
K8s Adversary Emulation
Adopting an Attacker's Mindset for Kubernetes Security

# Whoami

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Product Manager @ Cast AI

Former security researcher @ Dynatrace

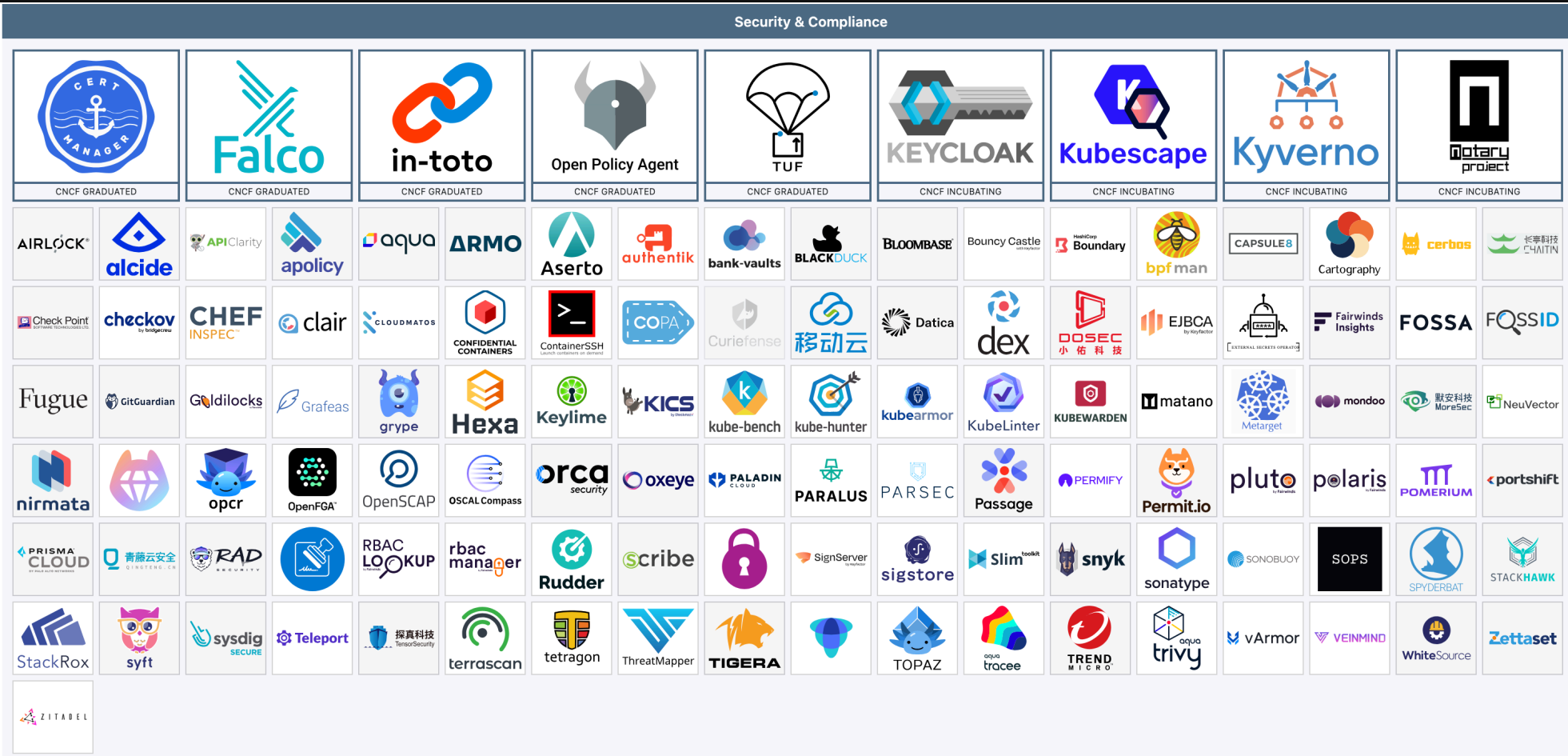
Enjoys exploring cybersecurity and AI

Magier Markus

# Whois Molly?

- New and only **SecOps Engineer** at Wish Ltd.
  - Wish Ltd. has ~300 employees
  - Heavy use of Kubernetes
- Previously ~3 years experience as SRE
- Responsible for “securing” the product

# What does "secure" mean?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KICS
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Metarget
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NeuVector
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orca security
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PARSEC
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Permit.io
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polaris
POMERIUM
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PRISMA CLOUD
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RAD SECURITY
RBAC LOOKUP
rbac manager
Rudder
scribe
SignServer
sigstore
Slim
snyk
sonatype
SONOBUOY
SOPS
SPYDERBAT
STACKHAWK
StackRox
syft
sysdig SECURE
Teleport
terrascan
tetragon
ThreatMapper
TIGERA
TOPAZ
tracee
TREND MICRO
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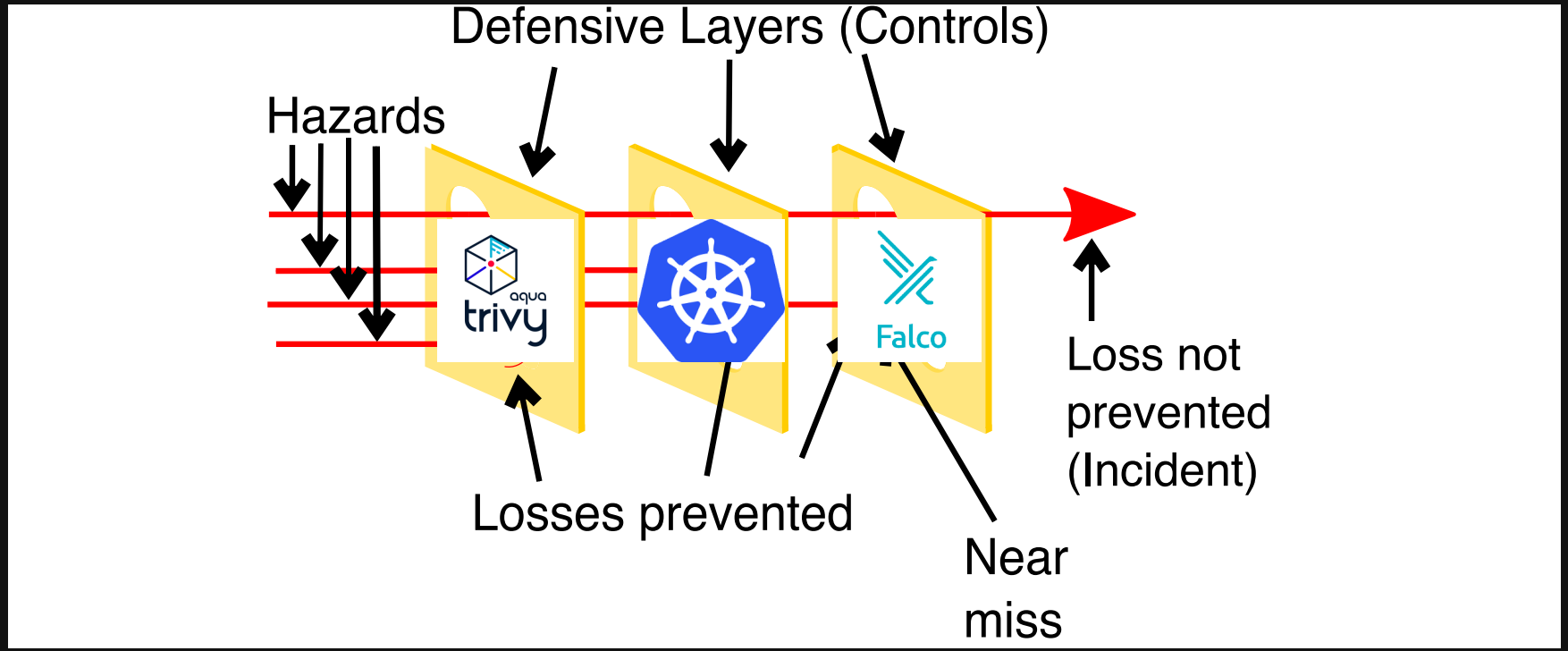
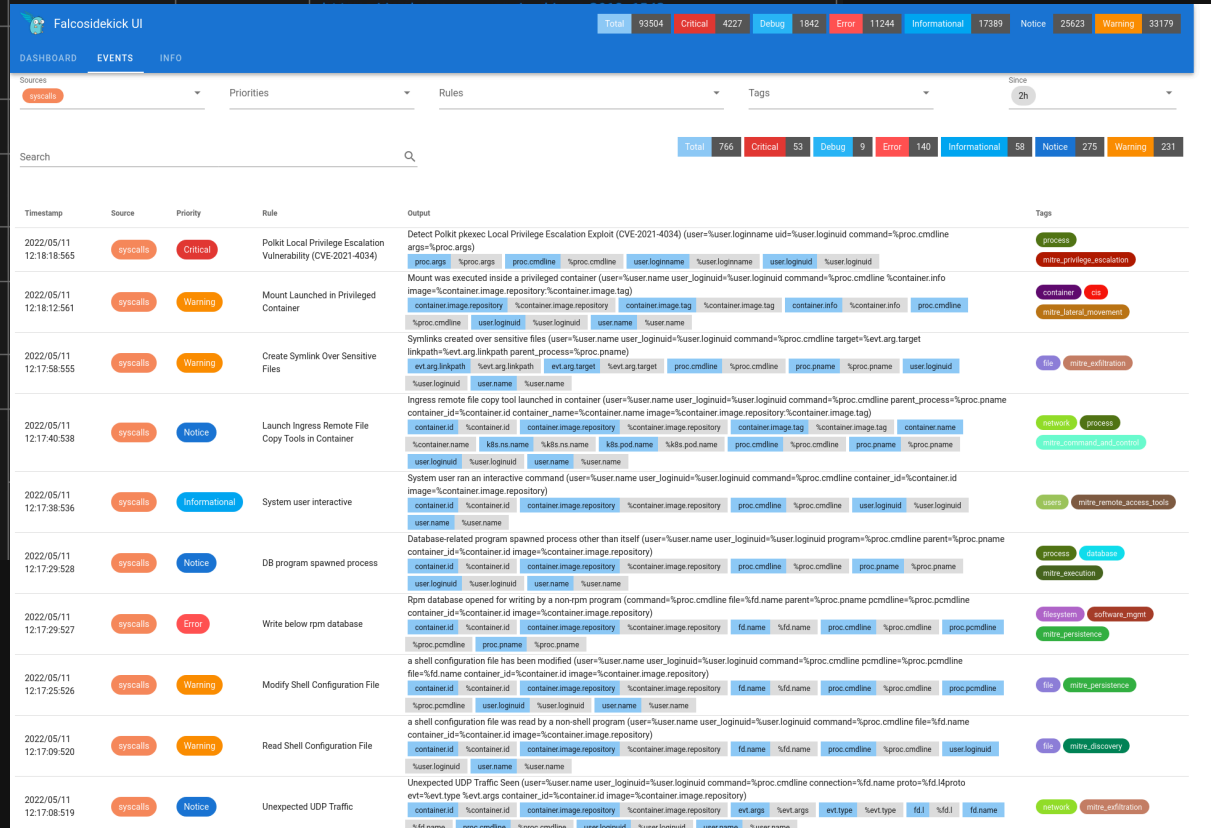
vArmor
VEINMIND
WhiteSource
Zettaset
ZITADEL

# Defense in Depth



# Endless list of findings

| | | | | | |
|---|---|---|---|---|---|
| expat | CVE-2019-15903 | HIGH | 2.2.6-r0 | 2.2.7-r1 | expat: heap-based buffer over-read via crafted XML input https://avd.aquasec.com/nvd/cve-2019-15903 |
| libcrypto1.1 | CVE-2019-1543 | | 1.1.1a-r1 | 1.1.1b-r1 | openssl: ChaCha20-Poly1305 with long nonces |
| libcrypto1.1 | CVE-2020-1967 | HIGH | | | |
| libcrypto1.1 | CVE-2021-23840 | HIGH | | | |
| libcrypto1.1 | CVE-2021-3450 | HIGH | | | |
| libssl1.1 | CVE-2019-1543 | HIGH | | | |
| libssl1.1 | CVE-2020-1967 | HIGH | | | |
| libssl1.1 | CVE-2021-23840 | HIGH | | | |
| libssl1.1 | CVE-2021-3450 | HIGH | | | |
| sqlite-libs | CVE-2019-19244 | | | | |

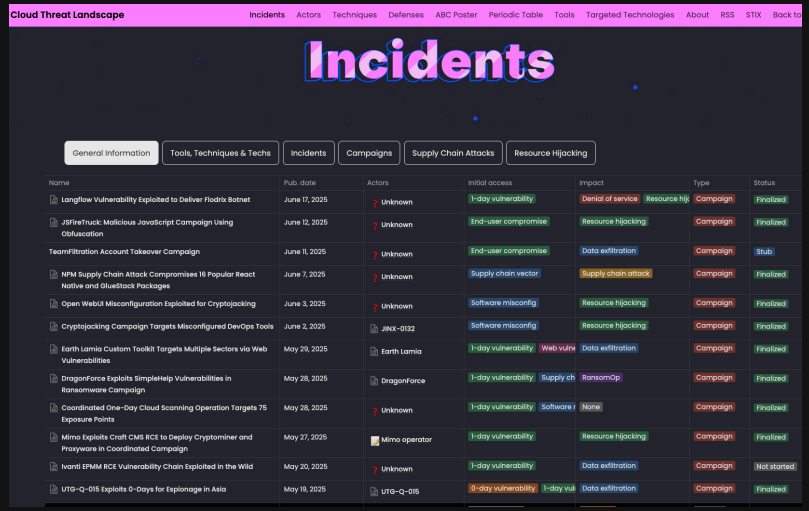


# Does *this* make our environments secure?

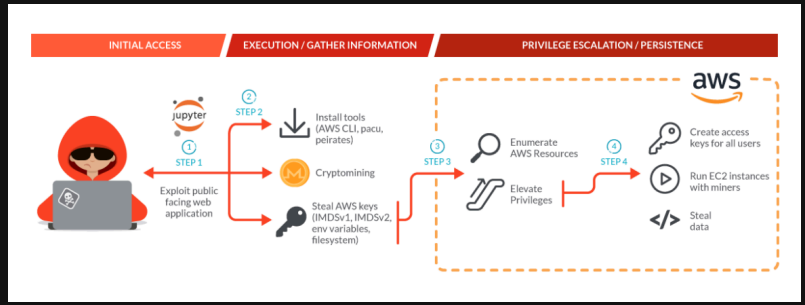
"Defenders think in lists.
Attackers think in graphs.
As long as this is true, attackers win"

John Lambert, VP Security @ Microsoft, 2015

# Threat Intelligence

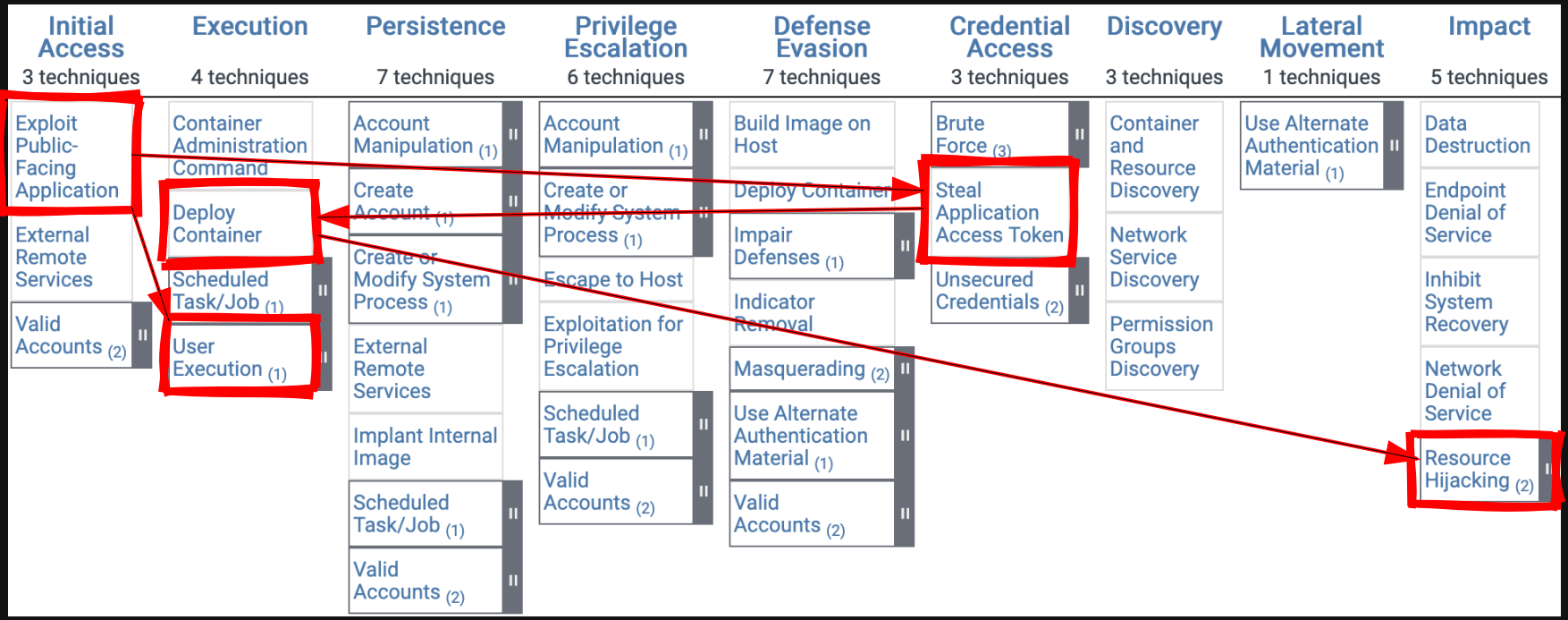



Wiz' Cloud Threat Landscape




Sysdig: Scarleteel 2.0

# MITRE ATT&CK

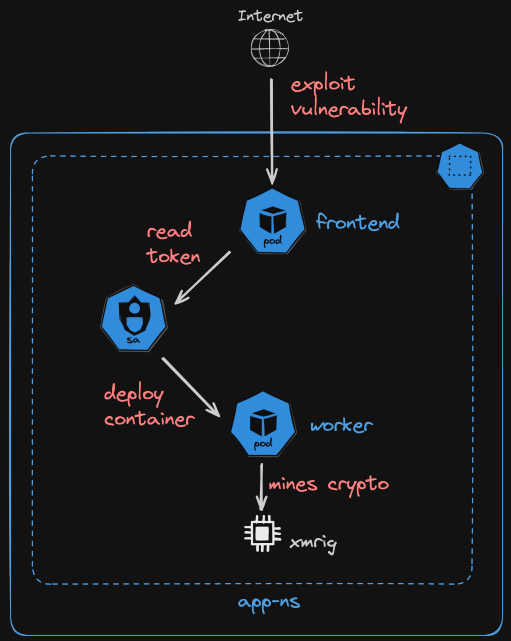



MITRE ATT&CK - Containers Matrix

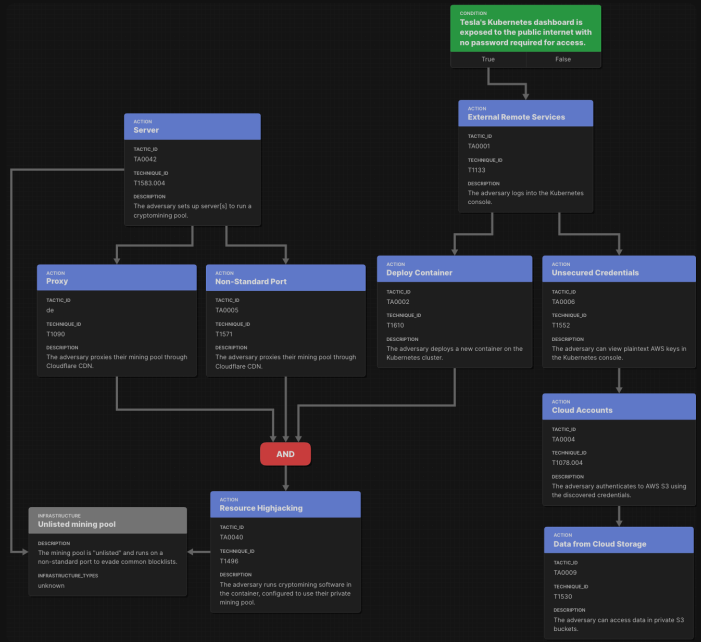
# Attack Graph

= combination of TTPs

## Resource-centric

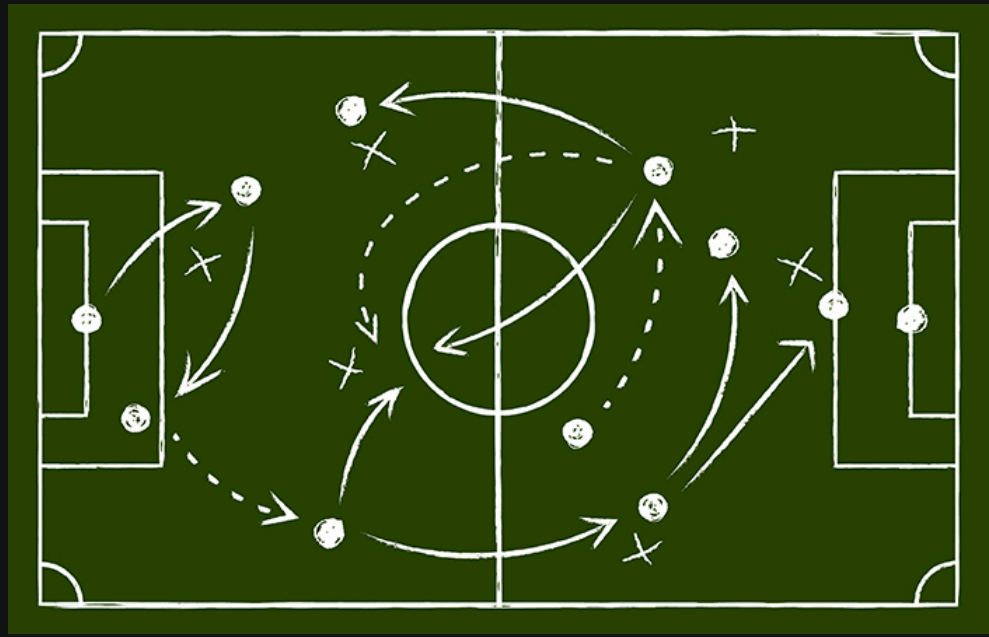



## Attack-centric



# Attack Path Analysis

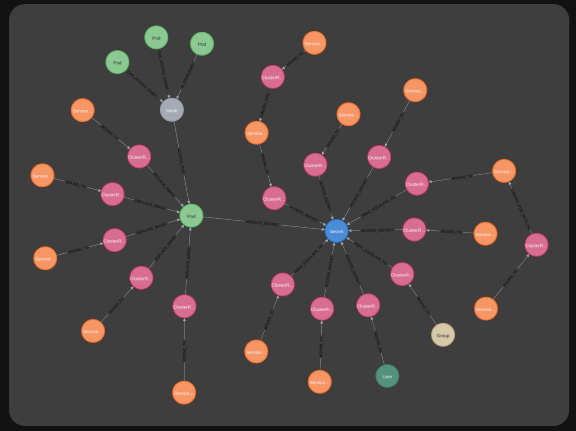
- *Models* all possible attack paths
- Full visiblity of environment
- Contextualizes findings
- Enables advanced analysis



# Attack Path Analysis Tools

## IceKube


- 25 TTPs
- uses Neo4J
- Query using Cypher

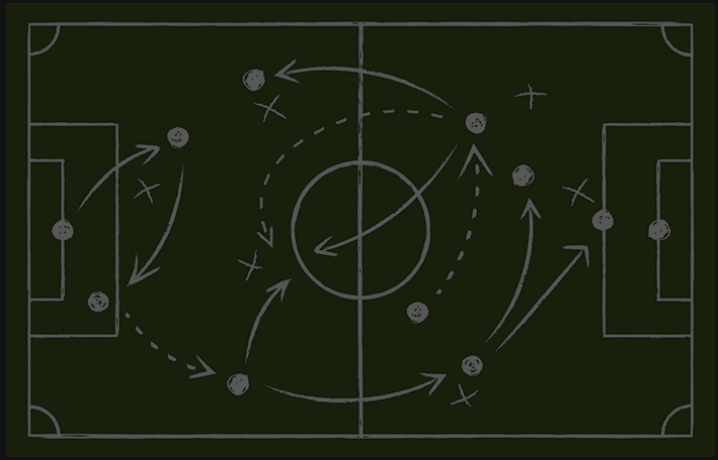


## KubeHound


- 25 TTPs
- uses JanusGraph
- Jupyter Notebook for analysis
- experimental automation features

# Getting real

## Attack Path Analysis



## Adversary Emulation

# Adversary Emulation

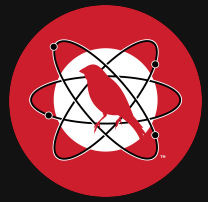
- Perform attack on real environments
- Evalates the effectiveness of security controls
- Varying degree of realism:

# Atomic Emulation

- detonate single TTPs
- primarily use-case:
  - test processing pipeline
  - manage detections

## Tools

### Atomic Red Team



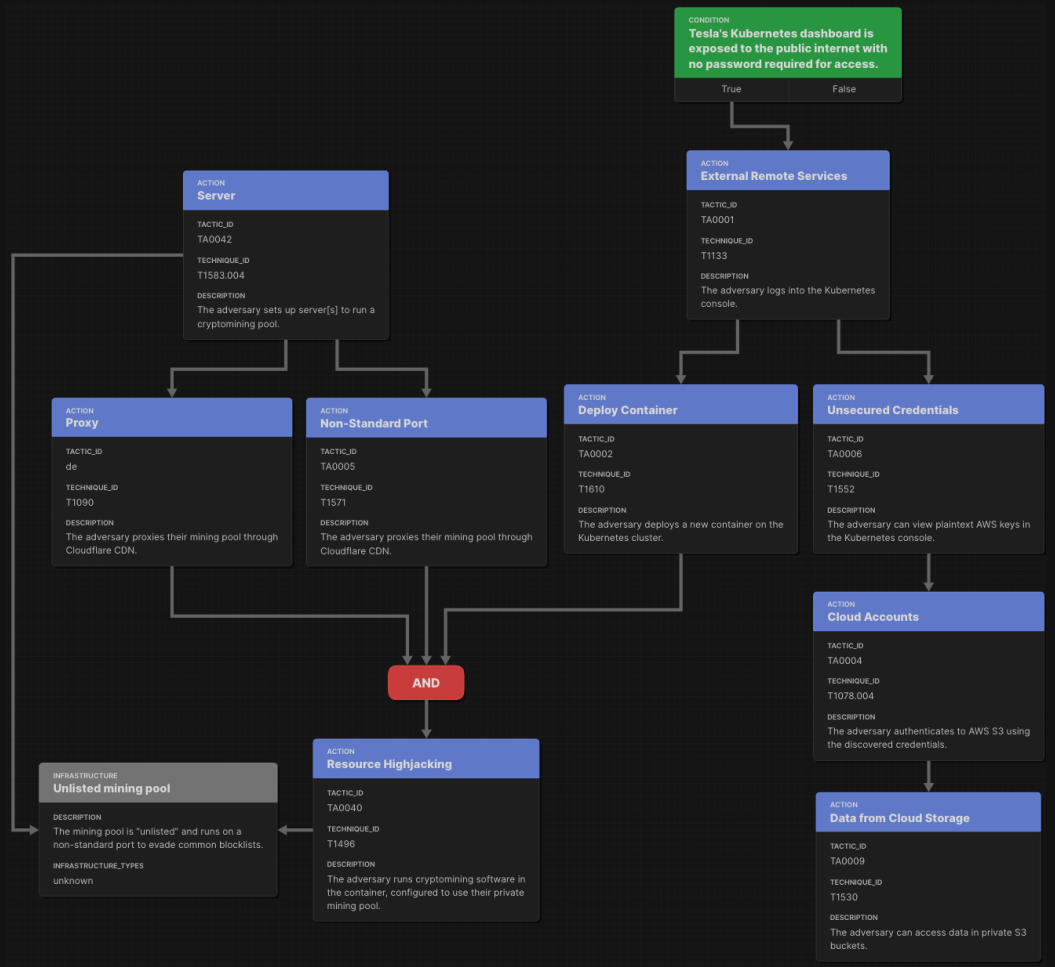
- 1700+ TTPs
- focus on OS-based TTPs
- ~10 TTPs for Docker + K8s

### Stratus Red Team


- 50+
- focuses on AWS, Azure, GCP
- ~8 TTPs for K8s

# Planned Emulation

- aka "Micro emulations"
- easy to automate
- Validate atomic + chain analytics
- good for reproducing scenarios



# Planned Emulation: Tools

## Mitre Caldera

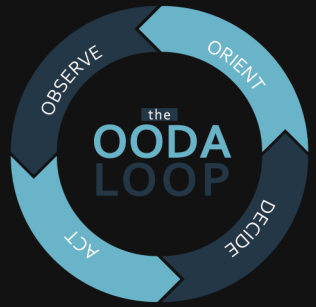

- oldest and most mature emulation tool (2015)
- primary for enterprise environments
- no special K8s support
- big plugin ecosystem
- supports automated planning

## Leonidas

- similar to Stratus Red Team
- allows chaining of TTPs
- runs as workload inside K8s cluster
- supports only `kubectl` -based TTPs for K8s

# Realistic Emulation

- "Fog of War"
- a red team engagement




## Use Cases

- Evaluate incident response plans
- testing more sophisticated defenses
  - Moving Target Defense
  - Deception

## Tools

CALDERA

Ran

# Demo

# Take-aways

Adopt an attacker's mindset to assess your effective security.

## Attack Path Analysis

- Contextualize security findings
- Uncover dangerous combinations
- Plan for improvements

## Adversary Emulation

- Validate security controls
- Improve detection & response
- Show value of more advanced defenses