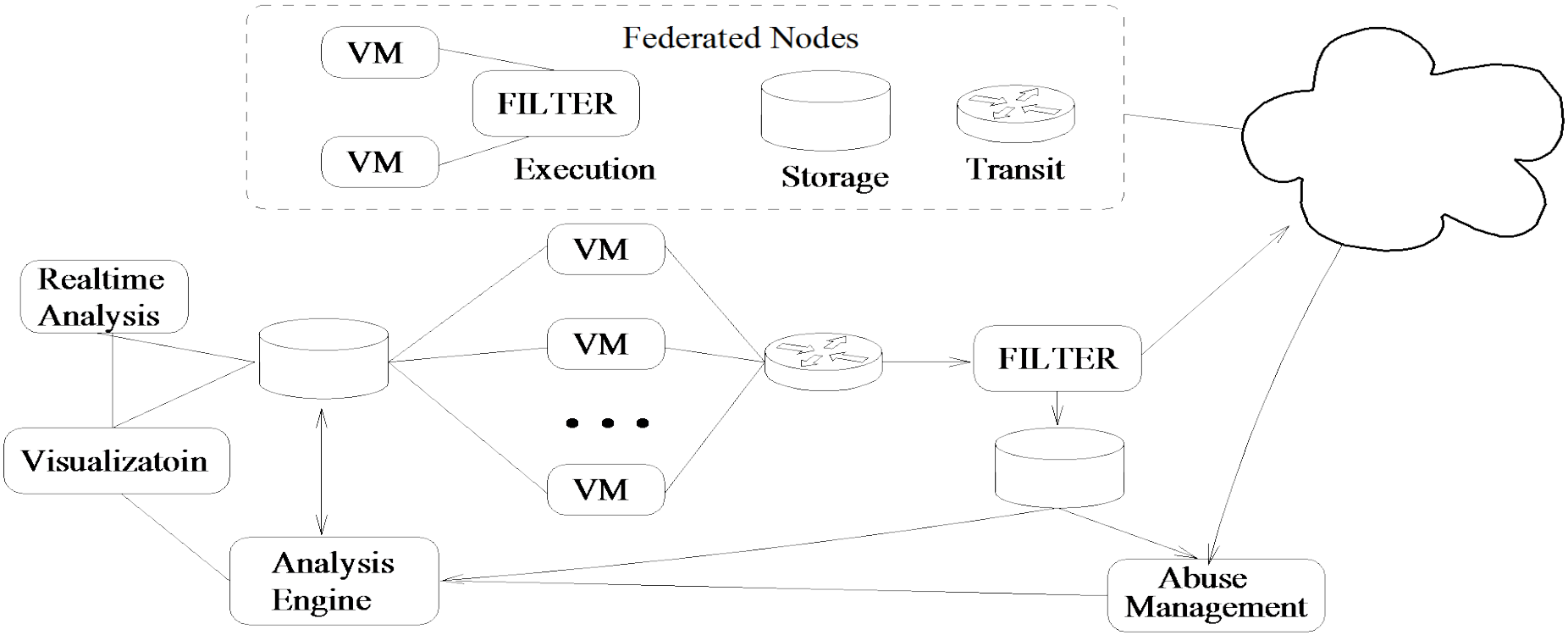
Customer Need



Customer Need

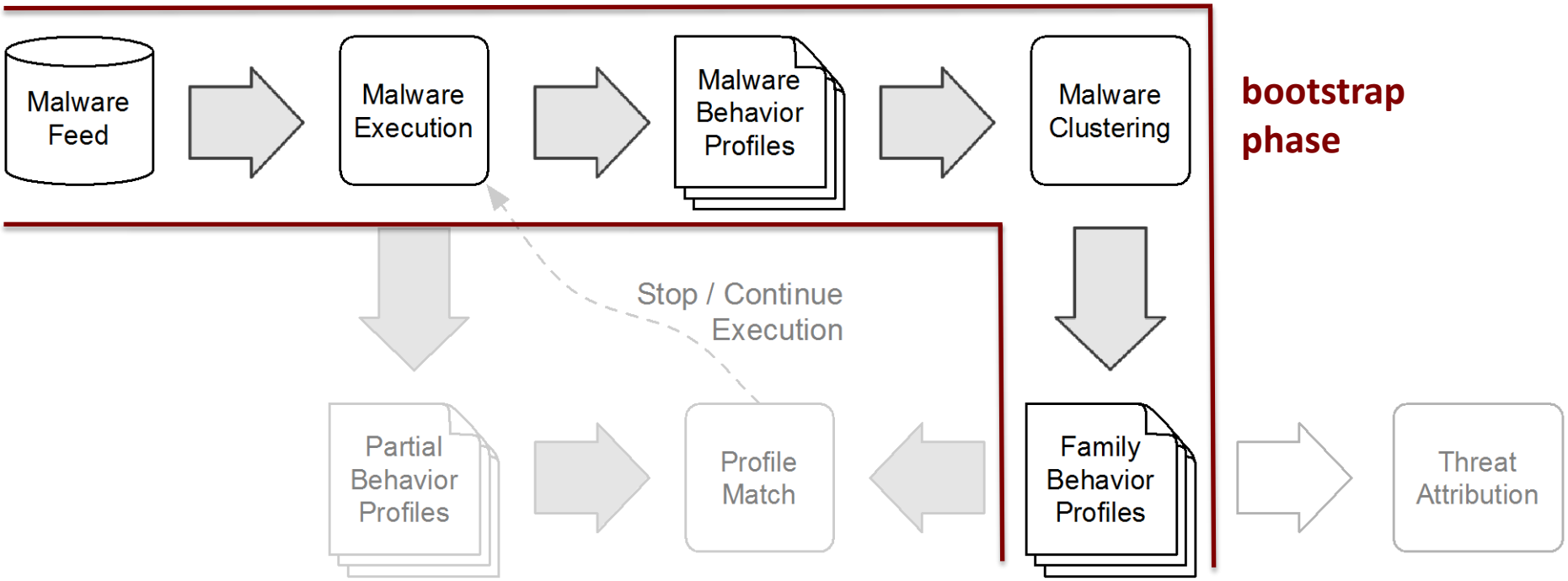
- Classify/cluster malware samples: known/family, new/capabilities
  - what really matters
- Attribution analysis: malware related in evolution and shared network infrastructures
  - how it happens
- Takedown

Approach: Federated Malware Execution



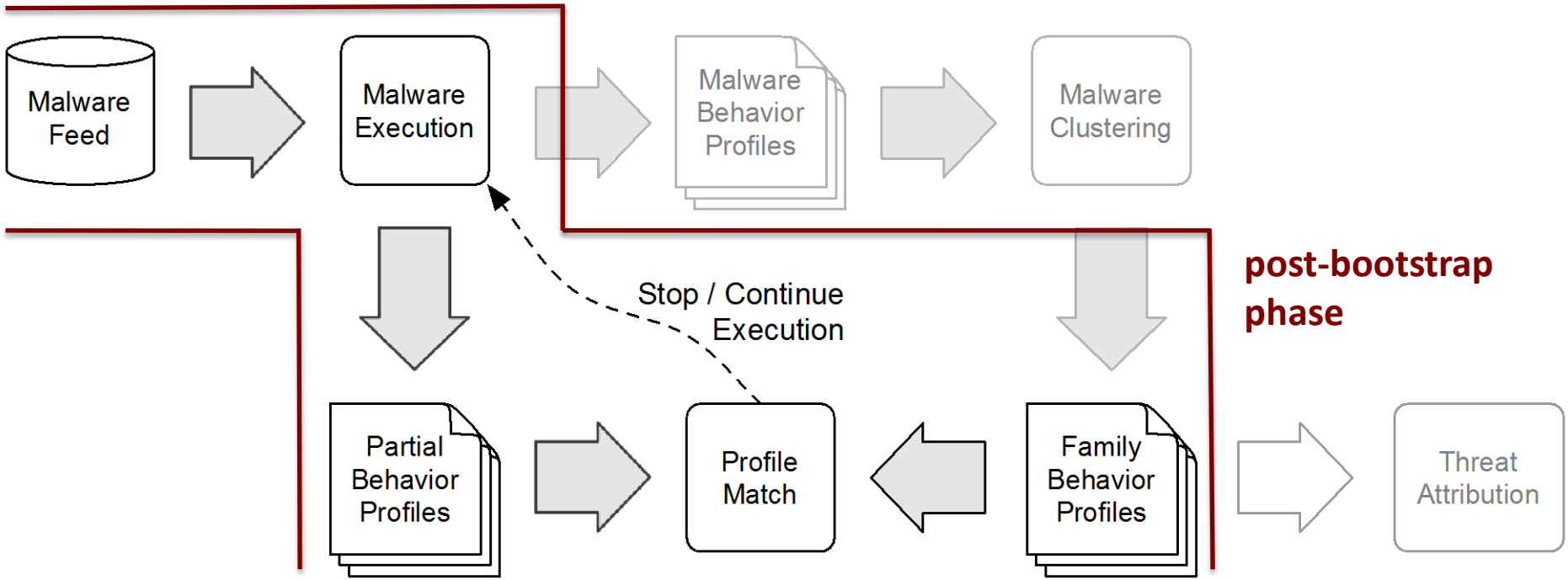
Approach: Scaling Execution

- Analyze “bootstrap” malware dataset
  - Run each sample for a relatively long time (e.g., few hours)
  - Group samples that behave similarly into *malware families*
  - Extract *family behavior profiles* for each malware family

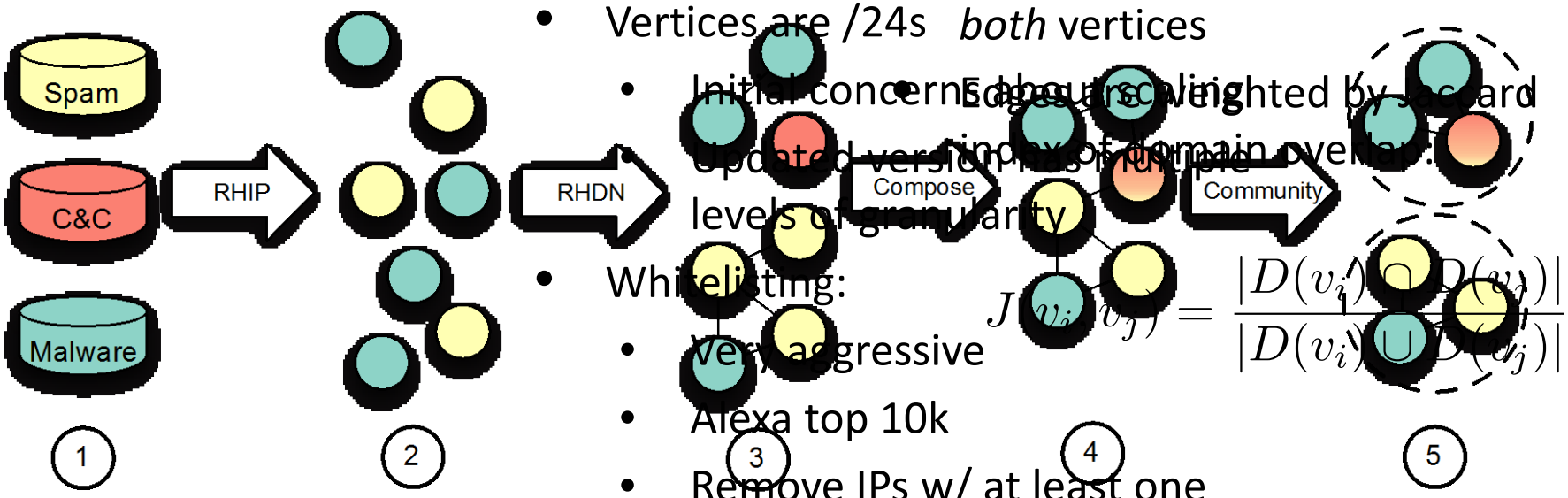


Approach: Scaling Execution

- Running new samples (post-bootstrap phase)
  - Frequently vet network/system behavior against family behavior profiles
  - If a profile matches a known family:
    - do malware in the family exhibit new behaviors if run for longer?
  - Stop/continue execution accordingly



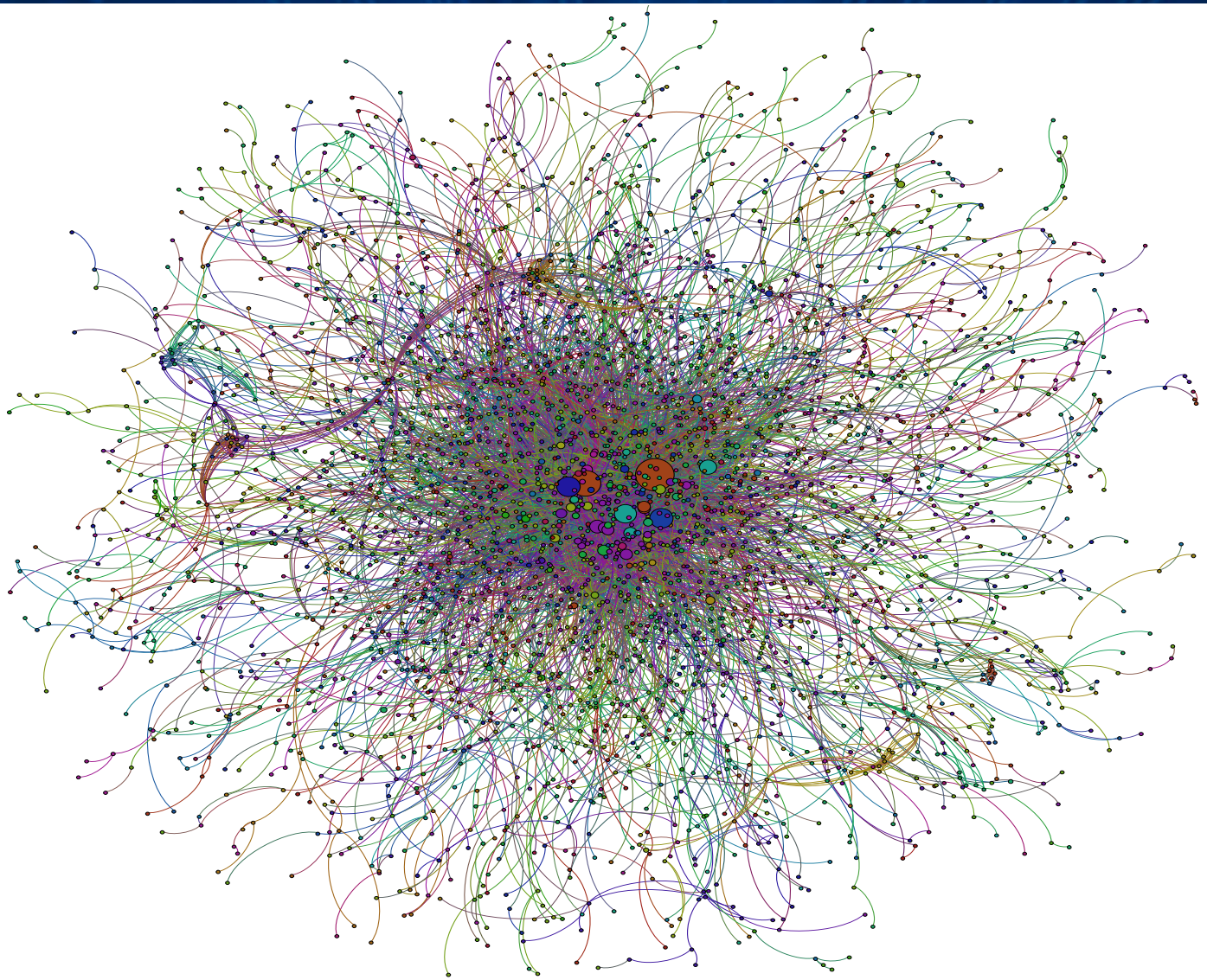
Approach: Identify Criminal Network



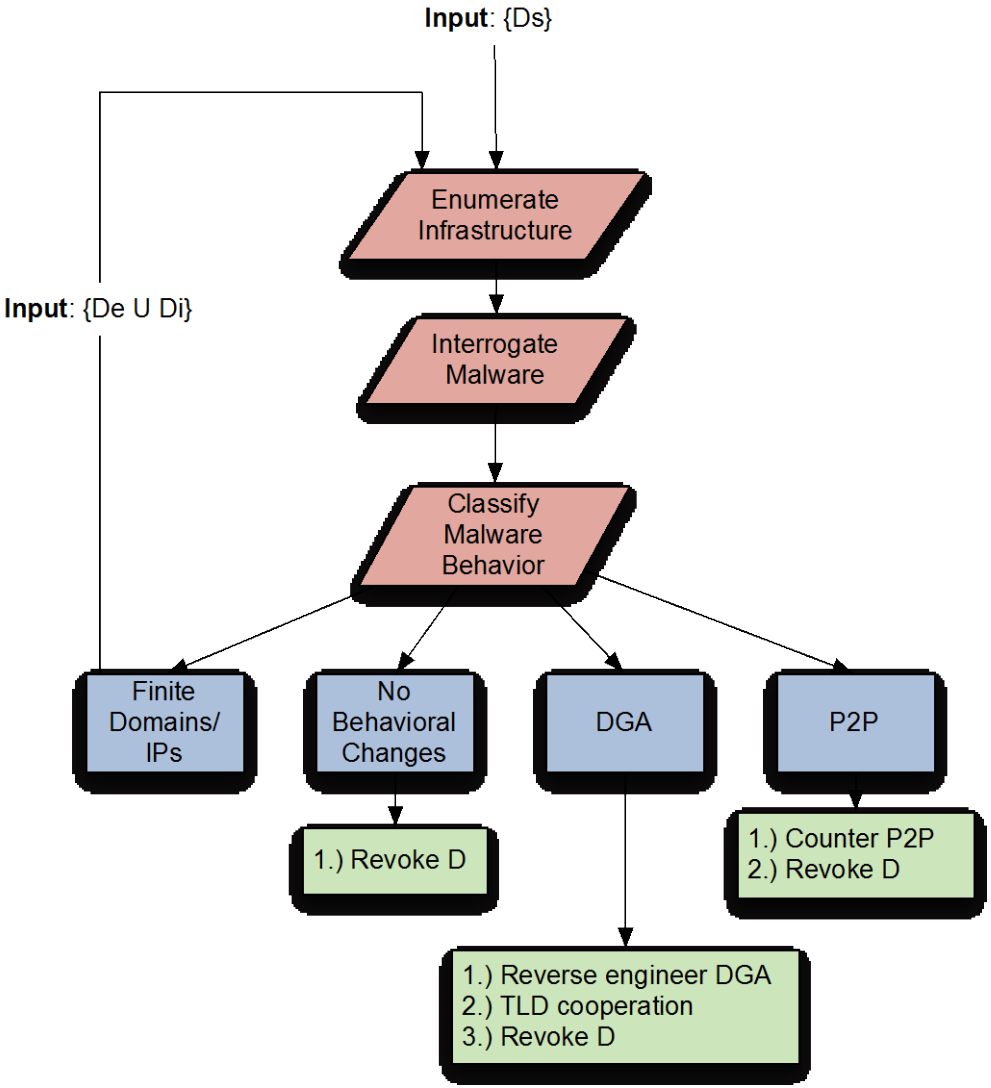
- RHIP on all domains pulled each day
- Vertices are /24s
  - Initial concern about single
  - Updated version has multiple levels of granularity
- Whitelisting:
  - Very aggressive
  - Alexa top 10k
  - Remove IPs w/ at least one RHDN in whitelist
    - e.g., doubleclick
- Edges denote historical overlap in domain name resolutions to *both* vertices
- Edges are weighted by Jaccard index of domain overlap

$$J(v_i, v_j) = \frac{|D(v_i) \cap D(v_j)|}{|D(v_i) \cup D(v_j)|}$$

Example: Rustock Criminal Network



Approach: Takedown Recommendation



Benefits

- Improved malware intelligence and situation awareness
  - Define legal boundaries for “live” malware analysis
  - Collection of malware intelligence at scale
- Improved remediation efforts
  - Recommendations for more effective takedowns

Current Status

- Legal issues associated with FMAS
  - Identified applicable laws, developing operational documents, agreements, and policies
- Developed malware clustering algorithms based on output of static and dynamic analysis
- Developed preliminary versions of attribution and takedown recommendation algorithms
- Papers accepted to the 2013 ACM CCS and RAID

Next Steps

- Complete legal framework for FMAS within the next six months
- Start scaling and improving malware clustering, attribution, and takedown recommendation systems
- PI and Co-PI are (co)founders of security start-ups
  - Data from real-world environments
  - Direct evaluation and transition technologies

Contact Information

- Wenke Lee: wenke@cc.gatech.edu
- David Dagon: dagon@sudo.sh
- Roberto Perdisci: perdisci@cs.uga.edu