Rod Soto + Phil Royer

Use Splunk SIEMulator to Generate Data for Automated, Detection, Investigation, and Response

Splunk Security Research

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During the course of this presentation, we may make forward-looking statements regarding future events or plans of the company. We caution you that such statements reflect our current expectations and estimates based on factors currently known to us and that actual events or results may differ materially. The forward-looking statements made in the this presentation are being made as of the time and date of its live presentation. If reviewed after its live presentation, it may not contain current or accurate information. We do not assume any obligation to update any forward-looking statements made herein.

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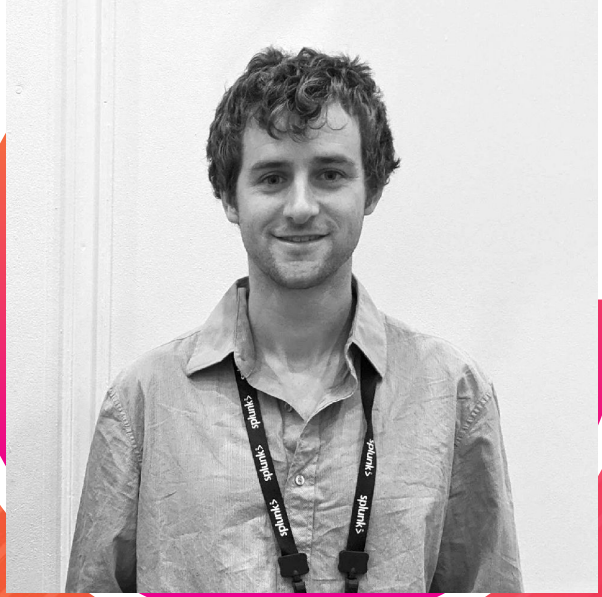

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The Problem with a Lack of Data

- Always catching up to the latest crimeware/exploit code
- Exploit/Bug market has made it more difficult
- Lack of a common data sharing framework
- Data if any is divided in pieces (exploitation, detection, pcaps/logs,)
- Most enterprises cannot afford a dedicated team of specialists to replicate/recreate specialized data

Industry Limitations

- No standard framework for sharing data
- Market driven by keeping data proprietary or charging for it
- Data shared into several pieces puzzle/jeopardy style
- Replicating exploits is still seen as breaking the rules or out of many corporate defensive environments
- There is no single framework that puts all the pieces together...

Challenges in Data Replication

Where does data come from?

- 0days, Twitter, Disclosure lists, Exploit-Db, Industry reports, Security Groups, Internal Research, Github

How do we replicate/measure?

- Exploit-Db, Github, Adversarial Simulation (Caldera, FireDrill, RedCanary, Metasploit)

How do we countermeasure?

- Snort Signature, Splunk Searches (Investigation/Detection), Phantom Playbooks

Enter Splunk SIEMulator

- Project based on Chris Long's Detection Lab (https://github.com/clong/DetectionLab)
- Used to feed data into Splunk
- Seeks to replicate attacks, generate data and countermeasures in a single framework
- Infrastructure as Code allows continuous integration, quick deployment, cloud storage and elasticity

SIEMulator IaC

		Simulation Phase	
1	Cloud Based AS: RedCanary, FireDrill, Custom	Attack	• Ansible • Vagrant • Terraform
2	Researcher Workstation / Splunk Cloud Instance	Measure	• Sysmon, Syslog • Splunk UF • Logs from application, service, debug
3	Splunk Cloud Ecosystem defense artifacts	Counter measure	• Splunk Core, Apps • Splunk ES • Splunk Phantom
4	Content Updates, Playbooks, Replication data	Shareable Knowledge	• Detections • Investigations • Playbooks

Attack Replication

together to develop more effective cybersecurity. ATT&CK is open and available to any person or organization for use at no charge.

ATT&CK™

Get Started » Contribute »

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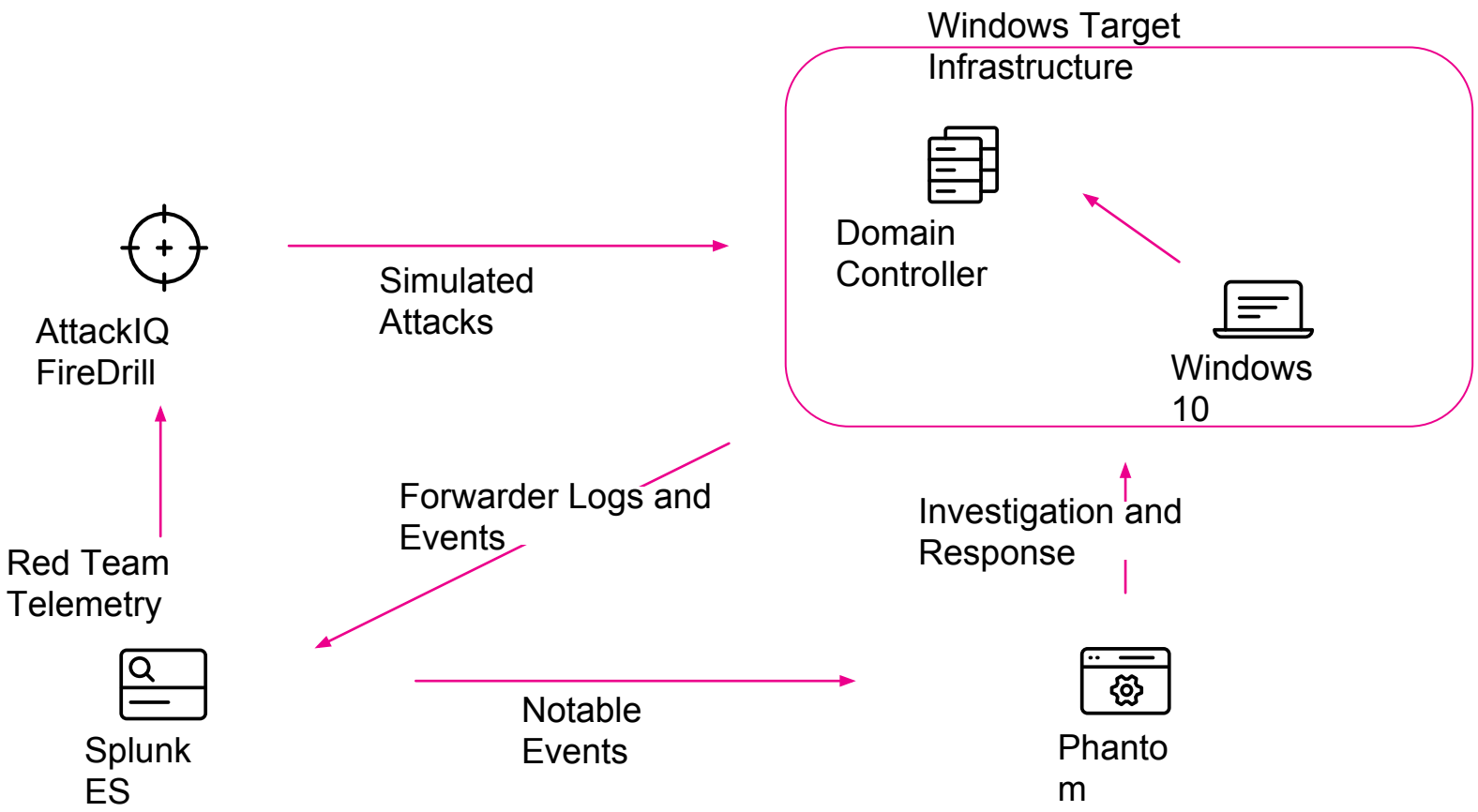
ATT&CK Matrix for Enterprise

Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Lateral Movement	Collection	Comm Co

SIEMulator Architecture Overview



Example

Attack Range Setup

1. root@rsoto-mbp-1ecaa: ~/Desktop/attack_simulation (zsh)

```
┌─[root@rsoto-mbp-1ecaa]─[~/Desktop/attack_simulation on master!]
└─ # ls
.git                  command_and_control  lateral_movement
.github               credential_access    persistence
.gitignore            defense_evasion      privilege_escalation
.pre-commit-config    discovery            requirements.txt
README.md             docs                 runscenario.py
attack_sim.py         execution            runscenario.pyc
collection            initial_access       venv
(env)
┌─[root@rsoto-mbp-1ecaa]─[~/Desktop/attack_simulation on master!]
└─ # source venv/bin/activate
(venv)
┌─[root@rsoto-mbp-1ecaa]─[~/Desktop/attack_simulation on master!]
└─ # ls
.git                  command_and_control  lateral_movement
.github               credential_access    persistence
.gitignore            defense_evasion      privilege_escalation
.pre-commit-config    discovery            requirements.txt
README.md             docs                 runscenario.py
attack_sim.py         execution            runscenario.pyc
collection            initial_access       venv
(venv)
┌─[root@rsoto-mbp-1ecaa]─[~/Desktop/attack_simulation on master!]
```

win10-workstation-5046 [Running]

Administrator: Windows PowerShell

```
               0 File(s)              0 bytes
               2 Dir(s)  47,687,725,056 bytes free

C:\>dir /s  *Sysmon/
Invalid switch - "".

C:\>dir /s  *Sysmon/\Operational
Invalid switch - "\Operational".

C:\>dir /s  *Operational
 Volume in drive C is Windows 10
 Volume Serial Number is 9E7A-1549

 Directory of C:\Program Files\SplunkUniversalForwarder\var\lib\splunk\modinputs\WinEven
tLog

07/22/2019  10:17 AM               130 Microsoft-Windows-Sysmon_Operational
               1 File(s)            130 bytes

     Total Files Listed:
               1 File(s)            130 bytes
               0 Dir(s)  47,620,894,720 bytes free

C:\>_
```

Windows 10 Enterprise Evaluation
Windows License valid for 14 days
Build 17134.rs4_release.180410-1804
11:38 AM
7/25/2019

Left ⌘

AttackIQ Web Interface (T1218/T1047)

ATTACKIQ PLATFORM

RS

Scenarios Library > Detail

Scenario Details

Create Process Through WMI

Type: Attack
Supported Platforms:

DOWNLOAD SOURCE CODE

This scenario executes a binary using the Windows Management Instrumentation (WMI) Console. The Windows Management Instrumentation is the Microsoft implementation of Web-Based Enterprise Management (WBEM), which is an industry initiative to develop a standard technology for accessing management information in an enterprise environment.

The basic purpose of WMI is to be able to obtain information about the operating system. Nevertheless, WMI offers advanced features that can be used by malware developers. One example of this advanced behavior is the capability to execute actions when a specific event happens or at a certain interval. Using this approach malware developers can achieve persistence in the compromised system by using uncommon techniques and therefore achieving lower antivirus detection ratios.

It's a known fact that malware tries to execute code using multiple approaches given that nowadays advanced security measures implement multiple checks in order to avoid code execution from unexpected sources. Malware tries to bypass these security checks using different ways of executing code such as executing it through the rundll32.exe utility, using DLL Side-Loading or, in this case, executing it through WMI queries.

This kind of behavior can be found in malware such as PlugX, a remote access tool used in campaigns against government-

AttackIQ Web Interface (T1218/T1047)

Create Process Through WMI ATTACK

Advanced Endpoint Detection | APT29 | APT32 | black_energy | Execution | Leviathan | PlugX | T1047 | T1218 | threat

MALICIOUS ACTIVITY ALLOWED

Hostname	Installed Technology	IP Address	Operating System
win10-workstation-41cb	no technology detected	10.0.2.15	Windows 10 Enterprise Evaluation

TOTAL PHASES (1)

NOT BLOCKED Execute Binary Through WMI CRITICAL

START TIME: **04:58:06 PM** ON JUL 25 2019 END TIME: **04:58:07 PM** ON JUL 25 2019

Detailed Findings:

A new process based on the binary "C:\Program Files\AttackIQ\FiredrillAgent\scenarios\2bb15b9b-5f2d-45e7-ae40-21ee1c6d2e21\files\4b019b84-1bb7-40b3-88e7-7322f6538f7f\helloworld_x86.exe" was successfully created using WMI Console

ACTIVITY DETAILS

Info Warning Error Advanced

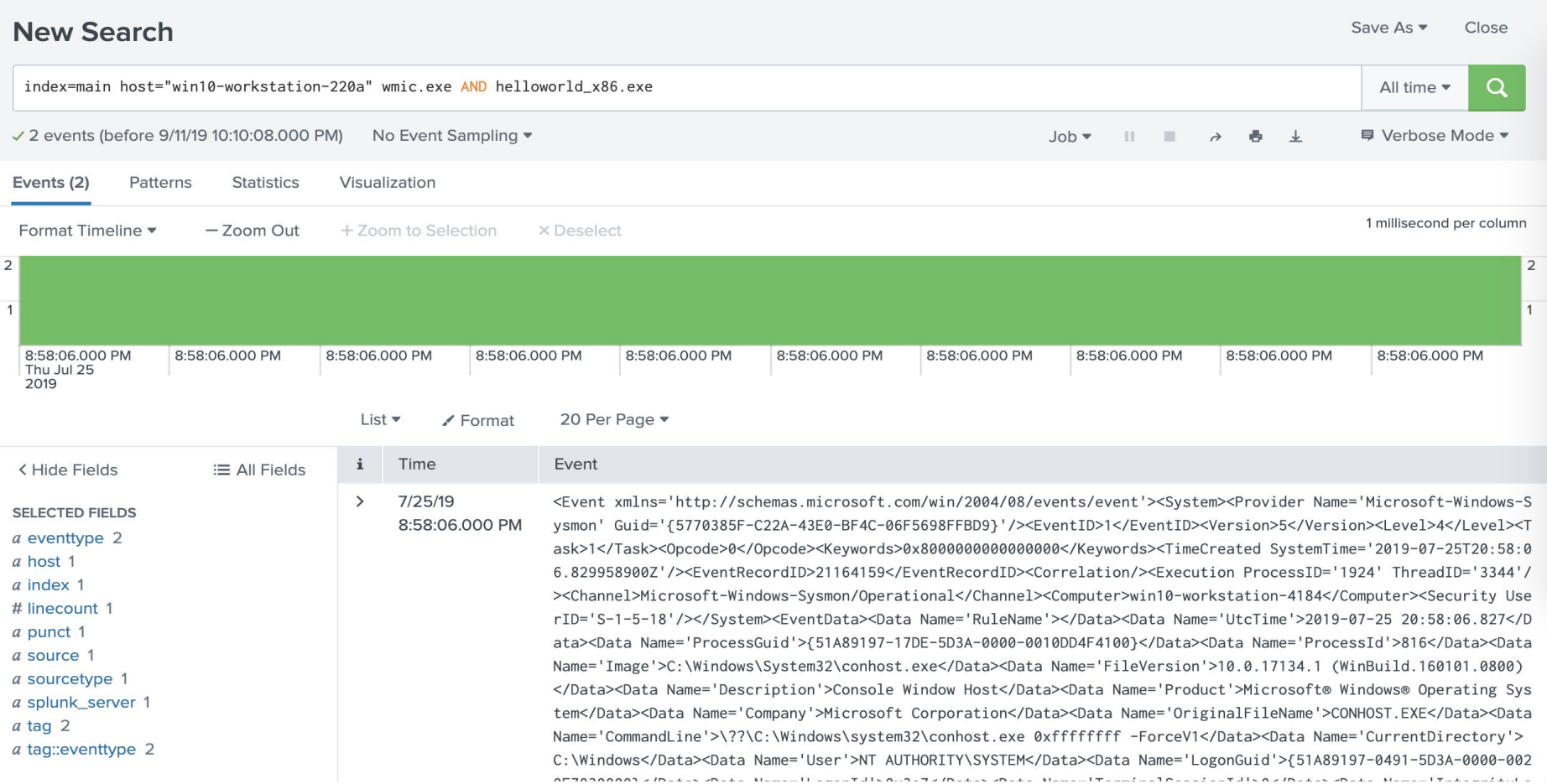
(07/25/2019 04:58:06) Executing: wmic Process call create "C:\Program Files\AttackIQ\FiredrillAgent\scenarios\2bb15b9b-5f2d-45e7-ae40-21ee1c6d2e21\files\4b019b84-1bb7-40b3-88e7-7322f6538f7f\helloworld_x86.exe "

(07/25/2019 04:58:07) Process ID for the new process: 2008

(07/25/2019 04:58:07) Successfully created process using WMI Console

(07/25/2019 04:58:07) Process "2008" already finished

Attack Recorded in Splunk (T1218/T1047)



splunk> .conf19

Translating Data into the Defensive Context

splunk>enterprise | App: Search & Reporting | Administrator | 2 Messages | Settings | Activity | Help | Find

Search | Datasets | Reports | Alerts | Dashboards | Search & Reporting

New Search

Save As | Close

```
| tstats `summariesonly` count values(Processes.process) as process values(Processes.parent_process) as parent_process min(_time) as firstTime max(_time) as lastTime from
    datamodel=Endpoint.Processes where Processes.process_name=wmic.exe by Processes.user Processes.process_name Processes.parent_process_name Processes.dest |
    `drop_dm_object_name(Processes)` | `ctime(firstTime)`| `ctime(lastTime)`
```

Last 4 hours

✓ 1 event (7/25/19 5:27:00.000 PM to 7/25/19 9:27:30.000 PM) | No Event Sampling | Job | Verbose Mode

Events (1) | Patterns | **Statistics (1)** | Visualization

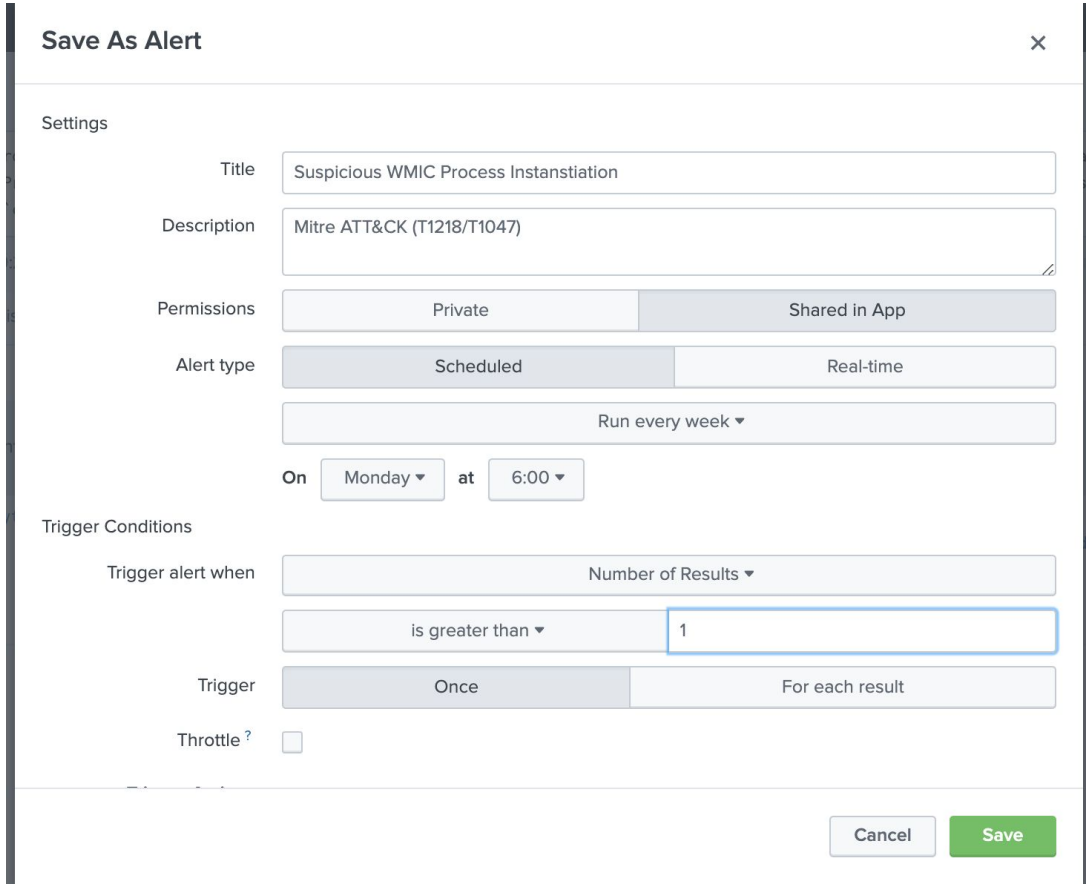
100 Per Page | Format | Preview

user	process_name	parent_process_name	dest	count	process	parent_process	firstTime
NT AUTHORITY\SYSTEM	WMIC.exe	ai_python.exe	win10-workstation-4184	1	"C:\Windows\System32\Wbem\wmic.exe" Process call create "C:\Program Files\AttackIQ\FiredrillAgent\scenarios\2bb15b9b-5f2d-45e7-ae40-21ee1c6d2e21\files\4b019b84-1bb7-40b3-88e7-7322f6538f7f\helloworld_x86.exe "	"C:\Program Files\AttackIQ\FiredrillAgent\engine\ai_python.exe" main.py model.json	07/25/2019 20:58:06

splunk> .conf19

Applying This Data

Splunk Alert



Applying This Data - Investigation Searches

splunk>enterprise App: Search & Reporting ▾ Administrator ▾ 2 Messages ▾ Settings ▾ Activity ▾ Help ▾ Find

Search Datasets Reports Alerts Dashboards Search & Reporting

New Search

Save As ▾ Close

```
| tstats `summariesonly` values(Processes.process) as process min(_time) as firstTime max(_time) as lastTime from datamodel=Endpoint.Processes where Processes
    .parent_process_name =helloworld_x86.exe by Processes.process_name Processes.parent_process_name Processes.dest Processes.user
```

Last 4 hours ▾

✓ 2 events (7/25/19 6:11:00.000 PM to 7/25/19 10:11:30.000 PM) No Event Sampling ▾ Job ▾ Verbose Mode ▾

Events (2) Patterns **Statistics (2)** Visualization

100 Per Page ▾ Format Preview ▾

Processes.process_name	Processes.parent_process_name	Processes.dest	Processes.user	process	firstTime	lastTime
Fondue.exe	helloworld_x86.exe	win10-workstation-4184	NT AUTHORITY\SYSTEM	"C:\Windows\system32\fondue.exe" /enable-feature:NetFx3 /caller-name:mscoreei.dll	1564088287	1564088287
conhost.exe	helloworld_x86.exe	win10-workstation-4184	NT AUTHORITY\SYSTEM	\??\C:\Windows\system32\conhost.exe 0xffffffff -ForceV1	1564088287	1564088287

Applying This Data - Investigation Searches

New Search

Save As Close

```
dest="win10-workstation-4184" helloworld_x86.exe | stats count by process parent_process _time
```

All time

✓ 11 events (before 9/11/19 10:13:08.000 PM) No Event Sampling Job Verbose Mode

Events (11) Patterns Statistics (7) Visualization

100 Per Page Format Preview

process	parent_process	_time	count
"C:\Program Files\AttackIQ\FiredrillAgent\scenarios\2bb15b9b-5f2d-45e7-ae40-21ee1c6d2e21\files\4b019b84-1bb7-40b3-88e7-7322f6538f7f\helloworld_x86.exe"	C:\Windows\system32\wbem\wmiprvse.exe -secured -Embedding	2019-07-25 20:58:07	1
"C:\Windows\Microsoft.NET\Framework64\v4.0.30319\InstallUtil.exe" /U "C:\Program Files\AttackIQ\FiredrillAgent\scenarios\3cbe6667-3c8b-44e2-8936-0d8d8870ac28\files\4b019b84-1bb7-40b3-88e7-7322f6538f7f\helloworld_x86.exe"	"C:\Program Files\AttackIQ\FiredrillAgent\engine\ai_python.exe" main.py model.json	2019-07-25 19:53:05	1
"C:\Windows\System32\Wbem\wmic.exe" Process call create "C:\Program Files\AttackIQ\FiredrillAgent\scenarios\2bb15b9b-5f2d-45e7-ae40-21ee1c6d2e21\files\4b019b84-1bb7-40b3-88e7-7322f6538f7f\helloworld_x86.exe "	"C:\Program Files\AttackIQ\FiredrillAgent\engine\ai_python.exe" main.py model.json	2019-07-25 20:58:06	1

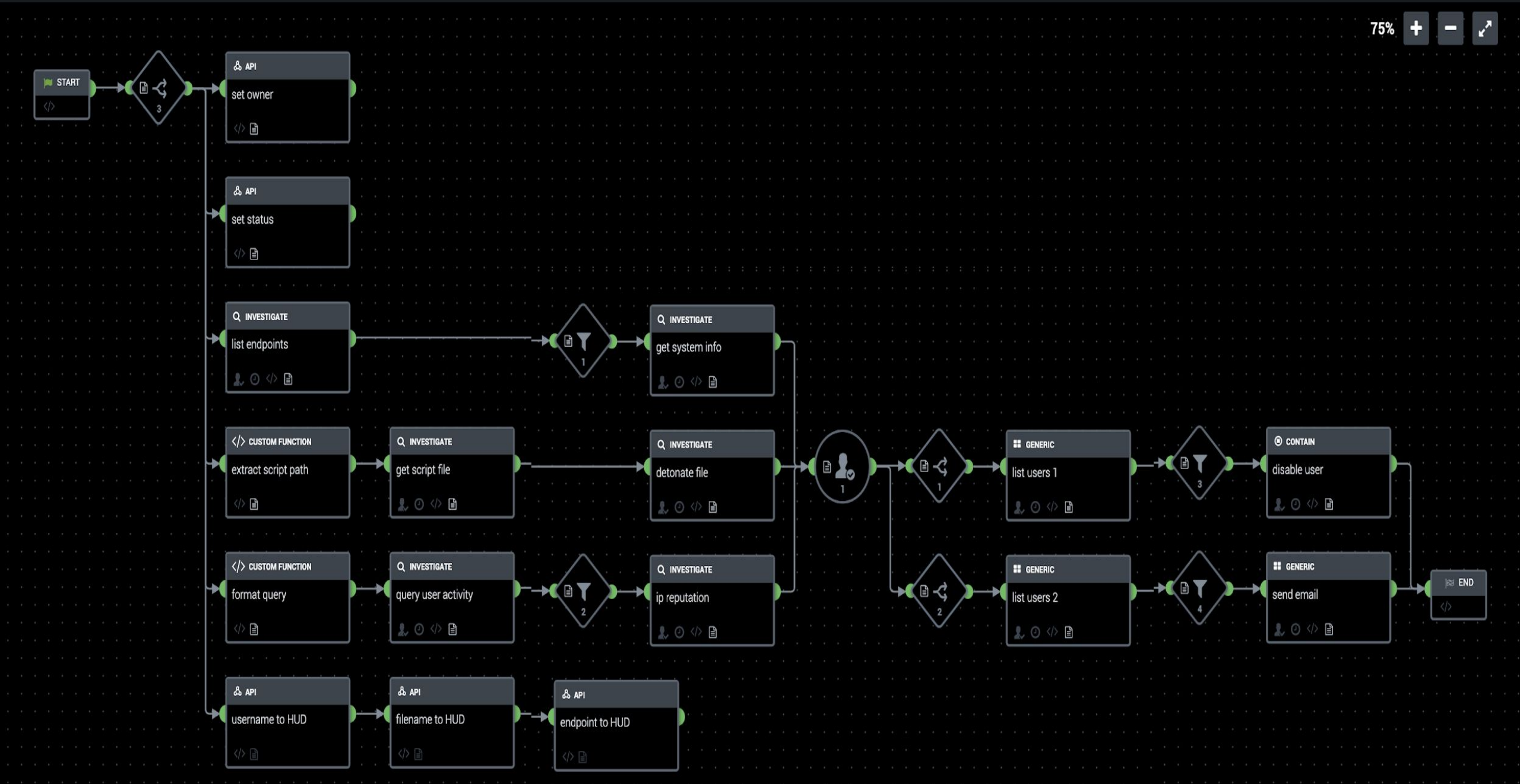
splunk>phantom

prohibited_endpoint_activity_response

Repo: local

PLAYBOOK SETTINGS

EDIT PLAYBOOK



Applying This Process

- By applying this process we can cover the entire cycle of replicating known and new exploits, recording data applying Splunk technology for detection, investigation and defense.
- We can now streamline the process of producing new content and tackle new threats in a faster mode.
- We can now share this knowledge via content updates, publishing searches, playbooks, apps or modifying current content.
- Future work will include integration with other Adversarial Simulation frameworks

Content Production via ESCU

splunk>enterprise App: ES Content Updates Administrator Messages Settings Activity Help Find

Content Library | Analytic Story Detail | Keyword Search | Feedback Center | Search | Usage Details | Docs | Take a Tour | ES Content Updates

Content Library

Edit Export ...

Explore the Analytic Stories included with ES Content Updates.

Analytic Story Summary | Search Summary

Total Analytic Stories

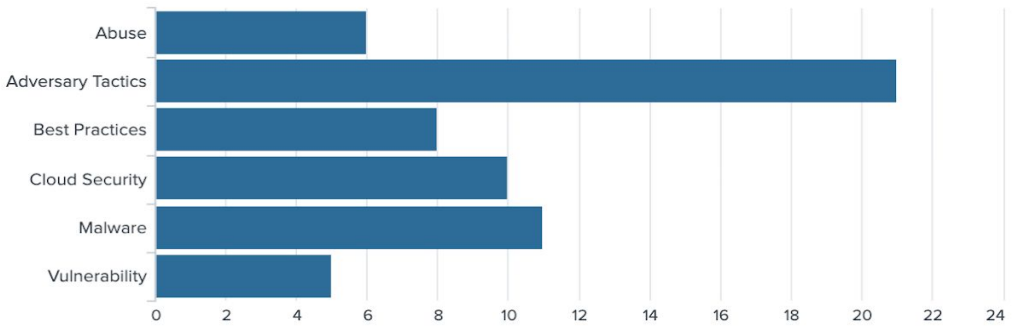
61

ESCU App Version

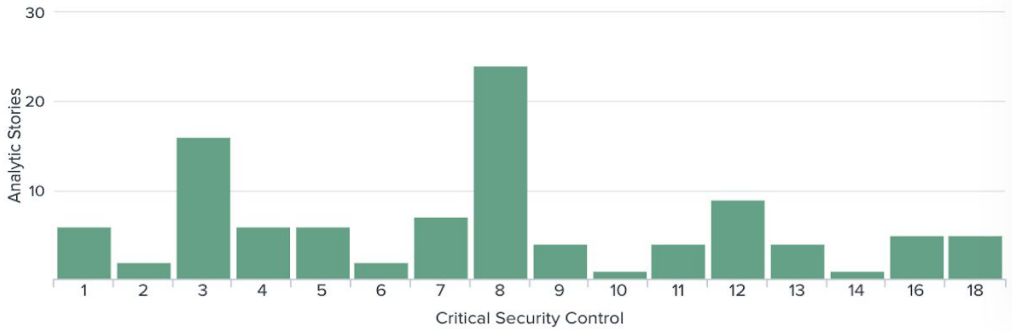
1.1.0

Story Categories

<1m ago



Analytic Stories by CIS Critical Security Control



splunk> .conf19

Splunk Security Research Team

The Security Research Team is devoted to delivering actionable intelligence to Splunk's customers in an unceasing effort to safeguard them against modern enterprise risks. Composed of elite researchers, engineers, and consultants who have served in both public and private sector organizations, this innovative team of digital defenders monitors emerging cybercrime trends and techniques, then translates them into practical analytics that Splunk users can operationalize within their environments. Download Splunk Enterprise Security Content Update in Splunkbase to learn more.

https://github.com/splunk/attack_range

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Q&A

Rod Soto | Security Researcher
Philip Royer | Security Researcher

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