Reproducible and Adaptable Log Data Generation for Sound Cybersecurity Experiments

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Introduction

- Numerous organizations are hit by data breaches and ransomware attacks
- Timely detection and analysis are vital to limit the damage
- Log data are an invaluable source for detection and analysis

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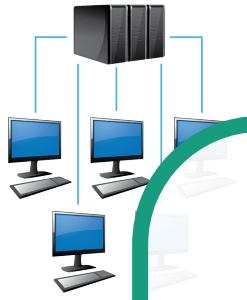
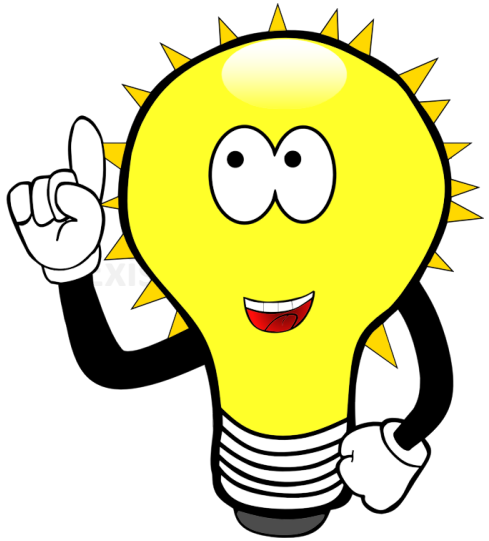
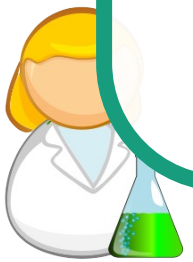
Motivation: Log Data Sources and Their Challenges







- No access or no permission to perform experiments
- Others cannot adapt the testbed to build on results

The scientific community requires

reproducible and adaptable testbeds

for log data generation

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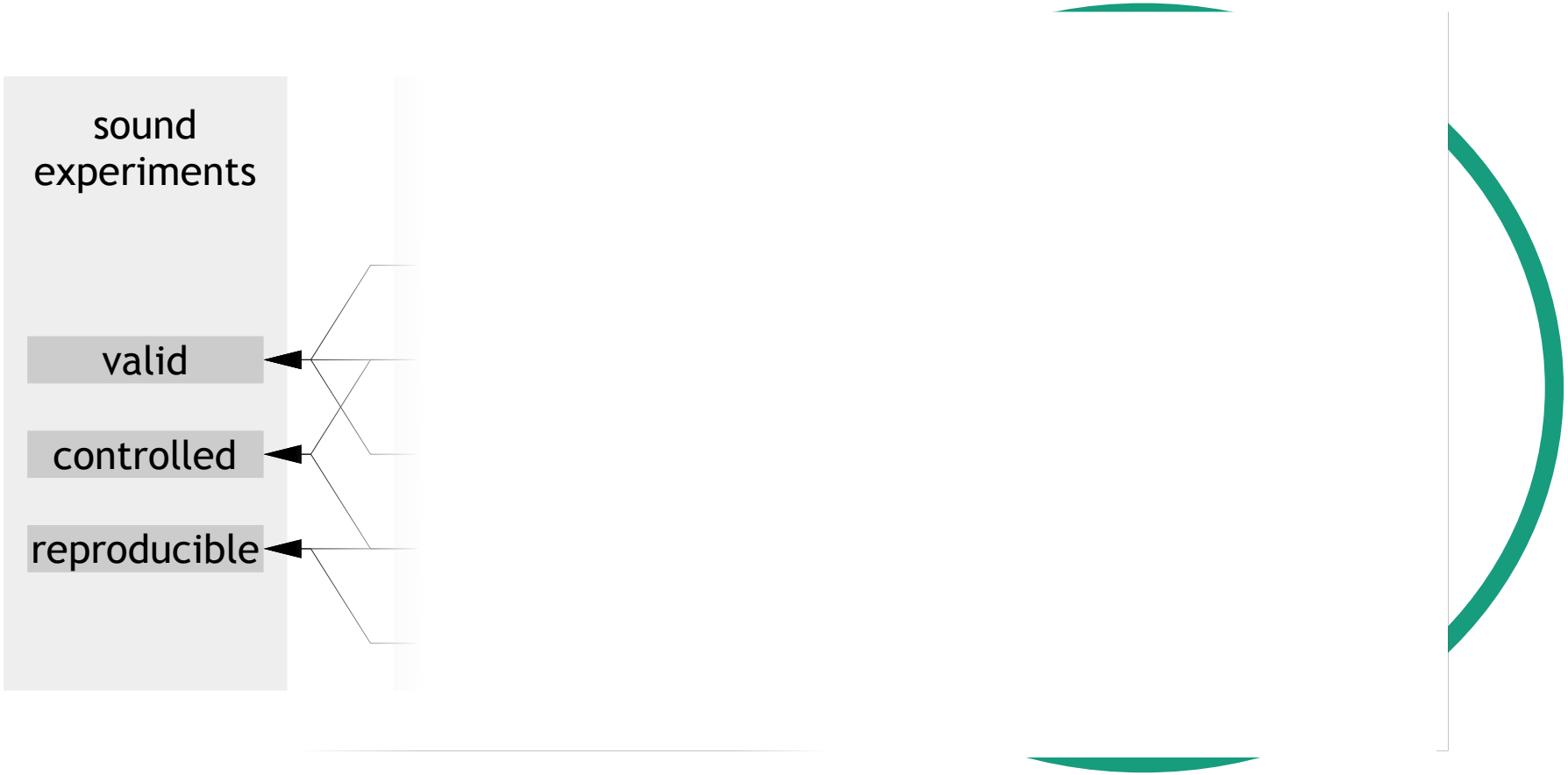
Testbed Requirements



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Proof-Of-Concept Testbed: SOCBED

Self-Contained Open-Source Cyberattack Experimentation Testbed

Main features

- Simulation of a small company's network using virtual machines
- Simulation of user activity (web surfing, emailing, file editing)
- Simulation of common multi-step cyberattacks
- Best-practice log data collection
- Optional collection of network traffic

fkie-cad/socbed

Distinctive design principles

- Runs on commodity computers, open source, full infrastructure as code
- Self-contained, numerous self-tests (unit and system)
- Deterministic user activity and fully scriptable attacks

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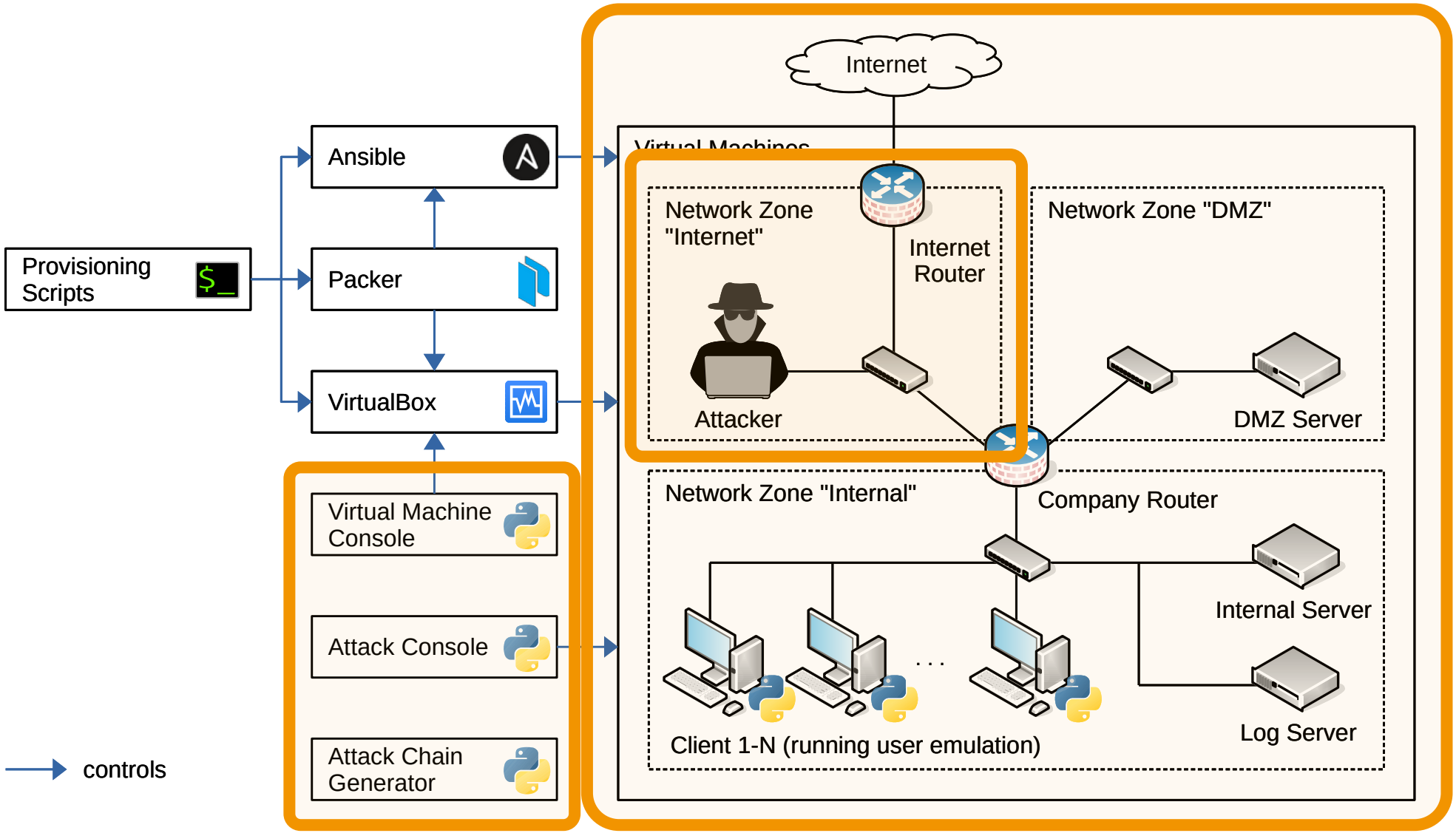
SOCBED Architecture



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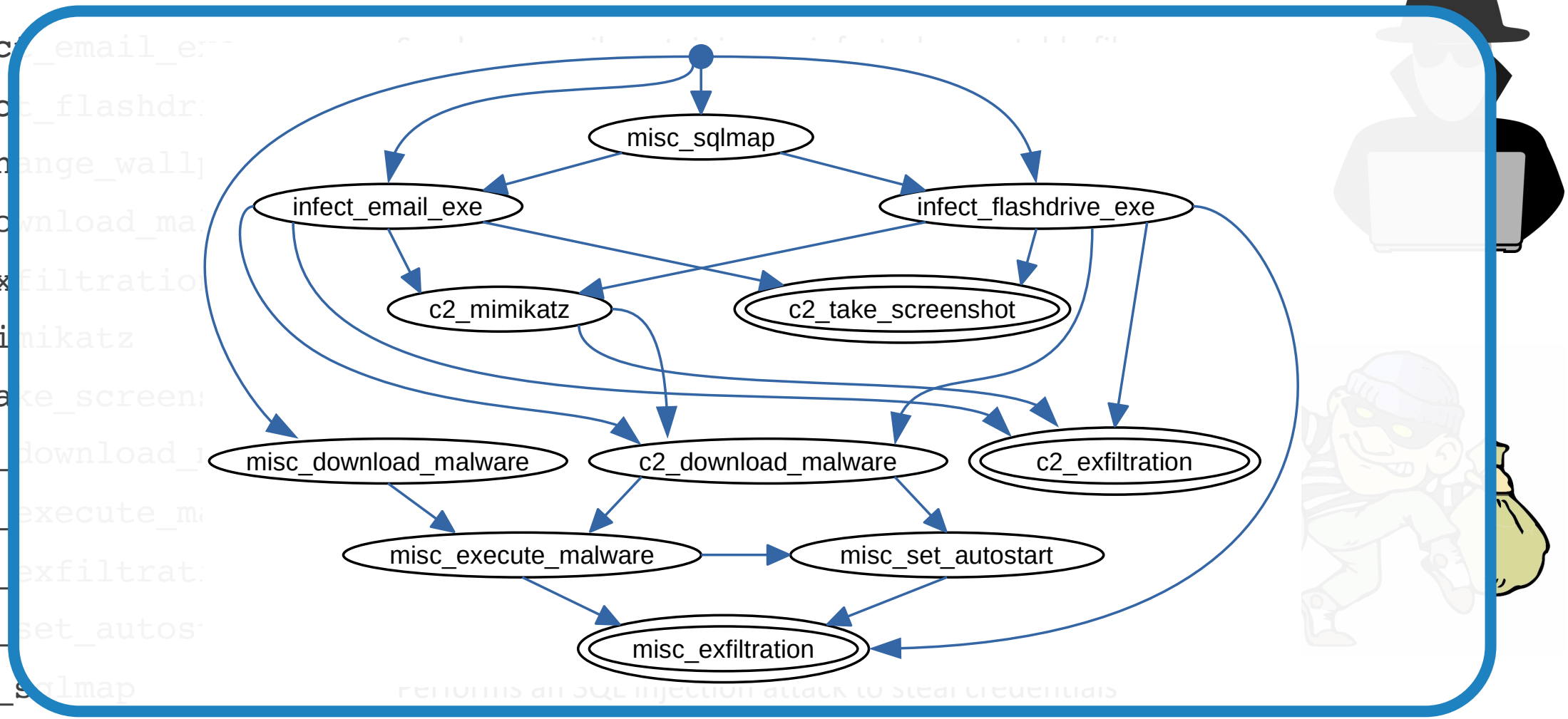
SOCBED Cyberattacks



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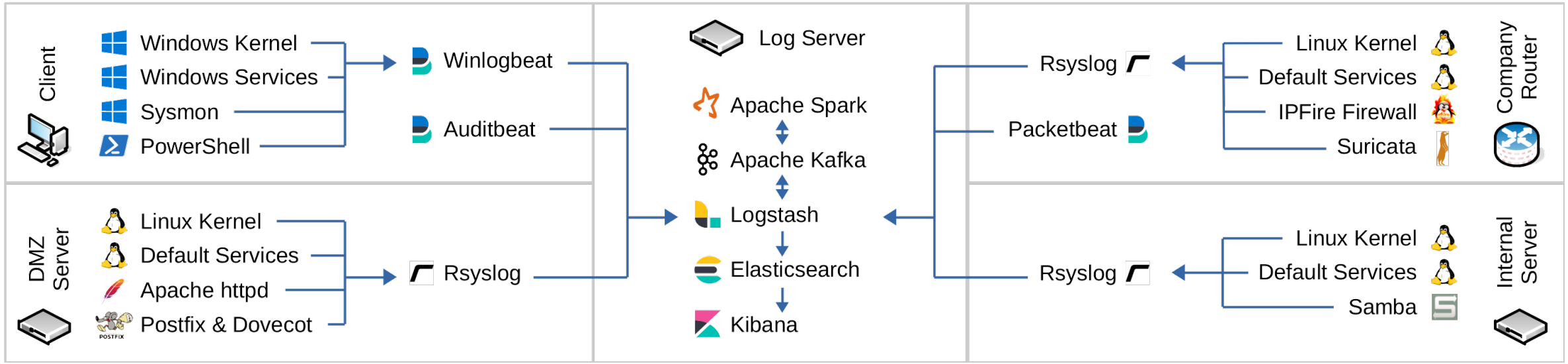
SOCBED Logging Facilities



- Log data collection from numerous sources
- Storage, search and visualization on a dedicated log server
- Easy download to create log datasets

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Evaluation

Goal	Show that SOCBED facilitates sound experiments
Approach	Show that exemplary experiment is valid, controlled, and reproducible
Experiment	Compare logging configs for detection of multi-step attack
Iterations	Repeated ten times on two independent hosts
Results	Consistent attack detection under reproduction and adaptation
Conclusion	**SOCBED facilitates sound experiments**

Attack step
(1) Scan and exploit web server
(2) Send email with malware
(3) Open malicious attachment
(4) Capture screen
(5) Collect cached credentials
(6) Search network & download files
(7) Download custom backdoor
(8) Set autostart for backdoor
(9) Execute backdoor
Number of detected attack steps

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Summary

- Log data are crucial for cybersecurity research
- Testbeds are an important means for generating log data
- Existing testbeds lack reproducibility and adaptability
- SOCBED is a proof-of-concept testbed to facilitate sound experiments
- SOCBED and our evaluation dataset are freely available on GitHub

`fkie-cad/socbed`

`fkie-cad/socbed-eval-acsac-2021`

Please see our paper for more details. Thank you very much for your attention!

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